Heterogeneous Districts, Interests, and Trade Policy*

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Abstract: Congressional districts are political entities with heterogeneous trade policy preferences due to their diverse economic structures. Representation of these interests in Congress is a crucial aspect of trade policy-making that is missing in canonical political economy models of trade. In this paper, we underscore the influence of districts by developing a political economy model of trade with region-specific factors. Using 2002 data from US Congressional Districts, we first characterize the unobserved district-level demand for protection. Extending the model beyond the small country assumption to account for export interests as a force countering protection, we develop a model of national tariff-setting. The model predictions are used to estimate the welfare weights implied by tariff and non-tariff measures enacted nationally. Our supply-side explanation for trade policy, while complementing Grossman and Helpman (1994), reveals district and industry levels patterns of winners and losers, central to understanding the political consequences of trade and the backlash against globalization.

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1 Introduction

Political economy models of trade posit that a political entity, a "government", decides how much trade protection is optimal for every sector of the economy. This may diverge from free trade because what is politically optimal for the tariff setter may not be optimal for citizens taken together. A classic model explaining this divergence is Grossman and Helpman (1994) in which special interests pay the government for protection from imports according to the willingness of the government to receive. That, in turn, is determined by the weight the government places on (a dollar of) its citizens' welfare relative to (a dollar of) campaign contributions that the government pockets. Thus, protection is endogenous: the payoffs from protection to owners of specific factors of production (workers and capitalists) who benefit from trade restrictions incentivize them to try to alter the government's calculus by making quid pro quo contributions. Helpman (1997) unifies analytically a number of models of endogenous protection in which the government's calculus is altered by interest groups (Magee et al., 1989); by political support from producers and consumers (Hillman, 1982); by competing lobbies (Bhagwati and Feenstra, 1982, Findlay and Wellisz, 1982); or by balancing domestic and foreign policy motivations (Hillman and Ursprung, 1988).

But who or what is "government"? Few models have allowed the actual process of preference aggregation in trade policy-making a significant role. Grossman and Helpman (1996) model the determinants of trade policy platforms chosen by representatives competing at the polls, which sheds light on the importance of ideology, uninformed voters, and special interest. Even in models featuring electoral competition (Magee et al., 1989, Chapter 6) or direct democracy (Mayer, 1984, Dutt and Mitra, 2002), incentives faced by members of the legislature, even the executive, are abstracted (Rodrik, 1995). This sidelines the institutionally most important actors in the tariff game, legislators, who must coalesce in the formulation of trade policy.

This paper attempts to restore the place of the legislature and the executive in a model of endogenous protection. Our model brings to focus the preferences of economically heterogeneous districts. These district-level preferences must be aggregated into a national policy, a process in which representatives form coalitions and engage in bargaining to arrive at a trade policy that is agreeable to a majority of members of the legislature. The impact of the process of aggregation of heterogeneous regional, or district-level, preferences is absent in political economy models of trade like Grossman and Helpman (1994) where a unilateral decision-maker sets tariffs. Who wins in these legislative bargains is the subject of a large body of research in political science built around the seminal work of Riker (1962). A principal contribution to the legislative bargain literature is Baron and Ferejohn (1989), whose focus on the role of an agenda setter in the distribution of gains, provides a framework for characterizing the process of preference aggregation in the making of trade policy (see Celik et al. (2013)).

Our research builds on a large literature that has sought to explain U.S. protectionism (Deardorff and Stern, 1983, Marvel and Ray, 1983) and its political economy determinants (Baldwin, 1985, Ray, 1981, Trefler, 1993). These empirical examinations make the case that, ultimately, government dispenses trade protection in response to demands from economic actors affected by trade. The Grossman and Helpman (1994) model highlights an important aspect of the demand side of trade policymaking – the influence of special interests. Examinations of the Grossman-Helpman model of trade protection (Goldberg and Maggi, 1999, Gawande and Bandyopadhyay, 2000) have further advanced the empirical literature on the influence of special interests. They find that while import-competing interests do exert influence, the amount of protection they are able to "buy" is less than what one might expect.

The model in this paper offers a view of these results from a different lens: focusing on legislators' incentives and legislative bargaining provides a supply-side explanation of trade policymaking in the U.S.. The paper makes three main contributions. First, we model tariff determination in the presence of heterogeneous regional interests. The model develops micro-foundations for an institutional explanation of why tariffs have remained low in the U.S. in the post-WWII era despite a growing public backlash against globalization. The analysis retrospectively examines the U.S. tariff structure that was largely determined in the Kennedy and Tokyo rounds of GATT. Hence, we extend the model to account for the reciprocal nature of trade liberalization, bringing to the fore the interests of specific factors in exporting industries that value preferential access to foreign markets, thereby affecting the calculus of policymakers (see Irwin and Kroszner (1999), Irwin (2017)).

The second contribution of the paper is to integrate legislative bargaining into a structural political economy model of trade, as in Celik et al. (2013). We model stylized coalitions in the legislature based on geography and politics. The main result is empirical: we estimate the implicit welfare weights that members of these coalitions "win" on behalf of specific factor owners in their districts in the national bargain. The bottom line is that the *national* tariffs and non-tariff measures derived from the model depend on the *regional* structure of economic activity, the weights representatives place on factor owners in their districts, and the way district preferences are aggregated. The model is consistent with, and closer to, institutions under which trade policy is made in the U.S. and captures the give-and-take between Congress and the Executive (Finger et al., 1988, Destler, 2005).

Third, and perhaps most importantly, the estimates of structural parameters, the *welfare weights*, provide a theory-based explanation of why U.S. manufacturing tariffs have been low and remained low even at the onset of the *China shock*. The results highlight the role of export interests in making it so, portraying which region's interests went unfulfilled and which region's interests were advanced in the making of trade policy.

The main results from our paper can be summarized as follows. First, we use the model predictions to estimate district-level tariff preferences. These estimates provide a measure of –otherwise unobserved– local demands for protection. The contrast between the independent demand for protection by districts and the protection actually delivered by the legislature, a measure of their "unmet" demand, can be stark particularlt in industrially concentrated districts.[1]

Second, the model provides the structure for estimating the implicit welfare weights that owners of specific factors of production and mobile factors receive in the process of aggregating district-level preferences into the national tariff. Overlaying a model of the legislative bargaining process further establishes that the vector of national tariffs proposed by an agenda setter, such as the House Ways and Means Committee, that would muster support in Congress is a weighted average of the demand for protection in a majority of districts. We estimate these weights using tariff data from the early 2000s, a time when the U.S. economy was transformed by the deluge of manufacturing imports, particularly from China. The results from this exercise suggest that the underlying political process determining national tariffs places twice as

[1] The relevance of this finding cannot be understated. It is the source of the China shock, examined in influential articles, e.g. Autor et al. (2013), that promise to shape the trade policy debate.

much weight on the aggregate welfare of mobile factors (labor) relative to the aggregate welfare of sector-specific factor owners seeking protection. Further, the positive weights on specific factor owners in import-competing industries are distributed unequally across districts and industries. The aggregate level of protection, including tariff and non-tariff measures (NTMs), implies that Republican-controlled districts take the lion's share of the aggregate weights placed on specific capital owners: they outweigh Democratic districts by a 2-to-1 ratio.

Finally, parameter estimates accounting for the reciprocal determination of tariffs and terms of trade effects (the large country case) unveil the strong influence of specific factor owners in exporting industries: their welfare is weighted as much as the welfare of factor owners in import-competing industries. Furthermore, when accounting for reciprocity with the rest of the world in the determination of U.S. tariffs we find that specific factor owners in safe Republican districts in states carried by the Republican Presidential ticket and safe Republican districts in battleground states receive positive weights. These findings suggest that the legislative majority enacting the tariffs includes representatives from districts with a higher concentration of specific factor owners in exporting industries. These are important and novel results that existing models of the political economy of trade do not capture. In the ensuing sections, we introduce our models, form an estimation strategy based on the propositions derived from the models, and present the results from our empirical analyses.

2 District Tariff Preferences: A General Framework

What tariff levels would be set by a decentralized policymaker seeking to represent interests in her district? This section presents a model of "district tariff preferences".

A small open economy is populated by two groups of economic agents: owners of factors specific to the production of good j, or specific "capital" K_j, and owners of a mobile factor L that is used in the production of all goods. Each individual owns one unit of either L or K_j. J goods are produced nationally, but their production is dispersed across R districts, where each district has equal political representation in the nation's legislature. The composition of output is heterogeneous across districts and depends on the (exogenous) regional endowment of factors. We assume that factor owners are immobile across districts, that is, a district is a local labor market (Topel, 1986, Moretti, 2011, Autor et al., 2014, 2013).[2] The non-specific factor (labor) is mobile across goods while specific factors owners, by definition, are immobile outside the good (sector) in whose production they are employed. The population of district r is $n_r = n_r^L + n_r^K = \sum_{j=0}^{J} n_{jr}^L + \sum_{j=1}^{J} n_{jr}^K$, where n_{jr}^K specific factor owners in district r are employed in producing good j. Aggregate population $n = \sum_r n_r$.

Goods $j = 1, ..., J$ are tradable and, under the small country assumption, world prices are exogenously determined, and taken as given. Domestic prices may be changed by raising or lowering tariffs. To keep the interpretation of the models simple, negative tariffs and subsidies are not allowed. There are no transport costs and goods are delivered to consumers at these domestic prices. Policy-induced price changes affect domestic production and consumption of goods, and hence the welfare of specific factor owners.

Production. Aggregate population n is distributed across R districts indexed by r, $r = 1, ..., R$. In each district, output in the non-tradable numeraire good 0 is produced using only the mobile factor (labor) with linear technology, which fixes labor's wage in district r at $w_r > 0$ (across all goods). Output of the numeraire good in district r is $q_{0r} = w_r n_{0r}^L$, where n_{0r}^L owners of labor in district r are employed in producing good 0. Units are chosen such that the price of the numeraire good (nationally) is $p_0 = 1$. Prices p_j in the J non-numeraire goods are expressed in these units.

Good j is produced with CRS technology. In district r, the technology combines n_{jr}^L units of labor and the fixed endowment of n_{jr}^K specific factors. These specific factors earn the indirect profit function $\pi_{jr}(p_j)$, and labor earns wage w_r regardless of its sector (good) of employment. A district does not necessarily produce all goods. By assumption, when good j is not produced in region r, $n_{jr}^K = n_{jr}^L = 0$ and $\pi_{jr} = 0$. The output of good j in district r is $q_{jr}(p_j) = \pi'_{jr}(p_j) > 0$ and its aggregate output is $Q_j(p_j) = \sum_{r=1}^{R} q_{jr}(p_j)$.

Preferences. Preferences are homogeneous across individuals in groups L and K, and represented by the quasi-linear utility function $u = x_0 + \sum_j u_j(x_j)$. These imply (separable) demand functions $x_j = d_j(p_j)$ for each individual. The indirect utility of an individual who spends z on consumption is $z + \sum_j \phi_j(p_j)$, where $\phi_j(p_j) =$

[2] The assumption that labor markets are local plays a fundamental role in contributing to the impact of trade and innovation on manufacturing employment and wages (Autor et al. (2013, 2014)).

$v_j(p_j) - p_j\, d_j(p_j)$ is the consumer surplus from good j.[3] The total per capita consumer surplus of the consumption of goods $j = 1, ..., J$ is $\phi = \sum \phi_j(p_j)$. The aggregate demand for good j is $D_j(p_j) = nd_j(p_j)$, where n is the country's population.

Imports, tariffs, and tariff revenue. M_j denotes imports of good j, and is given by $M_j(p_j) = D_j(p_j) - Q_j(p_j)$. Trade policy consists of imposing a specific per unit tariff t_j on the import of goods j, $j = 1, \ldots, J$. Total revenue generated by the tariffs is $T = \sum(p_j - \overline{p}_j)[D_j(p_j) - Q_j(p_j)] = \sum_j(p_j - \overline{p}_j)M_j(p_j)$, where $M_j(p_j)$ is good j's import demand function, $\overline{p}_j$ is the world price, and $t_j = p_j - \overline{p}_j$. Import subsidies are disallowed. Tariffs on imports are collected at the country's border and tariff revenue is distributed nationally on an equal per capita basis, i.e., each individual receives $\frac{T}{n}$.

Total utility. The total utility of the mobile non-specific factor in good-district $\{jr\}$ is $W_{jr}^L = n_{jr}^L \left(w_r + \frac{T}{n} + \phi\right)$, and the total utility of specific factor owners in good-district $\{jr\}$ is $W_{jr}^K = n_{jr}^K \left(\frac{\pi_{jr}}{n_{jr}^K} + \frac{T}{n} + \phi\right)$. Common to both is the per capita tariff revenue, $\frac{T}{n}$, and the total per capita consumer surplus, ϕ. The expressions differ, however, on the income received by each factor of production. While a higher tariff increases p_j and lowers consumer surplus, it also raises the return to the specific factor owner employed in $\{jr\}$. This group, therefore, could have a strong interest to demand a tariff on imports of j.

2.1 District Tariff Preferences

Tariffs are, of course, decided at the national level. Our framework seeks to understand how a policy-making body comprising representatives from each district – like the U.S. House of Representatives – arrives at these national tariffs. We approach this problem by answering two questions. First, if individual districts were granted the authority to choose tariffs for the entire nation, what would their preferred tariffs be? Second, how are these preferences aggregated across districts into nationally determined tariffs?

This section answers the first question. Consider the case in which a representative of district r chooses (national) tariffs to maximize the district's welfare, defined as

[3] The index r is dropped from the demand functions because they do not change across districts (prices are nationally determined). Technical Appendix B considers heterogeneous tastes for the two types of agents. This model assumes preferences are described by the utility function $u^m = x_0^m + \sum_j u_j^m(x_j^m)$, where $m = \{L, K\}$ indexes owners of labor and owners of the specific factor, yielding demand functions $d_j^m(p_j)$ and consumer surplus $\sum_j \phi_j^m(p_j) = \sum_j[v_j^m(p_j) - p_j d_j^m(p_j)]$.

a weighted sum of the welfare of each factor owner in the district. We begin with a general framework where the welfare weights differ across districts, goods, and the two groups of factor owners. We will later apply sensible restrictions to identify the weights in the estimation. In district r, a unit of specific factor employed in producing good j gets welfare weight Λ_{jr}^K and a unit of labor in good j gets welfare weight Λ_{jr}^L. District r's aggregate welfare is

$$\Omega_r \;=\; \sum_j \Lambda_{jr}^L W_{jr}^L + \sum_j \Lambda_{jr}^K W_{jr}^K,$$

where the total welfare of type-m factor owners in district r, W_{jr}^m, depends on the vector of domestic prices $\mathbf{p} = (p_1, ..., p_J)$. The small open economy assumption means there is a one-to-one relationship between the tariff t_j and price p_j (the world price $\overline{p}_j$ is exogenous), and total welfare W_{jr}^m for the two types of factors are functions of tariffs. Then, district r's aggregate welfare may be decomposed as

$$\Omega_r \;=\; \sum_j \Lambda_{jr}^L n_{jr}^L \left(w_r + \frac{T}{n} + \phi \right) + \sum_j \Lambda_{jr}^K n_{jr}^K \left(\frac{\pi_{jr}}{n_{jr}^K} + \frac{T}{n} + \phi \right). \tag{1}$$

The first parenthesis in (1) defines welfare per a non-specific factor owner, and the second parenthesis defines welfare for a specific factor owner. The first expression on the right-hand side weights the sum of per capita wage, tariff revenue, and consumer surplus to arrive at the aggregate welfare of owners of L residing in district r. The weights are the product of Λ_{jr}^L, the welfare weight assigned to each non-specific factor employed in producing good j, and the number of district r's non-specific factors employed in producing the good, n_{jr}. The second expression differs in the first component: the per capita returns to owners of good j-specific factor, $\frac{\pi_{jr}}{n_{jr}^K}$. The three components in the expression are aggregated using the weights $\Lambda_{jr}^K n_{jr}^K$ to obtain the welfare of district r's specific-factor owners.

Noting that T, ϕ and π_{jr} are functions of t_j, the tariffs preferred by district r are obtained by maximizing (1) with respect to each t_j. Denote the aggregate welfare weights on factor owners in district r as $\lambda_r^K = \sum_{j=1}^J \Lambda_{jr}^K n_{jr}^K$ and $\lambda_r^L = \sum_{j=0}^J \Lambda_{jr}^L n_{jr}^L$, respectively, and their sum as $\lambda_r = \lambda_r^L + \lambda_r^K$. Then, district r's preferred tariff on good j, t_{jr}, is

$$t_{jr} \;=\; -\frac{n}{M_j'}\left[\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\left(\frac{q_{jr}}{n_{jr}^K}\right) - \frac{D_j}{n} + \frac{M_j}{n}\right], \quad j = 1, \ldots, J, \tag{2}$$

for $r = 1, \ldots, R$, where $\frac{D_j}{n}$ is the country's per capita demand for good j, $\frac{M_j}{n}$ is the country's per capita imports of good j, and $M_j' \equiv \frac{\partial M_j}{\partial t_j} < 0$. The representative chooses trade policy t_{jr} defined by (2). This equation captures both the interests of producers in district r and the welfare of consumers nationally, given the assumption of identical tastes. The first term in the square brackets indicates that the tariff increases with r's output of good j through the tariff's positive impact on profits.[4] The second term shows that the tariff declines with the nation's per capita demand via the negative impact of the tariff on consumer surplus. The third term indicates the tariff increases with national imports through its impact on tariff revenue, which is redistributed lump-sum to the nation's residents.

An institutional interpretation is that (2) determines the tariff preferred by a representative of a district r, which is one among a federation of districts. This representative is accountable to district r's residents; the choice of the nation's tariff in good j represents the local interests via $\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\left(\frac{q_{jr}}{n_{jr}^K}\right)$ in (2). The tariff reduces the consumer surplus of the representative national consumer via $\frac{-D_j}{n}$ in (2), and revenue from the tariff is distributed as a lump sum back to all consumers via $\frac{M_j}{n}$. In a majoritarian electoral system, such as in the U.S., a member of the House of Representatives faces incentives to choose a trade policy t_{jr} defined by (2) that maximizes the welfare function (1) for the district the member represents.[5] The following proposition describes the level of protection in terms of ad-valorem tariffs:

[4] By the envelope theorem the derivative of profits with respect to price is output, reflecting the impact of the tariff on returns to owners of sector-specific factors in district r. With labor perfectly mobile across goods within district r, $w_{jr} = w_r$ for all j, where w_r is determined by labor's productivity in the numeraire good. Any change in tariff t_j does not affect labor income.

[5] The district is institutionally constrained, being part of the federation of districts, to distribute import tariff revenue equally across all districts in the federation. Further, the market for each good clears at the national level. District r considers the impact of higher tariffs on district r's consumers; some effects are "washed out" on the consumer side because preferences across groups are assumed identical. The vector of tariffs enacted by Congress for the nation then reflects the weights on different factors, industries, and districts, implied by a legislative bargaining process, given regional output-to-import ratios and import elasticities.

Proposition 1 *District r's effective demand for tariff protection in good j is:*

$$\frac{\tau_{jr}}{1+\tau_{jr}} = \frac{\Lambda_{jr}^K n_r}{\lambda_r} \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right), \tag{3}$$

where $\tau_{jr} = \frac{t_{jr}}{\bar{p}_j}$ is the ad-valorem tariff proposed by district r as the tariff applicable to the nation's imports of good j, and $M_{jr} = M_j \times \left(\frac{n_r}{n}\right)$.

Proof Using good j's import demand elasticity $\epsilon_j = M_j' \left(\frac{p_j}{M_j}\right)$, the market clearing condition $D_j = Q_j + M_j$, and defining *ad-valorem* tariffs as $\tau_{jr} = \frac{t_{jr}}{\bar{p}_j}$ or $\frac{\tau_{jr}}{(1+\tau_{jr})} = \frac{t_{jr}}{p_j}$, (2) may be written as:

$$\frac{\tau_{jr}}{1+\tau_{jr}} = \frac{n}{-\epsilon_j M_j} \left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r} \frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right) = \frac{\Lambda_{jr}^K n}{\lambda_r} \left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right). \tag{4}$$

Assuming M_j is distributed according to districts' populations, district r's imports of j, M_{jr} are $M_{jr} = M_j \times \left(\frac{n_r}{n}\right)$. (3) then predicts tariffs with (district) output-to-import ratios, enabling comparison with the Grossman and Helpman (1994, GH) model. □

Just as in the GH model, good j's tariff is determined by the output-to-import ratio in the sector and its import demand elasticity, represented by $\frac{q_{jr}/M_{jr}}{(-\epsilon_j)}$. The models differ in that (3) is the "national" tariff on imports of j that is preferred by the representative of district r. In (3), if $\Lambda_{jr}^K = \Lambda_{jr}^L = \Lambda_r$, that is, if all factor owners in district r get equal weight, the coefficient on $\frac{q_{jr}/M_{jr}}{(-\epsilon_j)}$ equals 1 and

$$\frac{\tau_{jr}}{1+\tau_{jr}} \begin{cases} > 0, & \text{if } \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) > \left(\frac{Q_j/M_j}{-\epsilon_j}\right) \\ = 0, & \text{if } \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) \leq \left(\frac{Q_j/M_j}{-\epsilon_j}\right), \end{cases} \tag{5}$$

where we impose the non-negativity constraint on tariffs (i.e., no import subsidies allowed). From (5) it becomes apparent that even when special interests, that is, specific factor owners, have the same welfare weight as labor, tariffs can be positive. If, for example, production of good j is concentrated in district r, $q_{jr} = Q_j$ and $\tau_{jr} > 0$. Expression (3) shows the implicit demand for tariffs by district r given the institutions. The national tariff schedule aggregates the tariff preferences, given by

(3), of districts. The aggregation of district preferences into national trade policy is discussed in the next section.

Relationship to the GH model. In the GH model, the welfare of specific factors employed in good j is given the weight $\mathbb{1}_j + a$, where $\mathbb{1}_j$ is a binary indicator equal to one if sector j is politically organized to lobby and zero otherwise. The parameter a represents the weight given to consumers in the model so that $\frac{(1+a)}{a}$ is the relative weight on the welfare of organized specific factors and reflects their influence on tariff-making. Adapting these weights to our model with districts, let a_r be the weight placed by district r's representative on the welfare of labor and $\mathbb{1}_{jr} + a_r$ the weight placed on the welfare of specific capital owners, where $\mathbb{1}_{jr}$ equals one if sector j in district r is politically organized to lobby (the representative) in district r and zero otherwise. That is, $\Lambda^L_{jr} = a_r$ and $\Lambda^K_{jr} = \mathbb{1}_{jr} + a_r$. Then (3) may be written as

$$\begin{aligned}\frac{\tau_{jr}}{1+\tau_{jr}} &= \frac{(\mathbb{1}_{jr} + a_r)\, n_r}{\sum_{j=1}^{J}(\mathbb{1}_{jr} + a_r) n^K_{jr} + \sum_{j=0}^{J} a_r\, n^L_{jr}} \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right) \\ &= \frac{(\mathbb{1}_{jr} + a_r)\, n_r}{\sum_{j=1}^{J} \mathbb{1}_{jr} n^K_{jr} + a_r\, n_r} \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right).\end{aligned}$$

Let α^K_r denote the fraction of district r's population that is politically organized, $\alpha^K_r = \frac{\sum_{j=1}^{J} \mathbb{1}_{jr} n^K_{jr}}{n_r}$; this expression is the district-equivalent of GH's α_L. Then,

$$\frac{\tau_{jr}}{1+\tau_{jr}} = \frac{\mathbb{1}_{jr} + a_r}{\alpha^K_r + a_r} \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right).$$

In the GH model, if everyone is politically organized, lobbies contribute but they nullify each other and there is free trade in all goods. In our model with everyone organized, $\alpha^K_r = 1$ and we get the result in (5).[6]

2.2 Some Counterfactual Results

Equation (3) may be used to predict the unobservable demand for protection, that is, the vector of tariffs at the line level preferred by each district. Another use for which the model may be put is to estimate the counterfactual welfare weights, separately for each district, that would deliver the observed U.S. tariff data. We construct a spatial

[6]Note that (5) would result as well if nobody is politically organized, i.e., $\mathbb{1}_{jr} = 0$ for all j, r, and α^K_r=0. In the GH model, where the district is the nation, $\frac{q_{jr}}{M_{jr}} = \frac{Q_j}{M_j}$, and $\tau_{jr} = 0$.

data set with industry-district output (q_{jr}), imports (M_j), import demand elasticities (ϵ_j), and ad valorem tariffs (τ_j). Data we collect, from a variety of sources described below, are as disaggregated at the industry level as possible with public census data.

Data and sources. Output and employment data are from the Census Bureau (County Business Patterns (CBP), 2002); import and tariff data are from the United States International Trade Commission's Dataweb (`dataweb.usitc.gov`). Ad valorem tariffs, from USTradeOnline, are based on duties collected at customs and measured at HS 10 digits. Import elasticities at 6-digit HS are from Kee et al. (2008). Output and employment data from CBP were converted to the NAICS 3-digit level, and mapped from Metropolitan Statistical Areas and Counties onto 433 Congressional districts for the 107^{th} Congress (the year 2002).[7] The year 2002 is chosen also for the window it provides at the inception of the "China's shock", the subject of intense recent research.[8] The share of workers in district r who own specific capital in any sector, $\frac{n_r^K}{n_r}$ is measured in two steps. A significant part of the compensation of white-collar (non-production) workers is rent due to their specificity, while blue-collar (production) workers, who are not "stuck" to a specific sector earn wages. The Census of Manufacturing provides data on national manufacturing employment and the proportion of production $\frac{n^L}{n}$ and non-production workers $\frac{n^K}{n}$ in each NAICS industry. The ratio $\frac{n_r^K}{n_r}$ is computed as the average of the national proportions using district r's sectoral manufacturing employment as weights. Alternative measures of specific factor ownership by industry, based on classification of occupations in manufacturing and services (Autor and Dorn, 2013), have ratios similar in magnitude to those used in our estimations. Those measures, however, are not available at the district level. District r's sectoral manufacturing employment is from the 2000 County Business Patterns, in turn, from the Geographical Area Series of the 2000 Census of Manufacturing.

District-specific results. Using (3) we conduct two counterfactual exercises about (unobserved) district tariff preferences. The first exercise estimates the relative wel-

[7] Due to non-disclosure restrictions we lose data for two of the 435 Congressional Districts. In other cases (approximately 17% of the sample), we are able to impute missing district-industry output data using available district-industry employment data. Documentation of the data and imputations where confidentiality issues prevent the Census from publicly reporting district output data is provided in Appendix C.

[8] The implications of these results for research on the China shock are in a companion paper.

fare weights $\frac{\Lambda_{jr}^K}{\Lambda_{jr}^L}$ under the counterfactual that the observed national tariff τ_j *is* the preferred tariff on good j for every district. We proceed with sensible restrictions that identify the welfare weights. Assume that in district r, weights on owners of K and L are invariant across goods, that is, $\Lambda_{jr}^K = \Lambda_r^K$ and $\Lambda_{jr}^L = \Lambda_r^L$. The first assumption is satisfied if representatives who "assign" these weights are influenced equally by specific factor owners, for example, if they are politically organized in all industries. Another possibility is for specific factors in a district to get equal weight based on their (equal) voting strength, but more weight than labor whose wage is not influenced by policy. Then (3) may be written as

$$\frac{\tau_{jr}}{1+\tau_{jr}} = \frac{1}{\frac{n_r^K}{n_r} + \frac{n_r^L}{n_r}\left(\frac{\Lambda_r^L}{\Lambda_r^K}\right)}\left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) - \frac{Q_j/M_j}{-\epsilon_j}. \tag{6}$$

If $\Lambda_r^K > \Lambda_r^L$, the coefficient on $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$ is greater than 1 (and conversely). For each of the 433 districts, we regress 2002 U.S. manufacturing tariffs at HS 8-digits, the tariff line level at which policymakers actually determine the schedule, on $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$ and $\frac{Q_j/M_j}{-\epsilon_j}$, with the coefficient on the latter constrained to -1. We then back out the relative weights $\frac{\Lambda_{jr}^K}{\Lambda_{jr}^L}$ from the estimated coefficient on $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$.

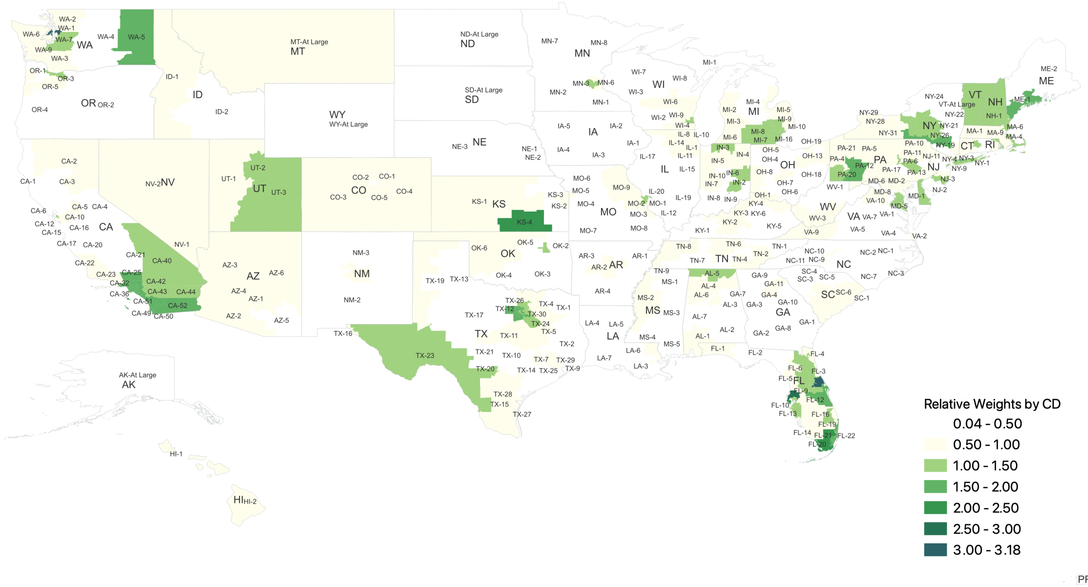
Figure 1 maps the distribution of the estimates of $\frac{\Lambda_{jr}^K}{\Lambda_{jr}^L}$. The estimate of $\frac{\Lambda_r^K}{\Lambda_r^L}$ is lower than one in 75% of the 433 districts, implying that the nationally set tariffs go against the interests of specific factor owners. A takeaway is that it is hard for the majority of districts to even have the voices of their specific factors heard in the determination of national tariffs, leave alone receive their tariff preference.

The next exercise answers the counterfactual of matching district tariff preferences with what districts actually succeed in obtaining once their preferences are aggregated (in Congress) into the tariff schedule that governs U.S. trade policy.[9] This second counterfactual exercise fixes the ratio $\frac{\Lambda_{jr}^K}{\Lambda_{jr}^L}$ equal to one for all j, r, and predicts the vector of tariffs $\boldsymbol{\tau}_r$ for district $r = 1, \ldots, 433$. Figures 2 summarize these results.[10] Figure 2 clearly shows that the distribution of district-level demand for protection, τ_{jr},

[9]As a prelude, Figure A.1.1 in Appendix A.1 shows the distribution of the variable $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$ for the twenty NAICS 3-digit industries.

[10]Figure A.1.2 in Appendix A.1 shows the distribution, across 433 CDs, of the positive tariff estimates ($\tau_{jr} > 0$) for the twenty NAICS-3 industries.

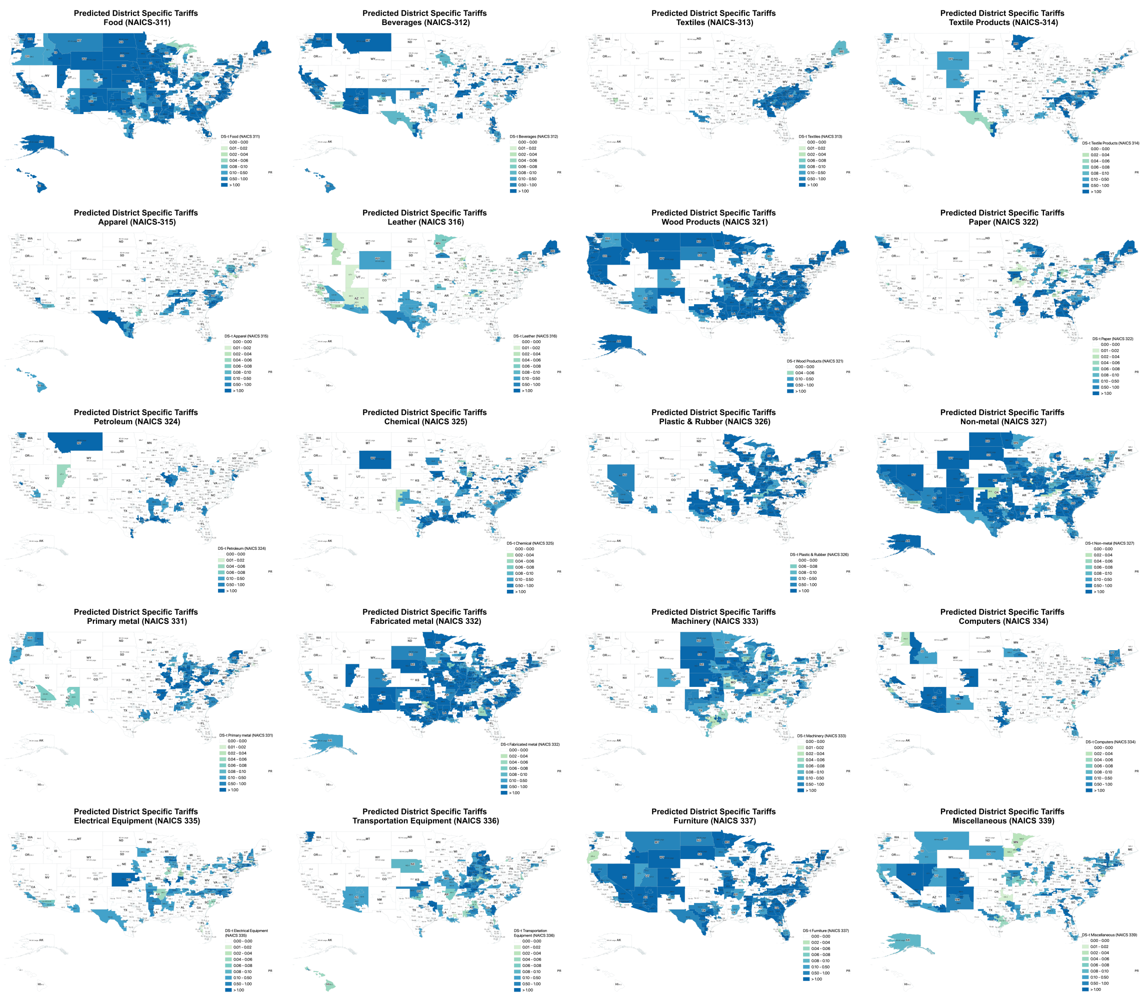
Figure 1: Implicit relative weights on specific to mobile factors ($\frac{\Lambda^K}{\Lambda^L}$) by CDs



varies widely across districts and industries. While predicted industry-district tariffs can be large as shown in figure A.1.2 in Appendix A.1, the overwhelming majority of districts are predicted to demand zero tariffs in most industries, as shown in figure A.1.2 and table A.1.1.. in Appendix A.1. Importantly, in districts with positive tariff estimates, the implied demand for protection dwarfs the level of protection actually granted to the industry in 2002 (Table A.1.1 in Appendix A.1).

A message from these counterfactual exercises is that district representatives have little chance of getting their preferred tariffs. For an individual district, $\frac{q_{jr}/M_{jr}}{-\epsilon_j} > \frac{Q_j/M_j}{-\epsilon_j}$ only if output of j is concentrated. A coalition C of districts with output-to-import ratio $\frac{q_{jr}/M_{jr}}{-\epsilon_j} > \frac{Q_j/M_j}{-\epsilon_j}$ for all $r \in C$ has a better chance of obtaining at least some protection (than if each r went alone) in the legislative bargain over the national tariff schedule. The bargain ultimately determines the welfare weights the winning coalition earns for specific factors in their districts relative to other coalitions. The aggregation of district preferences into national tariffs is the subject of the remainder of the paper.

Figure 2: Predicted district-level tariffs (τ_r), by NAICS 3-digit industries



3 National Tariffs in a Small Open Economy

How are district tariff preferences aggregated into national tariffs? We draw on the legislative bargaining literature (Baron and Ferejohn, 1989, Eraslan and Evdokimov, 2019, Celik et al., 2013) to answer this question. The solution provides a foundation for estimating welfare weights implied by national tariffs.

3.1 The Baron-Ferejohn solution

The Baron-Ferejohn model (henceforth BF) predicts the distribution of gains in a legislature under different voting rules. In the canonical model, a fixed amount of money A is to be distributed among n (homogeneous) districts.[11] An agenda-setter proposes a specific distribution of A across n districts, with the motion holding if a majority of the districts votes in favor. Under a closed rule, if the proposal by the agenda setter is rejected the session terminates.

We extend the canonical model to include districts with heterogeneous tariff preferences. The framework presented in this section is a variation of the model in Celik et al. (2013).[12] The starting point of the BF version of our model is the vector of tariffs preferred by each district given by equation (3) in Section 2.1. As described above, these are the tariffs district r would choose if it had the ability to impose its own preferences over the other districts. In reality, however, individual districts do not have that power: they will need to form coalitions and hope to be part of the majority needed to move their joint preferred tariffs. This approach offers an explanation of how district tariff preferences τ_{jr}, for $r = 1, \ldots, R$, may be aggregated into national tariffs τ.

One-period, three-region BF model. Consider a one-period BF bargaining model with three districts, each with the same number of residents $n_r = n/3$ (so that each district has the same national representation). Suppose district r is randomly selected to be the agenda setter. Then, r's proposal is implemented if at least one other district, district r', joins to form a majority coalition.

The problem for the agenda setter, district r, can be thought of as being solved in two stages. In the first stage, the agenda setter chooses the vector of (specific) tariffs $\mathbf{t}_r = \{t_{1r}, \ldots, t_{jr}, \ldots, t_{Jr}\}$ that maximizes district r's welfare $\Omega_r(\mathbf{t}_r)$ subject to $\Omega_{r'}(\mathbf{t})_r \geq \Omega_{r'}(\bar{\mathbf{t}})$ for all $r' \neq r$ (the two other districts), where $\bar{\mathbf{t}}$ is the vector of existing (status-quo) tariffs. Denoting by $\mathbf{t}_r^{r'}$ the solution tariff vector for each r', district r receives utility $\Omega_r(\mathbf{t}_r^{r'})$. In fact, district r maximizes the Lagrangian $\mathcal{L}_r = \Omega_r(\mathbf{t_r}) + \rho_{r'}[\Omega_{r'}(\mathbf{t}_r) - \Omega_{r'}(\bar{\mathbf{t}})]$ with respect to $\mathbf{t}_r$, where $\rho_{r'} \geq 0$ denotes the Lagrange multiplier for each $r' \neq r$. Specifically, $\rho_{r'} = \text{Max}\left[-\frac{\partial\Omega_r/\partial t_j}{\partial\Omega_{r'}/\partial t_j}, 0\right]$. At an interior solution, when the constraint is binding, the numerator and denominator have opposite signs: conceding a higher t_j to satisfy r' lowers r's welfare. The size of

[11] Eraslan and Evdokimov (2019) review this literature.

[12] The main difference with the Celik et al. (2013) model is that in our solution tariffs determined by the winning coalition depend not only on the geographic concentration of economic activity but reflect welfare weights placed on different factor owners in the districts and nationally.

$\rho_{r'}$ depends on the rate of this trade-off at the constrained maximum. The solution to this problem gives the vector of specific tariffs that district r would propose to district r', and district r' would accept. For each $j = 1, \ldots, J$, the solution tariff, denoted by $t_{jr}^{r'}$, is given by

$$t_{jr}^{r'} = \frac{n}{-M_j'} \left[\alpha_r \frac{\lambda_{jr}^K}{\lambda_r} \frac{q_{jr}}{n_{jr}^K} + (1 - \alpha_r) \frac{\lambda_{jr'}^K}{\lambda_{r'}} \frac{q_{jr'}}{n_{jr'}^K} - \frac{Q_j}{n} \right], \tag{7}$$

where $\alpha_r = \lambda_r/(\lambda_r + \rho_{r'}\lambda_{r'}) \geq 0$. Observing (4), the right-hand side is expressed, intuitively, as the weighted average $\alpha_r t_{jr} + (1 - \alpha_r)t_{jr}$. The following proposition summarizes the result using ad-valorem tariffs.

Proposition 2 *In the three-district case, the ad-valorem tariff on good j proposed by the district-r agenda setter to (the representative of) district r' that would be accepted by r', $\tau_{jr}^{r'}/(1 + \tau_{jr}) = t_{jr}^{r'}/p_j$, for each $j = 1, \ldots, J$, is given by*

$$\frac{\tau_{jr}^{r'}}{1 + \tau_{jr}^{r'}} = \frac{n}{-\epsilon_j M_j} \left[\alpha_r \frac{\lambda_{jr}^K}{\lambda_r} \frac{q_{jr}}{n_{jr}^K} + (1 - \alpha_r) \frac{\lambda_{jr'}^K}{\lambda_{r'}} \frac{q_{jr'}}{n_{jr'}^K} - \frac{Q_j}{n} \right] = \alpha_r \frac{\tau_{jr}}{1 + \tau_{jr}} + (1 - \alpha_r) \frac{\tau_{jr'}}{1 + \tau_{jr'}}, \tag{8}$$

where $\lambda_{jr}^K = \Lambda_{jr}^K n_{jr}^K$ is the aggregate welfare weight placed on special interests in district r, $\lambda_r = \Lambda_{0r}^L n_{0r}^L + \sum_m \sum_j \Lambda_{jr}^m n_{jr}^m$ is the aggregate welfare weight on the district r's population, and the weight $\alpha_r = \frac{\lambda_r}{\lambda_r + \rho_{r'}\lambda_{r'}}$ is a function of the Lagrange multiplier ρ_r, and $0 < \alpha_r < 1$.

In the second stage, the agenda setter r chooses to form a coalition with district r', and implement the tariff vector $\mathbf{t}_r^{r'}$ if: (i) $\Omega_r(\mathbf{t}_r^{r'}) \geq \Omega_r(\mathbf{t}_r^{r''})$, for $r'' \neq r, r'$, and (ii) $\Omega_r(\mathbf{t}_r^{r'}) \geq \Omega_r(\bar{\mathbf{t}})$. Alternatively, r decides to maintain the status quo tariffs if $\Omega_r(\bar{\mathbf{t}}) > \text{Max}\{\Omega_r(\mathbf{t}_r^{r'}),\ \text{for } r' \neq r\}$.

The tariffs that emerge from this political bargaining process can be characterized as follows. First, note that tariffs proposed by district r to district r' (either (7) or (8)) can be expressed as a weighted average of per capita specific factor output in districts r and r'. Second, this solution is in fact a convex combination of the unconstrained tariffs preferred by districts r and r'. Third, the distance of the status quo tariff $\bar{t}_j$ from r''s unconstrained maximum is a key consideration in the first step. The larger this distance, the larger the multiplier $\rho_{r'}$, and the greater the weight $(1 - \alpha_r)$. But this adversely affects r's welfare $\Omega_r(\mathbf{t}_r^{r'})$, and in the second step pushes the agenda setter to coalesce with the district less constrained by the status quo.

In sum, since individual districts do not have the political power to impose their unconstrained preferred tariffs, they are required to coalesce with other districts. The vector of tariffs ultimately approved and implemented at the national level is shaped by the influence of districts belonging to the winning coalition. The form of the solution in equation (8) generalizes to more than three districts (see Technical Appendix B).

Institutional background. The institutional setting under which U.S. tariff policy-making has unfolded in recent history lends credibility to the model presented in previous sections. Through the 1960s and 1970s, negotiating multilateral tariff cuts required each GATT member country to believe that the agreed-upon reciprocal cuts would actually be legislated by all their GATT trading partners (Bagwell and Staiger, 1999, Irwin, 2017). In the U.S. such credibility resulted from the authority that Congress extended to President Kennedy via the 1962 Trade Expansion Act; this statute set the scope of the tariffs cuts in manufacturing and explicitly limited the liberalization of agriculture. Once the U.S. Trade Representative (USTR) completed GATT negotiations on behalf of the Executive, the President brought the proposal to Congress for a final up-or-out vote. This precedent prevailed when Congress legislated the Trade Act of 1974, and (as in the 1962 Act) granted "fast track", delegating authority to President Ford to determine the tariff cuts to be negotiated during the Tokyo Round. Fast-track, as in the canonical BF model, was subject to a *closed* rule vote – the fast–track procedure meant the motion by the President would receive an up-or-out vote by Congress, not subject to amendment.

In the ensuing sections, we introduce a *centralized* solution, where a "government" chooses a vector of tariffs that maximizes a national welfare function. The solution, a vector of tariffs, aggregates district tariff preferences in a way that is analytically tractable for estimating district-specific welfare weights for owners of L and K. This is the primary goal of the empirical analysis following the model's prediction. The solution(s) also plausibly reconcile the counterfactual district tariff preferences obtained in section 2.1.

3.2 A General Model

Trade policy is determined through a political process that aggregates the preferences of districts, where welfare weights capture the political influence of districts and economic actors. The political process is assumed to maximize the weighted sum of the individual utilities of the population of factor owners:

$$\Omega = \sum_r \sum_j \Gamma^K_{jr} W^K_{jr} + \sum_r \sum_j \Gamma^L_{jr} W^L_{jr}, \tag{9}$$

where Γ^m_{jr} is the weight attached to the welfare W^m_{jr} of owner of $m \in \{L, K\}$ employed in producing good j in district r. The weights capture the impact of rich regional heterogeneity in production and factor ownership on tariff-making. W^m_{jr} depends on domestic prices $\mathbf{p}$. In this section, we consider the small country case, where (specific) tariff t_j has no impact on world price $\bar{p}_j$, and domestic price $p_j = \bar{p}_j + t_j$. Welfare for the two types of factor owners are therefore fully functions of tariffs $\mathbf{t}$. Expressing national welfare in (9) as the sum of its three components yields

$$\Omega = \sum_r \sum_j \Gamma^L_{jr} n^L_{jr} \left(w_{0r} + \frac{T}{n} + \phi_j \right) + \sum_r \sum_j \Gamma^K_{jr} n^K_{jr} \left(\frac{\pi_{jr}}{n^K_{jr}} + \frac{T}{n} + \phi_j \right), \tag{10}$$

where $\frac{T}{n}$ is per capita tariff revenue and ϕ_j is per capita consumer surplus from the consumption of all goods. Expression (10) is essentially a weighted sum of the district welfare functions. National tariffs are obtained by maximizing (10) with respect to each t_j. The resulting per-unit (specific) tariff on imports of each good j is given by:

$$t_j = -\frac{n}{M'_j} \left[\sum_r \frac{\Gamma^K_{jr} n^K_{jr}}{\gamma} \left(\frac{q_{jr}}{n^K_{jr}} \right) - \frac{D_j}{n} + \frac{M_j}{n} \right], \quad j = 1, \ldots, J, \tag{11}$$

where $\frac{\sum_r \Gamma^K_{jr} n^K_{jr}}{\gamma}$ is the share of the total welfare weight received by the nation's owners of specific factors employed in good j, $\gamma^L = \sum_j \sum_r \Gamma^L_{jr} n^L_{jr}$ and $\gamma^K = \sum_j \sum_r \Gamma^K_{jr} n^K_{jr}$ are the aggregate welfare weights on non-specific and specific factors, respectively, and $\gamma = \gamma^K + \gamma^L$. $\frac{D_j}{n}$ is per capita demand for good j, $\frac{M_j}{n}$ is per capita imports of good j, and $M'_j \equiv \frac{\partial M_j}{\partial t_j} < 0$. Using good j's import demand elasticity, $\epsilon_j = M'_j \left(\frac{p_j}{M_j} \right)$, the market clearing condition $D_j = Q_j + M_j$, and defining $\tau_j = \frac{t_j}{\bar{p}_j}$, we have the following result about the ad-valorem national tariff for good j.

Proposition 3 *In terms of ad-valorem tariff, protection to good j is given by:*

$$\frac{\tau_j}{1+\tau_j} = \frac{n}{-\epsilon_j M_j}\left(\sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right) = \sum_{r=1}^{R}\frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{n}{n_{jr}^K}\left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right), \quad (12)$$

where $\frac{\tau_j}{1+\tau_j} = \frac{t_j}{p_j}$ is the ad-valorem tariff applied to imports of good j.

A comparison with its district counterpart in (3) shows that (12) aggregates district tariff preferences as a weighted sum. While the framework abstracts from how weight shares in (12) are determined, the equilibrium national tariff aggregates district preferences in a manner similar to the Baron-Ferejohn solution in Section 3.1. A comparison with (8) shows their essentially similar form: a weighted sum of the output-to-import ratio scaled by absolute import elasticity across districts that form a majority and legislate the agenda setter's tariff proposal. The term $\alpha_r\left(\frac{\lambda_{jr}^K}{\lambda_r}\right)$ in (8) is the counterpart to $\frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}$ in (12). In words, $\frac{\lambda_{jr}^K}{\lambda_r}$ is the share of district r's total welfare weight received by specific factors employed in the production of good j and α_r is district r's share of aggregate (national) welfare weight. Their product is equal to the aggregate welfare weight received by specific factors located in district r and employed in the production of good j, or $\frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}$.

If the status quo utility for district r' is relatively low compared to the utility it would get under r's proposal, then the Lagrange multiplier in (7) $\rho_{r'}$ is close to zero. That is, it is "cheap" for district r to attract r' to the coalition. As a result, $\alpha_r = 1$, and r proposes a vector of tariffs that is exactly the same as its preferred tariff vector (4), which r' accepts. If, on the other hand, the multiplier $\rho_{r'} > 0$ and the constraint for r' is binding, then $0 < \alpha_r < 1$. This means the agenda setter's proposal must place positive weight on specific factors in district r' in the tariff determination.

As a final remark, suppose welfare weights are equal for all factors, goods, and districts, so that $\Gamma_{jr}^m = \Gamma$, that is, political economy considerations have no influence on the outcome. Then, tariffs are zero and there is free trade.[13] In Appendix A.2 we compare this result with the Grossman and Helpman (1994) model predictions. As

[13]To see this note that $\gamma^m = \Gamma\sum_r\sum_s n_{sr}^m = \Gamma n^m$, $\gamma = \Gamma(n^L + n^K) = \Gamma n$, and (12) reduces to $\frac{\tau_j}{1+\tau_j} = \frac{n}{-\epsilon_j}\left(\sum_r \frac{n_{jr}^K}{n}\frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right) = \frac{1}{-\epsilon_j}\left(\sum_r q_{jr} - Q_j\right) = 0$. This result does not necessarily hold in the district-preferred tariff case.

show in the appendix, removing districts from the model provides an interpretation of the GH coefficient a with the parameters in our model.

3.3 Estimation Strategy in the Small Country Case

A primary goal of the paper is to estimate the welfare weight shares derived in Proposition 3. The estimated weights would reveal which group of agents, districts, and goods were influential in determining the vector of tariffs prevailing in 2002. No doubt, history had much to do with these tariffs – the Kennedy and Tokyo Rounds of tariff cuts through the 1960s and 70s are reflected in the commodity composition of U.S. tariffs to this day.[14] On December 27, 2001, President Bush signed a proclamation establishing permanent normal trading relations (PNTR) with China, putting an end to the annual reviews of US-China relations mandated by the Jackson–Vanik amendment to the Trade Act of 1974. The authority to normalize relations between the US and China and the certification of the terms of China's accession to the WTO resulted from an act of Congress. Congress was aware that the decision to grant MFN status to a large country like China (which took effect on January 1, 2002) effectively moved U.S. tariffs out of their existing political-economic equilibrium. Subsequently, legislators introduced bills to terminate China's MFN trade access to the U.S. market. During the 107^{th} Congress, for instance, H. J. Res. 50 terminating China's conditional trade access to the US market was referred to the Ways and Means Committee, negatively reported to the floor, and ultimately defeated by a 169-259 vote.[15] Hence, while U.S. trade policy is rooted in the reciprocal concessions negotiated under successive GATT Rounds, the vector of tariffs prevailing in 2002 is a reflection of the will of the legislative coalition at that time.

We attempt to characterize those coalitions and estimate the welfare weights on industries and districts in the small country case, which has been the setting for the majority of empirical studies of trade protection. The building block of the empirical strategy is to estimate the welfare weight shares $\frac{\Gamma_{jr}^K n_{jr}^K}{(\gamma^K+\gamma^L)}$ using equation (12).

[14] The 2007 World Trade Report (WTO 2007, Ch II.D) details the process of tariff cuts. See, for example, Whalley (1985) for a CGE analysis of the process of tariff cutting in the Tokyo Round.

[15] See Congressional Research Service, CRS Report RL30225, "Most-Favored-Nation Status of the People's Republic of China", June 7, 2001 – July 25, 2001: Link (accessed 10/2022).

3.3.1 Specification and Identification

In (12) the number of parameters $\{\Gamma^K_{jr}, \Gamma^L_{jr}\}$, $r = 1, \ldots, R, j = 1, \ldots, J$, is excessive. The forming of coalitions resolves this problem.[16] We estimate the industry and district-level weights that would result from bargaining among plausible legislative coalitions. We consider two stylized coalitions (i.e. aggregation of districts) founded, respectively, on (i) political geography, reflecting the spatial clustering of industries in districts; and (ii) purely political coalitions, based on the competitiveness of the state in the Presidential election, and whether the district's election is competitive or safe for incumbent Democratic or Republican representatives. The latter grouping is intended to capture differential electoral incentives faced by local representatives, parties, and the President. Without loss of generality, we continue to use R to denote the number of coalitions of districts, or "regions" and r to index the regions.

Expressing the demand-for-protection term in (12) with region r's output-to-imports ratios $\frac{q_{jr}}{M_{jr}}$, the tariff equation (12) can be rewritten in a form resembling the GH prediction with regional output-to-import ratios. Since preferences are homogeneous, the imports of j by region r (which are unobserved, only national imports of j are observed) are approximated by distributing national imports of j according to r's population share as $M_{jr} = M_j \times \left(\frac{n_r}{n}\right)$. Then, (12) may be written as:[17]

$$\frac{\tau_j}{1+\tau_j} \;=\; \sum_{r=1}^{R} \frac{\Gamma^K_{jr} n^K_{jr}}{\gamma} \, \frac{n_r}{n^K_r} \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right). \tag{13}$$

For the small country case, (13) provides the basis for industry-region welfare weights implied by the observed vector of tariffs.[18] We estimate the relative welfare weights

[16] Public output data for districts is most completely available at NAICS 3-digits. NAICS-332 Printing and Related Support Activities, a largely non-tradable industry, is dropped, leaving 20 manufacturing industries, which is the upper bound on the number of estimable parameters.

[17] We abstract from the role of lobbying to focus on the two-level process by which U.S. trade policy is determined. Lobbying may be incorporated as done in prior work testing the GH model (Goldberg and Maggi, 1999, Gawande and Bandyopadhyay, 2000) as we show in Online Appendix B Section 1.3. Future research can move the literature by measuring lobbying at the *district-good* level. This framework would need to allow for lobbies to emerge endogenously, as in Mitra (1999). Lobbying could influence policy stances at both district and national levels.

[18] Modeling institutions that aggregate preferences, frame legislative bargaining rules, and regulate instruments of protection are a potential research agenda.

$\frac{\Gamma^K_{jr} n^K_{jr}}{\gamma}$ using the econometric specification

$$\frac{\tau_j}{1+\tau_j} = \sum_{r=1}^{R} \beta_r \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right) + \alpha \left(\frac{Q_j/M_j}{-\epsilon_j}\right) + u_j, \tag{14}$$

with $\beta_r \geq 0$.[19] The coefficient α on the national output-import ratio scaled by absolute import elasticity is constrained to -1. The relative welfare weights are underdetermined: the R parameters β_r do not identify the $2\times(J\times R)$ industry-region welfare weights $\Gamma^K_{jr} n^K_{jr}$ and $\Gamma^L_{jr} n^L_{jr}$. As in the district-specific counterfactual exercises, we assume the welfare weights for specific factor owners have no within-region variation. That is, specific factors employed in all goods j produced in region r are treated the same, $\Gamma^K_{jr} = \Gamma^K_r$.[20] If all specific factor owners were politically organized, or weights were assigned based on their (equal) voting strength, this assumption is plausible. The corresponding assumption for owners of labor, $\Gamma^L_{jr} = \Gamma^L_r$, is due to their mobility. Then, the coefficient β_r is

$$\beta_r = \frac{\Gamma^K_r n^K_r}{\gamma} \frac{n_r}{n^K_r} = \frac{\Gamma^K_r n^K_r}{\left(\sum_r \Gamma^K_r n^K_r + \sum_r \Gamma^L_r n^L_r\right)} \frac{n_r}{n^K_r}, \tag{15}$$

where $\frac{n_r}{n^K_r}$ is the inverse of the proportion of region r's population who are specific factor owners. There are $2R$ parameters, Γ^K_r and Γ^L_r, but for our purpose it is sufficient to recover $(R+1)$ parameters: R welfare weights on specific capital in each region, $\Gamma^K_r n^K_r$, and the collective economy-wide welfare weight on labor, $\gamma^L = \sum_r \Gamma^L_r n^L_r$. This is straightforward with estimates of β_r in hand.

Arguably, the regressors $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$ are endogenous: In the specification (14), shocks to the tariff τ_j can move the output-to-import ratio $\frac{q_{jr}}{M_{jr}}$ in region r. Shocks that increase the tariff can lower M_{jr} and increase q_{jr}; negative tariff shocks, by liberalizing trade, can have the opposite effect. This endogeneity can cause OLS estimates of the R coefficients $\beta_r, r = 1, \ldots, R$ to be biased.

Our strategy to identify coefficients on the endogenous regressors $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$ employs Bartik-like instruments (Bartik, 1991, Goldsmith-Pinkham et al., 2020). To construct Bartik instruments (BIVs), we start by decomposing good j's overall *imports-to-output*

[19] Import subsidies (negative tariffs) are disallowed. In the U.S. they are rarely, if at all, used in manufacturing. Any subsidies may be incorporated by admitting negative weights.

[20] Lobbying structure distinguishing specific capital across goods is a potential research direction.

ratio using the accounting identity

$$\frac{M_j}{Q_j} = z_{j1}\frac{M_{j1}}{q_{j1}} + z_{j2}\frac{M_{j2}}{q_{j2}} + \ldots\ldots + z_{jR}\frac{M_{jR}}{q_{jR}},$$

where z_{jr} is region r's share of output Q_j, where for each j, $\sum_{r=1}^{r=R} z_{jr} = 1$. The weights $\{z_{jr}\}$ are constructed using district output data (aggregated up to "regions" that form political coalitions). Let us construct the BIV for the (endogenous) variable for region 1, $\frac{q_{j1}}{M_{j1}}$. Rewrite the identity as

$$\frac{M_{j1}}{q_{j1}} = \frac{1}{z_{j1}}\frac{M_j}{Q_j} - \frac{z_{j2}}{z_{j1}}\frac{M_{j2}}{q_{j2}} - \ldots\ldots - \frac{z_{jR}}{z_{j1}}\frac{M_{jR}}{q_{jR}}. \tag{16}$$

Now decompose both region r's import penetration $\frac{M_{jr}}{q_{jr}}$ and the nation's import penetration $\frac{M_j}{Q_j}$ as

$$\frac{M_{jr}}{q_{jr}} = \frac{M_r}{q_r} + \widetilde{\frac{M_{jr}}{q_{jr}}}, \text{ and } \frac{M_j}{Q_j} = \frac{M}{Q} + \widetilde{\frac{M_j}{Q_j}},$$

where $\frac{M_r}{q_r}$ is region r's overall import-output ratio and $\widetilde{\frac{M_{jr}}{q_{jr}}}$ is the idiosyncratic good-region component; similarly, $\frac{M}{Q}$ is the nation's aggregate import-output ratio and $\widetilde{\frac{M_j}{Q_j}}$ the idiosyncratic component. The BIV for $\frac{M_{j1}}{q_{j1}}$ is constructed by substituting the non-idiosyncratic components into the RHS of (16):

$$\left(\frac{M_{j1}}{q_{j1}}\right)^{BIV} = \frac{1}{z_{j1}}\frac{M}{Q} - \frac{z_{j2}}{z_{j1}}\frac{M_2}{q_2} - \ldots\ldots - \frac{z_{jR}}{z_{j1}}\frac{M_R}{q_R}.$$

The BIV addresses the correlation between the idiosyncratic component and the structural error u_j. For example, an unobservable variable that shocks both $\frac{M_{jr}}{q_{jr}}$ and τ_j generates endogeneity (Goldsmith-Pinkham et al., 2020, p. 2593). The general BIV for regressor $\frac{M_{jr}}{q_{jr}}$ is

$$\left(\frac{M_{jr}}{q_{jr}}\right)^{BIV} = \frac{1}{z_{jr}}\frac{M}{Q} - \sum_{d=1}^{d=R}\frac{z_{jd}}{z_{jr}}\frac{M_d}{q_d}, \tag{17}$$

where the sum is taken over $d \neq r$.

The identifying assumptions may be cleanly described with two regions (i.e., $r =$

1, 2). Then $z_{j1} = 1 - z_{j2}$ and the BIV is

$$\left(\frac{M_{j1}}{q_{j1}}\right)^{BIV} = \frac{1}{z_{j1}}\left(\frac{M}{Q} - \frac{M_2}{q_2}\right) + \frac{M_2}{q_2}$$

The research design inherent in this 2-region case is that the (inverse) share $\frac{1}{z_{j1}}$ measures exposure to a "policy" that affects region 1, and where the difference between the national import-output ratio and region 2's import-output ratio of good j, $\left(\frac{M_j}{Q_j} - \frac{M_2}{q_2}\right)$, is the size of the policy ($\frac{M_2}{q_2}$ is a constant and does not vary with j). Instrumenting $\frac{M_{j1}}{q_{j1}}$ in the first stage with $\left(\frac{M_{j1}}{q_{j1}}\right)^{BIV}$ achieves identification from the differential *exogenous* exposure $\frac{1}{z_{j1}}$.

We assume strict exogeneity of the inverse share, which is necessary for the Bartik estimator to be consistent. The identifying assumption in the 2-region example is that the differential effect of higher exposure of one region only affects the change in the outcome τ_j through the endogenous variable $\frac{M_{j1}}{q_{j1}}$ and not through any confounding channel. This is clearly spelled out in the theory from which specification (14) is derived. Note that the policy shock $\left(\frac{Q}{M} - \frac{q_2}{M_2}\right)$ is constant, so the identifying variation comes solely from differential exposure for each region separately.

In our more general case, we have R endogenous variables. Each is associated with the BIV (17). We report the first stage estimates in Appendix A.1, which provides information about the exposure design.[21]

4 National Tariffs in a Large Country

The political economy of trade literature, with few exceptions, has sublimated the role of specific factors employed in exporting. The presumption has been that the primary trade policy influencers must be import-competing producers since they stand to gain the most. In the large country model, world prices are no longer exogenous. Tariffs can lower world prices and worsen the terms of trade for exporters. Grossman and Helpman (1995) model the interaction between two large countries and make the case for the terms of trade motive for tariffs (in addition to the special interest motive). Bagwell and Staiger (1999) view the emergence of trade liberalizing institutions like

[21] In (13) the R *output-to-import* ratios $\frac{q_{jr}}{M_{jr}}$ are instrumented using the Bartik IVs $\left.\frac{q_{jr}}{M_{jr}}\right|^{BIV} = 1/\left(\frac{1}{z_{jr}}\frac{M}{Q} - \sum_{d=1}^{d=R}\frac{z_{jd}}{z_{jr}}\frac{M_d}{q_d}\right)$, Identifying variation comes (nonlinearly) from output share ratios $\frac{z_{jd}}{z_{jr}}$.

the GATT as a commitment by countries to avoid a global race to the bottom where countries impose terms of trade externalities on each other.

We present a model highlighting the role of *domestic* specific factors employed in producing export goods as a countervailing influence against protecting *domestic* import-competing goods. The threat of retaliation by partners, reflected in the tariffs and incidence of granting China preferential access presented on Tables 1 and 2 of the 2001 CRS Report, and the consequent worsening of terms of trade for U.S. exporters is the primary motive for exporters to force trade liberalization.[22]

4.1 The Model

Consider a world with two countries, US and RoW, and three types of goods: a numeraire (good 0), importable, and exportable goods. From the perspective of country US, there are J import goods (M-sector) indexed by j, $j \in \mathcal{M}$, and G export goods (X-sector) indexed by $g, g \in \mathcal{X}$. The three sectors employ $n^L = n^{L^0} + n^{L^M} + n^{L^X}$ units of labor, where $n^{L^0} = \sum_r n_r^{L^0}$, $n^{L^M} = \sum_r \sum_{j \in \mathcal{M}} n_{jr}^{L^M}$, $n^{L^X} = \sum_r \sum_{g \in \mathcal{X}} n_{gr}^{L^X}$, and $n^K = n^{L^0} + n^{L^M} + n^{L^X}$ units of specific factors, where $n^{K^M} = \sum_r \sum_{j \in \mathcal{M}} n_{jr}^{K^M}$ and $n^{K^X} = \sum_r \sum_{g \in \mathcal{X}} n_{gr}^{K^X}$. Total employment is $n = n^L + n^{K^M} + n^{K^X}$.

On the demand side, consumer surplus from the M and X sectors are $\phi_j = u_j(d_j) - p_j d_j$ and $\phi_g = u_g(d_g) - p_g d_g$. In this two-country world, imports of good j, M_j (respectively, exports of good g, X_g) by US are equal to exports of good j, X_j^* (respectively, imports of good g, M_g^*) by RoW. Therefore, the market clearing conditions are $D_j - Q_j = Q_j^* - D_j^*$ (> 0), and $D_g - Q_g = Q_g^* - D_g^*$ (< 0), where asterisks refer RoW's output and demand in exporting and import-competing goods.

US may impose an ad valorem tariff $\tau_j = \frac{(p_j - \overline{p}_j)}{\overline{p}_j}$ on imports of good j, so that the domestic price of j in US is $p_j = (1 + \tau_j)\overline{p}_j$. Tariffs generate a tariff revenue of $T = \sum_i \tau_i^M \overline{p}_i^M M_i$, where $T \geq 0$, since export subsidies are not allowed. As before, tariff revenue is distributed back to all domestic residents in a lump-sum way.

The world price of good j, $\overline{p}_j$, is implicitly determined by the market clearing condition, $M_j[(1+\tau_j)\overline{p}_j] - X_j^*(\overline{p}_j) = 0$, making $\overline{p}_j$ a function of τ_j. Export subsidies are disallowed, so the domestic price prevailing in RoW is simply $p_j^* = \overline{p}_j$.[23] Reciprocally,

[22] Relevant at that time, the Jackson-Vanik amendment and Title IV procedure provided Congress with a statutory basis for continuing in force or (unilaterally) withdrawing China's MFN status. Back-of-the-envelope calculation of losses to exporters, if China retaliated, are in CRS Report.

[23] US chooses $\tau_j \geq 0$. In RoW, $\tau_j^* = 0$ since it does not subsidize its exports of j.

if RoW imposes tariff τ_g^* on US exports of good g, its price in RoW is $p_g^* = (1+\tau_g^*)\overline{p}_g$, where $\overline{p}_g$ is g's world price determined by market clearing, $M_g^*[(1+\tau_g^*)\overline{p}_g] - X_g(\overline{p}_g) = 0$. The price of good g in the U.S. is the world price, $p_g = \overline{p}_g$.

Aggregate welfare in US is the sum of welfare of owners of the mobile factor and owners of specific factors, or $\Omega = \Omega^L + \Omega^K = \Omega^{L^0} + \Omega^{L^M} + \Omega^{L^X} + \Omega^{K^M} + \Omega^{K^X}$, where

$$\Omega^L = \sum_r \left(\Gamma_r^{L^0} n_{0r}^{L^0} w_{0r} + \sum_{j \in \mathcal{M}} \Gamma_{jr}^{L^M} n_{jr}^{L^M} w_{0r} + \sum_{g \in \mathcal{X}} \Gamma_{gr}^{L^X} n_{gr}^{L^X} w_{0r} \right) + \gamma^L \Upsilon, \tag{18}$$

$$\Omega^K = \sum_r \left[\sum_{j \in \mathcal{M}} \Gamma_{jr}^{K^M} n_{jr}^{K^M} \left(\frac{\pi_{jr}^M(p_j)}{n_{jr}^{K^M}} \right) + \sum_{g \in \mathcal{X}} \Gamma_{gr}^{K^X} n_{gr}^{K^X} \left(\frac{\pi_{gr}^X(p_g^X)}{n_{gr}^{K^X}} \right) \right] + \gamma^L \Upsilon.$$

The previous expression uses $\Upsilon = \sum_{j \in \mathcal{M}} \phi_j^M(p_j) + \sum_{g \in \mathcal{X}} \phi_g^X(p_g^X) + \frac{T}{n}$, $\gamma^K = \sum_r \sum_{j \in \mathcal{M}} \Gamma_{jr}^{K^M} n_{jr}^{K^M} + \sum_r \sum_{g \in \mathcal{X}} \Gamma_{gr}^{K^X} n_{gr}^{K^X}$, $\gamma^L = \sum_r \Gamma_r^{L^0} n_{0r}^L + \sum_r \sum_{j \in \mathcal{M}} \Gamma_{jr}^{L^M} n_{jr}^{L^M} + \sum_r \sum_{g \in \mathcal{X}} \Gamma_{gr}^{L^X} n_{gr}^{L^X}$, and $\gamma = \gamma^L + \gamma^K$. To estimate the welfare weights, we will assume they differ between the importable and exportable sectors, but not within each sector. That is, $\Gamma_r^{L^0} = \Gamma_{jr}^{L^M} = \Gamma_r^{L^M}$, $\Gamma_{gr}^{L^X} = \Gamma_r^{L^X}$, $\Gamma_{jr}^{K^M} = \Gamma_r^{K^M}$, and $\Gamma_{gr}^{K^X} = \Gamma_r^{K^X}$ for all $j \in \mathcal{M}, g \in \mathcal{X}$.

Nash Bargaining. Tariffs are determined in a Nash bargaining game between US and RoW that makes explicit the possibility of a retaliatory response to a tariff. The equilibrium vectors of tariffs $\{\boldsymbol{\tau}, \boldsymbol{\tau}^*\}$ maximize $\left(\Omega^{US} - \overline{\Omega}^{US}\right)^{\sigma} \left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)^{(1-\sigma)}$, where $\boldsymbol{\tau} = (\tau_1, ..., \tau_j, ..., \tau_J)$, and $\boldsymbol{\tau}^* = (\tau_1^*, ..., \tau_g^*, ..., \tau_G^*)$. The FOCs (at an interior solution) with respect to each τ_j chosen by US and τ_g^* chosen by RoW are (taking the tariffs of the other country as given):

$$\tau_j \; : \; \frac{\sigma}{\left(\Omega^{US} - \overline{\Omega}^{US}\right)} \frac{d\Omega^{US}}{d\tau_j} + \frac{(1-\sigma)}{\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)} \frac{d\Omega^{RoW}}{d\tau_j} = 0,$$

$$\tau_g^* \; : \; \frac{\sigma}{\left(\Omega^{US} - \overline{\Omega}^{US}\right)} \frac{d\Omega^{US}}{d\tau_g^*} + \frac{(1-\sigma)}{\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)} \frac{d\Omega^{RoW}}{d\tau_g^*} = 0,$$

where $\frac{d\Omega^{US}}{d\tau_j} = \frac{\partial \Omega^{US}}{\partial p_j} \frac{\partial p_j}{\partial \tau_j} + \frac{\partial \Omega^{US}}{\partial \tau_j}$ and $\frac{d\Omega^{US}}{d\tau_g^*} = \frac{\partial \Omega^{US}}{\partial \overline{p}_g} \frac{\partial \overline{p}_g}{\partial \tau_g^*}$. Rearranging and taking the ratio,

$$\frac{d\Omega^{US}}{d\tau_j} - \frac{d\Omega^{US}}{d\tau_g^*} \left[\frac{d\Omega^{RoW}/d\tau_j}{d\Omega^{RoW}/d\tau_g^*} \right] = 0. \tag{19}$$

If US is a small country, $\frac{\partial \overline{p}_j}{\partial \tau_j} = 0$, eliminating any interaction such as in (19).

We will consider the large country case where US exports a *single* good g.[24] To gain insight into (19), suppose US and RoW come to an agreement that when US raises a tariff on RoW's exports of j, RoW is entitled to increase its tariff on US exports of g to keep RoW's utility at its pre-existing level (i.e., prior to the increase in tariffs). The amount by which RoW increases τ_g^* to keep Ω^{RoW} at its status quo is given by $-\frac{d\Omega^{RoW}/d\tau_j}{d\Omega^{RoW}/d\tau_g^*} = \frac{d\tau_g^*}{d\tau_j}$. The change in RoW's tariff on US exports of g in reaction to the US tariff increase is a gauge of the "bargaining strength" of US relative to RoW with respect to τ_j, denoted by μ_j, where $\mu_j = \frac{d\tau_g^*}{d\tau_j}$. The equilibrium τ_j and τ_g^* under such an agreement are determined endogenously by (19) (and the corresponding expression for RoW).[25]

The separate influence of specific factors in the export sector requires the welfare weights of specific factors employed in import-competing sectors to differ from the welfare weights of specific factors employed in the export sector. We denote these welfare weights for each district r by $\Gamma_r^{K^M}$ and $\Gamma_r^{K^X}$, respectively.

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[24] The model generalizes to many export goods (Online Appendix B). The counterpart to (19) is

$$\frac{d\Omega^{US}}{d\tau_j} - \left[\frac{d\Omega^{RoW}/d\tau_j}{\sum_g d\Omega^{RoW}/d\tau_g^*}\right] \sum_g \frac{d\Omega^{US}}{d\tau_g^*} = 0.$$

RoW can retaliate by potentially increasing tariffs, $\boldsymbol{\tau^*}$, on all US exports. The (negative of the) term in square brackets represents US bargaining strength with respect to τ_j, $\mu_j \equiv -\frac{d\Omega^{RoW}/d\tau_j}{\sum_g d\Omega^{RoW}/d\tau_g^*}$.

[25] A rise in τ_j by US reduces RoW's utility. The logic of the "agreement" is that it allows RoW to compensate for this decline: RoW is allowed to increase its tariff τ_g^* on US exports to keep RoW's utility constant before the increase in the US tariff. Let $\Omega^{RoW}(\tau_j, \tau_g^*)$ denote the indirect welfare function for RoW, where $\partial\Omega^{RoW}/\partial\tau_j < 0$ and $\partial\Omega^{RoW}/\partial\tau_g^* > 0$. The agreement would state that $\widehat{\Omega}^{RoW} = \Omega^{RoW}(\tau_j, \tau_g^*)$ for an agreed-upon status quo utility $\widehat{\Omega}^{RoW}$ (reciprocally also for US). Then,

$$\frac{\partial\Omega^{RoW}}{\partial\tau_j} d\tau_j + \frac{\partial\Omega^{RoW}}{\partial\tau_g^*} d\tau_g^* = 0 \quad \Rightarrow \quad \frac{d\tau_g^*}{d\tau_j} = -\frac{\partial\Omega^{RoW}/\partial\tau_j}{\partial\Omega^{RoW}/\partial\tau_g^*}.$$

In general, $d\tau_g^*/d\tau_j$ represents the slope of RoW's reaction function evaluated at the equilibrium tariffs ($d\tau_g^*/d\tau_j$ is the quotient of the two expressions immediately before (19), but for RoW instead of US). Since bargaining strength μ_j is not measurable, Online Appendix A.3 provides a sensitivity analysis to a range of its possible values.

Decomposing the impact of a change in τ_j. In the import-competing sector, a change in τ_j indirectly affects Ω^{US} through its impact on the domestic price p_j:

$$\frac{\partial \Omega^{US}}{\partial p_j} = \sum_r \Gamma_r^{K^M} n_r^{K^M} \left(\frac{q_{jr}}{n_r^{K^M}} \right) - \frac{\gamma}{n} D_j + \frac{\gamma}{n} \tau_j \overline{p}_j^M M_j', \tag{20}$$

where $n_r^{K^M}$ is employment of specific factors in the M sector in district r. The first term in (20) captures the impact of a change in p_j on producers, the second term, its impact on consumer surplus, and the third term the (indirect) effect on tariff revenue $T = \tau_j \overline{p}_j M_j$. A change in τ_j also affects T, and consequently Ω^{US}, both directly and indirectly through its impact on the world price $\overline{p}_j$ as follows:

$$\frac{\partial \Omega^{US}}{\partial \tau_j} = \frac{\gamma}{n} \frac{\partial T}{\partial \tau_j} = \frac{\gamma}{n} \left(\overline{p}_j^M M_j + \frac{\gamma}{n} \tau_j M_j \frac{\partial \overline{p}_j}{\partial \tau_j} \right). \tag{21}$$

Finally, the change in tariffs by US triggers a response by RoW: RoW modifies the tariff on US exports of good g, τ_g^*, which in turn affects g's equilibrium world price. The latter has an impact on producers and consumers of g scattered across US districts, which is given by

$$\frac{\partial \Omega^{US}}{\partial \overline{p}_g} = \sum_r \Gamma_r^{K^X} n_r^{K^X} \left(\frac{q_{gr}}{n_r^{K^X}} \right) - \frac{\gamma}{n} D_g^X, \tag{22}$$

where $n_r^{K^X}$ is employment of specific factors in the X sector in district r, $\frac{q_{gr}}{n_r^{K^X}}$ is output per unit of specific factor, which gets a welfare weight $\Gamma_r^{K^X} n_r^{K^X}$, and $\frac{\gamma}{n}$ is the welfare weight on the representative consumer. A decrease in the world price of US export good g due to a (retaliatory) tariff increase by RoW is the negative of this expression. The solution to the Nash bargaining game is stated in this proposition.

Proposition 4 *The tariff on good j in the two-country bargaining game satisfies*

$$\begin{aligned} \frac{\tau_j}{1+\tau_j} \quad = \quad & \sum_{r=1}^{R} \frac{\Gamma_r^{K^M} n_r^{K^M}}{\gamma} \left(\frac{n}{n_r^{K^M}} \right) \left(\frac{q_{jr}/M_j}{-\delta_j} \right) + \sum_{r=1}^{R} \frac{\Gamma_r^{K^X} n_r^{K^X}}{\gamma} \left(\frac{n}{n_r^{K^X}} \right) \mu_j \theta_{jg} \left(\frac{q_{gr}/M_j}{-\delta_j} \right) \\ & - \left(\frac{Q_j/M_j}{-\delta_j} \right) + \frac{1}{1+\epsilon_j^{X^*}} - \mu_j \theta_{jg} \left(\frac{D_g/M_j}{-\delta_j} \right), \end{aligned} \tag{23}$$

where $\tau_j = \frac{(p_j - \overline{p}_j)}{\overline{p}_j}$ *is the ad-valorem tariff applied to imports of good* j*,* $\frac{\tau_j}{(1+\tau_j)} = \frac{(p_j - \overline{p}_j)}{p_j}$*,* $\frac{\sum_r \Gamma_r^{K^M} n_r^{K^M}}{\gamma}$ *is the share of the national welfare weight received by specific capital employed in producing the nation's import-competing goods, and* $\frac{\sum_r \Gamma_r^{K^X} n_r^{K^X}}{\gamma}$ *is the share of the national welfare weight received by specific capital employed in producing the nation's export good. Further,* $\gamma = \gamma^L + \gamma^K$*,* $\delta_j = \epsilon_j^M \left(\frac{1}{\epsilon_j^{X^*}} + 1\right) < 0$*,* $\epsilon_j^M = \frac{\partial M_j}{\partial p_j} \frac{p_j}{M_j} < 0$*,* $\epsilon_j^{X^*} = \frac{\partial X_j^*}{\partial \overline{p}_j} \frac{\overline{p}_j}{X_j^*} > 0$*,* $\theta_{jg} = \frac{\partial \overline{p}_g / \partial \tau_g^*}{\partial p_j / \partial \tau_j} < 0$*, and* $\mu_j = -\frac{d\Omega^{RoW}/d\tau_j}{d\Omega^{RoW}/d\tau_g^*} > 0$*.*

Proof Result (23) is obtained by substituting expressions (20), (21), and (22) into (19), and isolating τ_j. We then divide both sides by $(1+\tau_j) = \frac{p_j}{\overline{p}_j}$ complete elasticities. These expressions use the results $\frac{\partial p_j}{\partial \tau_j} = \frac{\epsilon_j^{X^*}}{\epsilon_j^{X^*} - \epsilon_j^M} > 0$, and $\frac{\partial \overline{p}_g}{\partial \tau_g^*} = \frac{\epsilon_g^{M^*}}{\epsilon_g^X - \epsilon_g^{M^*}} < 0$, obtained by differentiating the market clearing conditions $M_j[(1+\tau_j)\overline{p}_j] - X_j^*(\overline{p}_j) = 0$ and $M_g[(1+\tau_g^*)\overline{p}_g] - X_g(\overline{p}_g) = 0$ and the elasticities ϵ_j^M and $\epsilon_j^{X^*}$. □

The two terms on the right-hand side of the imports-only (small country) case (12) also appear in (23), except that the absolute import elasticity $-\epsilon_j^M$ is now replaced by $-\delta_j$. In the large country case, $-\delta_j$ incorporates the response along *RoW*'s export supply function as the international price $\overline{p}_j$ changes. The tariff τ_j is lower than it would be in the small country case ($-\delta_j > -\epsilon_j^M$). Three additional terms for the large country case appear in (23). The first term, $\sum_r \frac{\Gamma_r^{K^X} n_r^{K^X}}{\gamma} \left(\frac{n}{n_r^{K^X}}\right) \mu_j \, \theta_{jg} \left(\frac{q_{gr}/M_j}{-\delta_j}\right) < 0$, is the demand by specific capital owners in the export sector for a reduction in τ_j in response to the threat of retaliation by *RoW* on exports of g ($\theta_{jg} < 0$). The second term, $\frac{1}{1+\epsilon_j^{X^*}}$, accounts for the impact of tariffs on the equilibrium world price of good j, and the third term, $-\mu_j \, \theta_{jg} \left(\frac{D_g/M_j}{-\delta_j}\right) > 0$, is the (beneficial) effect of a retaliatory tariff by *RoW* (in response to an increase in τ_j) for *U.S.* consumers of the exportable.

4.2 Estimation Strategy in the Large Country case

How significant were U.S. export interests in the minds of policymakers determining 2002 U.S. tariffs? The share of the aggregate welfare weight received by specific capital employed in producing the export good g, $\frac{\Gamma_r^{K^X} n_r^{K^X}}{\gamma}$, quantifies the impact of export interests in liberalizing trade. By estimating this expression, we provide a possible answer to this key question in the political economy of trade policy literature.

An econometric specification to estimate the relative welfare weights $\frac{\Gamma_r^{K^M} n_r^{K^M}}{\gamma}$ and

$\frac{\Gamma_r^{K^X} n_r^{K^X}}{\gamma}$ based on Proposition 4 is

$$\begin{aligned}\frac{\tau_j}{1+\tau_j} &= \sum_{r=1}^{R} \beta_r \left(\frac{q_{jr}/M_{jr}}{-\delta_j}\right) + \beta^X \left(\mu_j \theta_{jg} \frac{Q_g/M_j}{-\delta_j}\right) \\ &+\alpha \left(\frac{Q_j/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}} + \mu_j \theta_{jg} \frac{D_g/M_j}{-\delta_j}\right) + u_j, \end{aligned} \tag{24}$$

where $\beta_r \geq 0$ and $\beta^X \geq 0$.[26] The $(R+1)$ coefficients $\beta_r = \frac{\Gamma_r^{K^M} n_r^{K^M}}{\gamma} \frac{n_r}{n_r^{K^M}}$ and $\beta^X = \frac{\Gamma^{K^X} n}{\gamma}$ are estimable with our data.

All elasticity measures are from Nicita et al. (2018) (NOP). The variable $\delta_j = \epsilon_j^M \left(\frac{1}{\epsilon_j^{X*}} + 1\right)$ is computed using NOP's estimates, at HS 6-digits, of the elasticity of *RoW*'s export supply of good j to the U.S., $\epsilon_j^{X^*}$, and good j's U.S. import demand elasticity, ϵ_j^M. In (23), both $\frac{D_g}{M_j}$ and $\frac{q_{gr}}{M_j}$ are ratios of quantities of different goods, while their data are in values.[27] Multiplying by the price ratio $\frac{\overline{p}_g}{p_j}$ converts them to ratios of values.

Using $\frac{\partial p_j}{d\tau_j} = \frac{\epsilon_j^{X^*}}{\epsilon_j^{X*} - \epsilon_j^M} > 0$ and $\frac{d\overline{p}_g}{d\tau_g^*} = \frac{\epsilon_g^{M^*}}{\epsilon_g^X - \epsilon_g^{M^*}} < 0$, we denote $\theta_{jg} = \frac{d\overline{p}_g/d\tau_g^*}{dp_j/d\tau_j}$. Let $\theta_{jg} = \widetilde{\theta}_{jg} \times \frac{\overline{p}_g}{p_j}$, where

$$\widetilde{\theta}_{jg} = \frac{p_j/\overline{p}_j}{p_g^*/\overline{p}_g} \times \frac{\frac{\epsilon_g^{M^*}/\epsilon_g^X}{1-\epsilon_g^{M^*}/\epsilon_g^X}}{\frac{1}{1-\epsilon_j^M/\epsilon_j^{X^*}}} < 0. \tag{25}$$

In this expression, $\epsilon_g^{M^*}$ is *RoW*'s import demand elasticity for good g and ϵ_g^X is its *US* export supply elasticity, and ϵ_j^M and $\epsilon_j^{X^*}$ are defined correspondingly for U.S. import good j. Note that $\widetilde{\theta}_{jg}$ is unit-free and $\frac{\overline{p}_g}{p_j}$ converts $\frac{D_g}{M_j}$ to the ratio of measurables $\frac{\overline{p}_g D_g}{p_j M_j}$.[28] We use NOP's estimates for $\epsilon_g^{M^*}$ (*RoW*'s import demand elasticity of good g) and ϵ_g^X (*US* export supply elasticity of exports of good g to *RoW*) to measure $\widetilde{\theta}_{jg}$.[29]

Additionally, model (24) imposes $\alpha = -1$. In going from Proposition 4 to (24) we assume that specific factors employed in producing the export good g coalesce nationally, equalizing welfare weight of each specific factor owner in the export sector,

[26] Weights are constrained to be non-negative - import subsidies on the j-goods and export tax on good g, which can lead to negative tariffs, are both disallowed.

[27] Other ratios in (23) have the same good in the numerator and denominator.

[28] See Online Appendix B for more details. The numerator is negative since $\epsilon_g^{M^*} < 0$.

[29] The ratio $\frac{p_j/\overline{p}_j}{p_g^*/\overline{p}_g}$ is set to 1 in the estimation. Results are robust to a range of its values.

that is, $\Gamma_r^{K^X} = \Gamma^{K^X}$.[30] We will estimate the relative welfare weights $\frac{\Gamma_r^{K^M} n_r^{K^M}}{\gamma}$ and $\frac{\Gamma_r^{K^X} n_r^{K^X}}{\gamma}$ by 2SLS using the Bartik-like IVs described in Section 3.3.1.

5 Results: Trade Policy Influencers

We empirically examine both the small country model (14) and the large country model (24) using two hypothetical legislative "coalitions" in the determination of U.S. tariff policy. *Case 1* groups the Congressional districts into nine geographical regions: New England, Mid-Atlantic, South Atlantic, East North Central, West North-Central, East South Central, West South Central, Mountain, and Pacific. *Case 2* aggregates districts into nine blocs ($R = 9$) according to purely political factors. The classification of districts is based on the electoral competitiveness of their state in the 2000 Presidential Election, the competitiveness of the district in the Congressional race closest (and prior) to 2002, and the party that carried the state in the Presidential election and the district in the Congressional race. Electoral motives of the national party drive coalitions for trade policy-making.

5.1 Geography-based coalitions

Table 1 presents descriptive statistics of the variables in the small- and large-country regression models (14) and (24) with geographic coalitions (*Case 1*). The first two columns show the number of districts in each coalition and the proportion of the population of workers – labor and specific factor owners – in each bloc.

Table 2 reports 2SLS estimates of coefficients β_r in (14) and (24). They are constrained to be non-negative as import subsidies and export taxes are ruled out. The small country model (14) requires the coefficient on $\frac{Q_j/M_j}{-\epsilon_j}$ to be constrained to -1, and the large country model (24) requires the same of the coefficient on $\frac{Q_j/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}} + \mu_j\, \theta_{jg} \frac{D_g/M_j}{-\delta_j}$. First-stage statistics indicate that the BIVs do not suffer from a weak-instrument problem.[31]

The small country estimates indicate positive welfare weights on specific factors (in import-competing goods) in eight of the nine regions (coalitions of districts).[32] The majority of empirical studies of protectionism have been predicated on the small country assumption, most notably the tests of the Grossman and Helpman (1994)

[30] As discussed in the conclusion, access to highly disaggregated (confidential) geographic area

Table 1: Descriptive statistics: Variable means

	Small Country			Large Country
	Districts	$\frac{n_r}{n}$	$\frac{q_{jr}/M_{jr}}{-\epsilon_j}$	$\frac{q_{jr}/M_{jr}}{-\delta_j}$
New England	23	0.060	1.11	0.59
Mid-Atlantic	65	0.125	1.35	0.72
East North Central	73	0.243	1.22	0.63
West North Central	31	0.067	1.39	0.75
South Atlantic	75	0.139	1.72	0.95
East South Central	26	0.060	1.59	0.82
West South Central	47	0.096	1.39	0.73
Mountain	24	0.043	1.26	0.65
Pacific	69	0.167	1.11	0.58
$\frac{Q_j/M_j}{-\epsilon_j}$			1.33	
$\mu_j\,\theta_{jg}\,\frac{Q_g/M_j}{-\delta_j}$				-0.13
$\frac{Q_j/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}} + \mu_j\,\theta_{jg}\,\frac{D_g/M_j}{-\delta_j}$				0.31
N		9,454		8,735

Notes: (1) $\frac{n_r}{n}$ is the total employment shares for each region r. (2) In the Large Country case, the export sector NAICS=334 (Computers) is not in the sample, so $N = 8735$. (3) The 433 districts (out of the 435) for which we assembled output, trade, protection, and employment data are classified into nine geographical blocs according to the US Census. **Division 1**: New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont). **Division 2**: Mid-Atlantic (New Jersey, New York, and Pennsylvania). **Division 3**: East North Central (Illinois, Indiana, Michigan, Ohio, and Wisconsin). **Division 4**: West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota). **Division 5**: South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, District of Columbia, and West Virginia). **Division 6**: East South Central (Alabama, Kentucky, Mississippi, and Tennessee). **Division 7**: West South Central (Arkansas, Louisiana, Oklahoma, and Texas). **Division 8**: Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming). **Division 9**: Pacific (Alaska, California, Hawaii, Oregon, and Washington). The column "Districts" indicates the number of districts in each "coalition".

series from the U.S. Census would allow us to estimate a larger set of parameters.

[31] First-stage regressions for Table 2 are reported in Tables A.1.2 and A.1.3 of Appendix A.1.

[32] Errors are clustered at the HS 2-digit level of 94 goods. Evidence for clustering of the 9454 HS 8-digit tariffs at a more aggregate level is in Conconi et al. (2014) and also implied by the huge number of industry level studies of protection. Presumably, these are administratively translated to HS 8-digit by replicating the clustered tariff at this "line level". Abadie et al. (2023) suggest that the decision to cluster and at what level be determined by both sampling and design. The HS 8-digit sample is actually the entire population tariff line products. Unlike field experiments which (randomly) sample micro-units, but from a few clusters in a population, our sample includes all clusters of the population of interest. The first step in accounting for clustering is to determine the clustering in the population. Based on the account of policymakers and the above studies, it is reasonable to suppose that tariff decisions are taken up in clusters of (the 94) HS 2-digit level product-groups. That is, "assignment to treatment" by policymakers, which is unobserved, occurs at HS 2-digits. Abadie et al. (2023) suggest that the decision to cluster standard errors depends on whether this within-cluster assignment is perfectly correlated (in which case, use clustered standard errors), uncorrelated (that is, random assignment, in which case use cluster-robust standard errors) or imperfectly correlated (use the Abadie et al. (2023) bootstrap procedure). We consider the assignment within HS 2 digits to be nearly perfect (for example, within the HS 2-digit Apparel and Textile group, *all* HS 8-digit units are assigned to treatment and receive a positive tariff outcome (which may be different across the 8-digit units). This errs on the conservative side, so standard errors are overstated compared to the zero correlation or imperfect correlation cases.

Table 2: 2SLS estimates of coefficients in (14) and (24) for Geography-based Coalitions
Dependent Variable: *Applied Tariff, 2002*

	Small Country Eq. (14)	$\frac{Q_{gr}}{Q_r}$	Large Country Eq. (24)
β_1: New England	0.067	0.21	0
	(0.027)		
β_2: Mid-Atlantic	0.163	0.10	0
	(0.012)		
β_3: East North Central	0.216	0.04	0
	(0.025)		
β_4: West North Central	0.063	0.08	0.292
	(0.009)		(0.017)
β_5: South Atlantic	0.140	0.09	0.264
	(0.008)		(0.020)
β_6: East South Central	0.089	0.03	0
	(0.020)		
β_7: West South Central	0.073	0.12	0.060
	(0.010)		(0.017)
β_8: Mountain	0	0.25	0
β_9: Pacific	0.214	0.25	0
	(0.019)		
β^X: $\mu_j\,\theta_{jg}\,\frac{Q_g/M_j}{-\delta_j}$			3.243
			(0.359)
α: $\frac{Q_j/M_j}{-\epsilon_j}$	-1		
α: $\frac{Q_j/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X^*}} + \mu_j\,\theta_{jg}\,\frac{D_g/M_j}{-\delta_j}$			-1
N	9454		8735
First Stage Statistics			
Anderson-Rubin χ^2(10 df)	2949.0		2010.0
Anderson-Rubin p-value	(0.00)		(0.00)
Kleibergen-Paap weak IV	102.5		937.5

Notes: (1) Standard errors in parentheses, clustered at 2-digit HS. (2) α is constrained to equal -1 required by (14) and (24). (3) (14) and (24) require dropping the constant term in the regressions. (4) $\frac{Q_{gr}}{Q_r}$ is the share of the output of export industry COMPUTER (3-digit NAICS=334) for coalition r. Larger shares (blue) suggest export coalitions. (6) In the **large country case**: (i) unconstrained estimates of β_1, β_2, β_3, β_6, β_8 and β_9 are negative and constrained to zero to disallow import subsidies or export taxes. (ii) μ_j is assumed to equal 1 (equal bargaining strength) for all j. (iii) θ_{jg} is calculated as in (25).

model. One interpretation of the result is that coefficients indicate coalitions of districts that have influence in tariff-making (positive) versus coalitions of districts that do not move the agenda and are expendable (zero). In the large-country case, protectionist interests find themselves pitted against domestic export interests who make their presence felt in legislative bargaining. Their anti-protectionism is due to concern about retaliation by *RoW* and the terms of trade effects inflicted on them. In the regression, their inclusion explains both zeros and low tariffs in the data. Facing export interests, the welfare weights on specific factors employed in import-competing goods are non-zero in only three of the nine regions. A primary contribution of the paper is this finding that is missing in the majority of studies about protection. The missing export variables are crucial to any explanation for why U.S. tariffs are low.

Table 3: Welfare Weights on Specific Capital Owners: From 2SLS estimates in Table 2
Dependent Variable: *Applied Tariff, 2002*

	Small Country		Large Country			
Region	K_r-share (estimated)	$\frac{\Gamma_r^K}{\Gamma^L}$	K_r^M-share (estimated)	$\frac{\Gamma_r^{K^M}}{\Gamma^L}$ (imputed)	K^X-share	$\frac{\Gamma^{K^X}}{\Gamma^L}$
1. New England	0.023	1.136	0	0		
2. Mid-Atlantic	0.051	1.314	0	0		
3. East North Central	0.063	0.899	0	0		
4. West North Central	0.019	0.941	0.075	4.646		
5. South Atlantic	0.040	1.019	0.063	2.036		
6. East South Central	0.024	1.493	0	0		
7. West South Central	0.023	0.766	0.016	0.675		
8. Mountain	0	0	0	0		
9. Pacific	0.073	1.300	0	0		
Agg./Relative Weights	0.316		0.154		0.204	3.485

Notes: (1) **Small country case**: Specific factors employed in import-competing sectors determine tariffs. The proportion of non-production workers in a NAICS 3-digit industry measures the proportion of specific factors in the industry. The weighted average of these proportions (weights are region r's output composition across the NAICS 3-digit industries), measures the proportion of region r's population that are specific factor owners $\frac{n_r^K}{n_r}$. In the Table, (i) K_r-share is the proportion of the national weight placed on region r's specific capital owners, $\gamma_r^K = \frac{\Gamma_r^K n_r^K}{\sum_r \Gamma_r^K n_r^K + \Gamma^L n^L}$, where $n^L = \sum_r n_r^L$ and Γ^L is invariant across regions. (ii) The aggregate share of weights on specific factors $\sum_r \gamma_r$ is 0.316. The remainder, 0.682, is the aggregate weight on labor's welfare γ^L. (iii) Relative weights $\frac{\Gamma_r^K}{\Gamma^L}$ are calculated by dividing K_r-share by the aggregate labor weight share and multiplying by $\frac{n^L}{n_r^K}$. (2) **Large country case**: Specific factors employed in both import-competing and export-producing sectors. Aggregate weight on agents' welfare is $\gamma = \sum_r \Gamma_r^{K^M} n_r^{K^M} + \Gamma_r^{K^X} n_r^{K^X} + \sum_r \Gamma_r^L n_r^L$. The proportion of region r's population owning specific capital in the import-competing and export sectors $\frac{n_r^{K^M}}{n_r}$ and $\frac{n_r^{K^X}}{n_r}$, respectively, are determined similarly as in the small country case above. In the Table, (i) K_r^M-share is the proportion of the national weight placed on region r's specific capital owners employed in manufacturing import-competing goods, $\frac{\Gamma_r^{K^M} n_r^{K^M}}{\gamma}$. The welfare-weight share of specific capital employed in import-competing goods is 0.154 (in contrast to 0.316 in the small-country case). (ii) K^X-share is the share of aggregate welfare weight placed on specific capital employed in the export industry "COMPUTER", $\frac{\Gamma^{K^X} n^{K^X}}{\gamma}$, where n^{K^X} is the total employment of specific capital in "COMPUTER". From Table 2, $\tilde{\beta}^X = 3.243$, the estimate for $\frac{\Gamma^{K^X} n}{\gamma}$ from (24). Multiplying by $\frac{n^{K^X}}{n} = 0.063$ yields the share 0.204 reported in the bottom row. The remainder $1 - 0.154 - 0.204 = 0.642$ is the aggregate weight share of labor. (iii) The relative weights $\frac{\Gamma_r^{K^M}}{\Gamma^L}$ are calculated as described in the small country case.

What do the estimates imply about the distribution of welfare weights across owners of specific capital in the nine regions? Table 3 provides the answers. In the small-country model exclusively representing import-competing interests, their aggregate share of welfare weights is 0.316, with the remainder going to mobile factor owners. With large populations of specific factor owners, Mid-Atlantic, East North Central, South Atlantic, and Pacific have the largest weight shares. Specific factors in Mountain get zero weight.

The relative weight $\frac{\Gamma_r^K}{\Gamma_r^L}$ on an owner of specific capital versus an owner of a mobile factor reflects the importance granted to the interests of specific factors in the tariff determination process. In five of the nine regions, specific factors receive more favorable treatment. The legislative bargaining interpretation is that it takes these five blocs to create a winning coalition. Specific capital owners in the Mid-Atlantic, East South Central, South Atlantic, and Pacific blocs receive the most favorable treatment relative to mobile factor owners. Viewed through the Baron-Ferejohn lens, the median district belongs to the South Atlantic bloc. Adding up the number of districts from Table 1 in descending order of $\frac{\Gamma_r^K}{\Gamma_r^L}$ indicates the 218^{th} district is in region 5. Districts in the remaining regions (3, 4, 7, 8) are inessential and the preferences of specific factors residing there are ignored. A free-trade bias in the agenda setter's tariffs is in evidence, as districts in the industrial East North Central, most in need of protection, are not in the winning coalition.

The large-country model showcases export interests employed in the Computers industry ("COMP"), classified as NAICS 3-digit code 334, who compete with import-competing interests employed in the remaining 3-digit NAICS industries.[33] The "K_r^M-share" columns indicate zero weights for specific factors employed in import-competing goods in all but the three regions: West North Central, South Atlantic, and West South Central. The first significantly different finding from the small country case is the sharply lower weight share to K^M owners in the aggregate, equal to 0.154. The second significant finding is the large welfare weight share to K^X owners, equal to 0.204. Specific factors on both sides of tariff protection get a total welfare weight share equal to 0.358.

An interpretation of the result is that the presence of anti-protection export interests reduces the need to satisfy coalitions of protectionist districts. Thus, the agenda setter needs to add only "cheap dates" to exporter coalitions and ignore the strong demands for protection from districts in the East North Central bloc, which receive zero

[33] Our model follows the tradition of one-way trade models (Grossman and Helpman, 1994), where either the good/industry is entirely import-competing or exporting, but not both. A significant extension would model industry with two-way trade in differentiated goods(Krugman, 1981).

weight. From the Baron-Ferejohn lens, a strategy for the agenda setter is to form the winning coalition with export-oriented blocs and then satisfy protectionist coalitions, in the cheapest way possible, to form a majority. Based on the share of the export industry COMP in the region's total manufacturing output ($\frac{Q_{gr}}{Q_r}$ in Table A.1.4 in Appendix A.1), the export coalitions consist of New England, Mountain, and Pacific, totaling 116 districts. The agenda setter only needs to satisfy the protectionist demands of regions 4 and 5 (106 more districts) for a majority. Relative to the industrial mid-west (East North Central region) where the demand for protection is the most intense, the "cheaper dates" produce a majority that puts East North Central in the losing coalition. The cheap date hypothesis plausibly explains why specific factors in the less populous West North Central region get a larger-than-commensurate welfare weight (their high $\frac{\Gamma_r^{K^M}}{\Gamma^L}$ weight).

The third significant finding is the large weight placed on an individual specific-factor owner in Computers relative to labor, $\frac{\Gamma^{K^X}}{\Gamma^L} = 3.485$. The implication is that the legislative bargain determining U.S. tariffs is won by export interests. They handily defeat manufacturing interests in the remaining (import-competing) industries. This representation of export interests in our model leads to a variable that is a key determinant of low U.S. tariffs, thus far absent in the literature. The missing variable can account for low overall U.S. tariffs, and the large number of tariff lines (70 percent) with zero tariffs.

The term $\left(\frac{Q_j/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}} + \mu_j \theta_{jg} \frac{D_g/M_j}{-\delta_j}\right)$ in (24), whose coefficient is constrained to -1, plays an important role in the results.[34] The three terms move tariffs in sometimes opposite directions. The optimal tariff, $\frac{1}{1+\epsilon_j^{X*}}$, whose values vary between 0.16 and 0.71, would increase U.S. tariffs by an order of magnitude (its mean is 0.38 compared to the mean U.S. tariffs equal to 0.029 in 2002). On the other hand, the harm to consumer welfare from tariffs on imports, $\frac{Q_j/M_j}{-\delta_j}$, calls for lower tariffs. In the net, the sum of the three components varies between -1.35 and 1.81 with a mean of 0.29. If its variation dominated the variation in tariffs, then the results would be driven largely by this constraint. That is, the portion of tariffs explained by import-competing special interest variables would be of second-order importance relative to

[34]The coefficient -1 implies that: $\frac{Q_j/M_j}{|\delta_j|}$ lowers tariffs (concern for consumer welfare) on average by 0.81; $\frac{1}{1+\delta_j^{X*}}$ raises tariffs (imposition of optimal tariff) on average by 0.38 and $\frac{\mu_j \theta_{jg}(D_g/M_j)}{|\delta_j|}$ lowers tariffs (TOT effect of *RoW* retaliation) on average by 0.14.

concerns about consumer welfare and the optimal tariff. This is the case with U.S. tariffs and is reflected in the low weights received by special interests in the import-competing sector. Applying the model to countries with high tariffs (for instance, India before its 1990s liberalization) would more appropriately highlight the role of special interests in India's protectionism before liberalization, and the influence of export interests in the liberalization.

5.2 Coalitions based on electoral dynamics

Case 1 ignores the long-held view that the primary motive for building strong parties is precisely to unify party-based coalitions during legislative bargaining. *Case 2* aggregates districts into stylized electoral coalitions based on how states voted in the 2000 Presidential elections (reflecting incentives faced by the Executive Branch in the formation of trade policy) and how districts voted that same year in elections to the House of Representatives (home of the agenda setters such as House Ways and Means and other committee chairs). Districts are formed into nine blocs ($R = 9$), combining election outcomes and the party winning the state or district. Districts in states where a party won more than 52 percent of the votes in the Presidential election are coded as safe for the winning party; they are considered competitive otherwise. Districts in which a candidate to the House won by more than 52 percent of the vote are considered safe for the winning party. Otherwise, they are considered competitive in the House elections.

Table 4: Districts, by Political Blocs based on 2000 Election Outcomes

State-wide Vote in Presidential Election	**Districts in House elections**			**Total**
	Competitive	Safe Democratic	Safe Republican	
Competitive	17	72	83	172
	[0.03]	[0.16]	[0.22]	
	(0.09)	(0.09)	(0.09)	
Safe Democratic	8	75	42	125
	[0.02]	[0.16]	[0.09]	
	(0.12)	(0.27)	(0.15)	
Safe Republican	5	51	80	136
	[0.02]	[0.11]	[0.20]	
	(0.05)	(0.12)	(0.06)	
Total	30	198	205	433
				[1.00]
				(0.11)

Notes: (1) Each cell in the 3 × 3 represents "coalition". A cell contains (i) # districts in the coalition, (ii) proportion of manufacturing workforce, in brackets, and (iii) proportion of export industry (COMPUTER) output, in parentheses.

Table 4 shows how districts were distributed across the nine political blocs after the 2000 elections. The numbers in square brackets indicate the proportion of the nation's manufacturing workforce in each bloc. The bottom row indicates there were 205 strongly Republican districts in 2000, 198 strongly Democratic districts, and just 30 competitive districts. We use this case with electoral-based coalitions to analyze the determination of the level of protection granted by both total ad-valorem tariffs and NTMs.[35] Institutionally, the authority for enacting NTMs is distinct from tariffs. It emerges from multiple statutes; further, granting protection through NTMs faces fewer constraints from international commitments and is more unilateral.

Table 5: K_r Weight Shares (from 2SLS estimates): Small Country model
Dependent Variable: *Applied Tariffs + NTMs, 2002*

State-wide Vote in Presidential Election	**Districts in House elections**			
	Competitive	Safe Democratic	Safe Republican	Total
Competitive	0	0	0.104	0.104
	[0]	[0]	[1.560]	
Safe Democratic	0	0.093	0	0.093
	[0]	[2.100]	[0]	
Safe Republican	0	0.047	0.073	0.120
	[0]	[1.576]	[1.212]	
Total K_r share	0	0.140	0.177	0.317

Notes: (1) $N = 8210$. (2) Each cell (coalition r) reports K_r-share of total welfare weights and (in square brackets) individual $\frac{\Gamma_r^K}{\Gamma_r^L}$ ratio these shares imply. (3) See Notes to Table 2 for computation details.

In the small country setting, the pattern of (estimated) weights reported in Table 5 suggests an interpretation of the trade policy-making process in the 107th Congress in line with the model.[36] Suppose the agenda setter is Representative Cliff Stearns, Chairman of the Commerce, Trade, and Consumer Protection Subcommittee of the powerful Ways and Means Committee in the 107th Congress. Stearns represents the 6th CD in Florida, a Safe Republican district in the most competitive State for the Presidency in the 2000 election. Further, suppose Stearns is to form a legislative majority in support of the status quo trade policy, which needs to satisfy the protectionist interests of the majority party's median representative, and yet be mindful

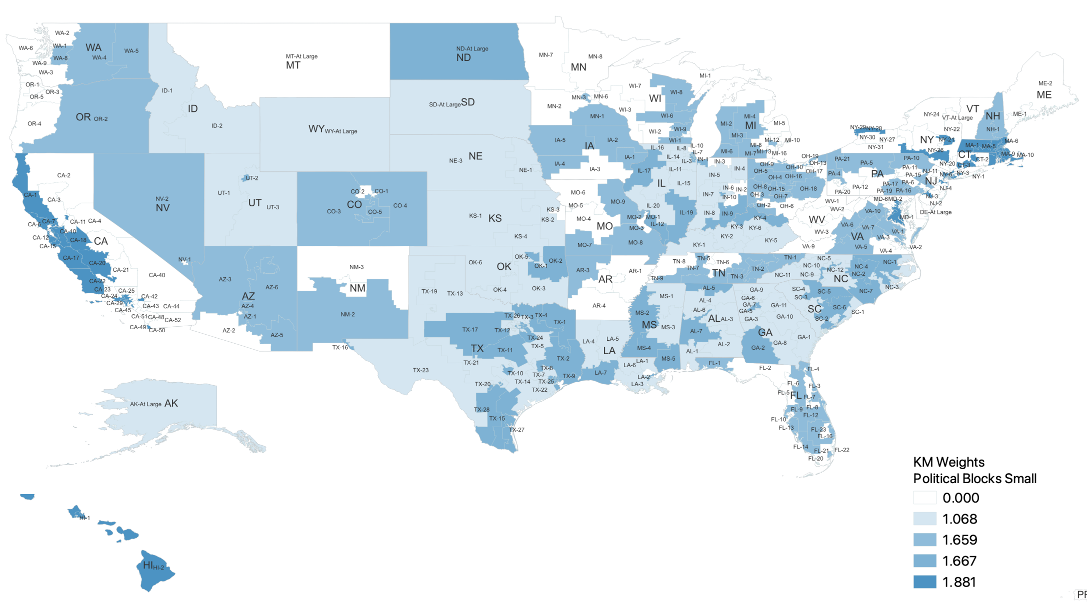
[35](Expression 24) may be used to estimate the political determinants of non-tariff measures (NTMs) measured as ad-valorem equivalents (AVEs). AVE of core NTMs is defined as the uniform tariff that would have the same effect on imports as the NTMs. These are measured by Kee et al. (2009). Here, AVE of Core NTMs is added to ad-valorem tariffs to measure overall protection.

[36]The 2SLS estimates for estimating the weights are reported in Table A.1.4 in Appendix A.1.

of the externalities imposed on voters in other districts. To form a winning coalition the agenda setter needs the support of a legislative majority drawn from the regional groupings used in our estimation. We can observe that a proposal formed as in equation (8), combining the agenda setter's status quo level of protection (tariffs plus NTMs) satisfies special interests in four regions: Safe Republican States + Safe Republican District (80); Safe Democratic State + Safe Democratic District (75); Safe Republican State + Safe Democratic District (51) and Stearns' own group of Competitive State + Safe Republican District (83). For these groupings of CDs, the relative weights $\frac{\Gamma_r^{K^M}}{\Gamma_r^L}$ are estimated to be greater than one (square brackets in Table 5). Our estimates suggest that such a proposal garners enough support of a super-majority in Congress (289 districts), making it Presidential veto-proof.

Figure 3 depicts the geographic distribution of the estimated relative weights $\frac{\Gamma_r^{K^M}}{\Gamma_r^L}$. The estimates indicate that tariffs and NTMs observed in the data are a winning proposal, and therefore likely to endure even with manufacturing powerhouses like China getting preferential access. The politically acceptable protection at the national level for any district-good is lower than the district's preference.

Figure 3: Estimated $\frac{\Gamma_r^K}{\Gamma_r^L}$ Weights – Small Country Case



The large country setting in Table 6 supports an interpretation of legislative bargaining over trade policy where tariffs and NTMs at home are enacted in the shadow of potential retaliation abroad, and policymakers need to internalize terms of trade resulting from changes in relative world prices. The estimated weights suggest that the same agenda setter, Trade Sub-committee Chair representing the coalition of 83 Safe Republican CDs in battleground states, can propose a vector of tariffs and NTMs that would muster the support of representatives from the 80 Safe Republican CDs in Safe Republican states. The vote of the additional 55 representatives that would result in a legislative majority could be drawn from CDs with a large presence of specific factor owners in the export industry, such as those that are safely controlled by Democratic Congress members in states where the Democratic ticket carried in the 2000 Presidential election. Note that accounting for the reciprocal determination of protection and terms of trade effect, the weights on specific factors in the exporting industry are estimated to be 16.6% of the total welfare weights as shown in Table 6.

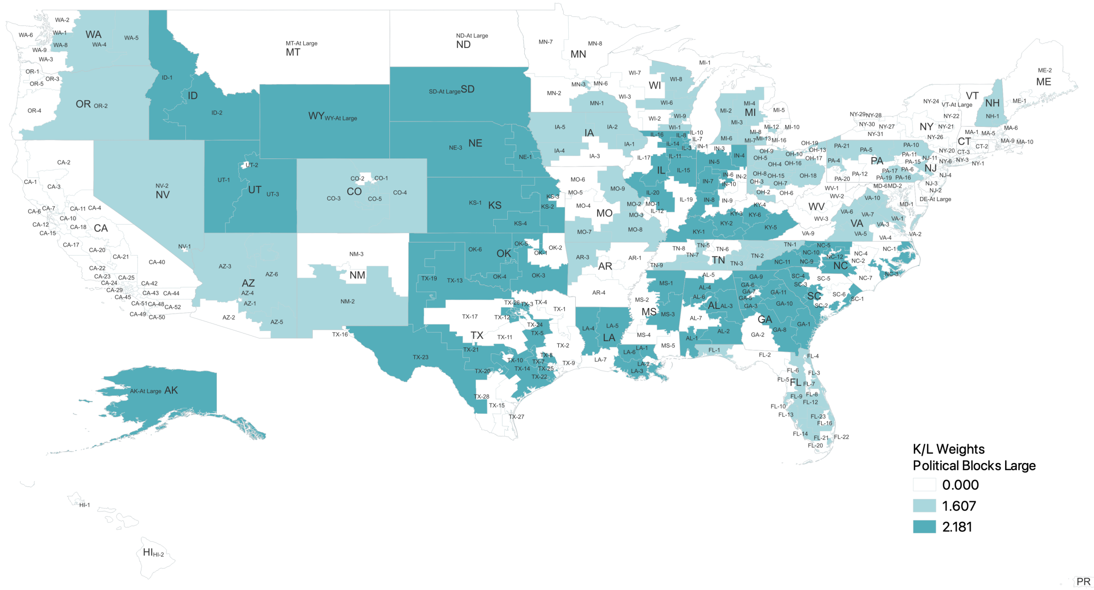
Table 6: K_r^M and K^X Weight Shares (from 2SLS estimates): Large Country model
Dependent Variable: *Applied Tariffs + NTMs, 2002*

State-wide Vote in Presidential Election	**Districts in House elections** Competitive	Safe Democratic	Safe Republican	Total
Competitive	0	0	0.081	0.081
	[0]	[0]	[1.537]	
Safe Democratic	0	0	0	0
	[0]	[0]	[0]	
Safe Republican	0	0	0.113	0.113
	[0]	[0]	[2.252]	
Total K_r^M share	0	0	0.194	0.194
Total K^X share				0.166
				[2.906]

Notes: (1) N = 7675 (export sector NAICS-3=334 (COMP) dropped). (2) Cells above the Total K^X share row (coalition r) report (i) share of welfare weights placed on import-competing interests K_r^M, and (ii) individual $\frac{\Gamma_r^{K^M}}{\Gamma_r^L}$ ratio in brackets. (3) The Total K^X share row reports the aggregate share of welfare weights on export sector interests and (in brackets) the individual $\frac{\Gamma^{K^X}}{\Gamma^L}$ ratio. (4) See Notes to Table 3 for computation details.

The pattern of protection through tariffs and NTMs in the data would, thus, result in a winning proposal for a majority in Congress. The relative weight on a specific factor owner in import-competing goods to a mobile factor owner $\frac{\Gamma_r^{K^M}}{\Gamma_r^L}$ is 1.54 times larger in Safe Republican Districts located in Competitive Presidential states, and 2.25 times larger in Safe Republican Districts located in Safe Republican states; the geographic distribution of relative weights is presented in Figure 4.

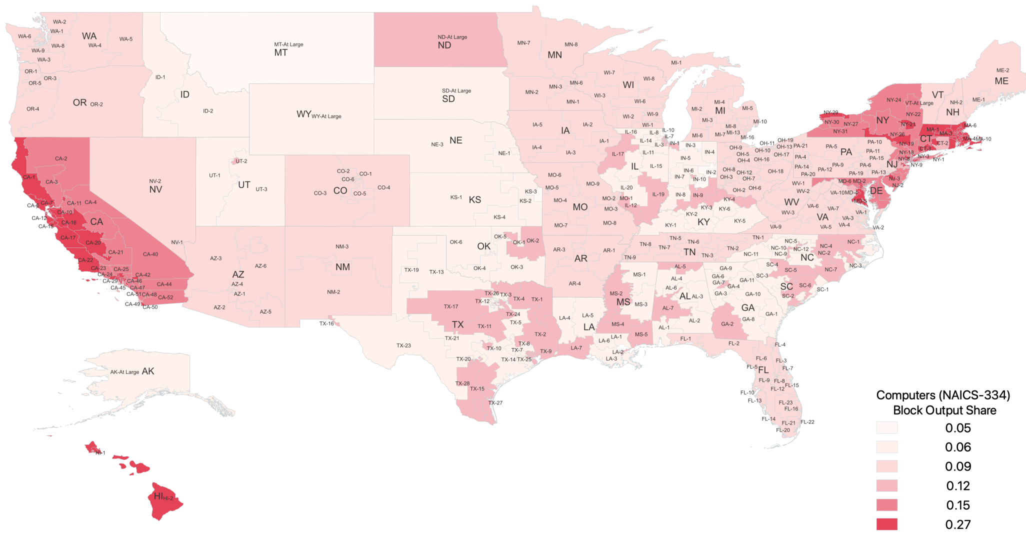
Figure 4: Estimated $\frac{\Gamma_r^K}{\Gamma_r^L}$ Weights – Large Country Case



The winning coalition, however, is biased towards export interests, in this case, producers of computers, whose distribution across political coalitions is presented in Figure 5. The estimated weight on the welfare of a specific factor owner in the exporting sector (nationally) is estimated to be almost three times that of a mobile factor owner ($\frac{\Gamma^{K^X}}{\Gamma^L} = 2.91$). The results show U.S. exporters to be highly effective in countervailing the demand for protection by domestic interests in import-competing industries. They do so because of the threat of retaliation, which is internalized by trade policy-making coalitions. It is also an explanation for why U.S. trade protection is low on average and concentrated in a few industries, facts that have eluded political economy models of trade policy.

In Appendix A.3 we present a sensitivity analysis of changes in K^X-share, the welfare weight shares of specific factors employed in exports, in response to changes in μ, the bargaining strength for the U.S. relative to the rest of the world. The corollary is that the influence of exporters on the domestic tariff increases as U.S. bargaining position decreases.

Figure 5: Output Share Computers (NAICS 334) by Political Coalitions



6 Conclusion

This paper integrates Congressional Districts into a political economy model of trade. This is necessary because in the U.S., and in many democracies, trade policy-making is a highly institutionalized process where elected legislative bodies play a central role. The institutional process regulating how trade policy is made in the U.S. relies on delegating "fast track" authority to the Executive branch to negotiate a bilateral or multilateral agreement. Under "fast track" the trade policy proposal negotiated by the President is subject to an up or down vote by Congress, without amendments, granting the majority party in Congress agenda-setting power over trade policy.

Closely related to our model is the protection-for-sale framework of Grossman and Helpman (1994). However, the emphasis of our approach differs: while GH models the demand for protection by special interests, our setup builds on a political-geography structure to explain the supply of protection. We are, thus, able to unpack the parameter "a" in the GH model, the rate at which the government trades welfare for contribution dollars, to account for the relative influence of local interests in the formation of trade policy. Both approaches feature special interests, but our present work incorporates Congressional Districts and legislative bargaining, the main actors and institutions participating in the legislative processes. The relative influence of districts is ultimately reflected in the weights received by local economic actors and interests in the formation of trade policy.

The first step in our framework is to characterize the tariff vectors that each Congressional District would choose if they were to set the national tariff on their own. Estimating the structural parameters from the model allows us to retrieve the otherwise unobservable local demand for protection at the industry and Congressional District levels. Our results provide a contrast between the "independent" demand for protection by districts and the protection actually delivered after district preferences are aggregated into national trade policy. These findings are key to understanding the backlash against globalization.

Next, we model the process of preference aggregation as a legislative bargaining protocol, where an agenda setter proposes a tariff vector that would muster a majority in Congress. This bargaining process produces welfare weights that are a weighted average of the preferences of the agenda setter and the legislative majority, reflecting the geographic distribution of economic activity and the institutionally defined process of preference aggregation in the legislature. Using district-level manufacturing data and national imports and tariff data for 2002, we estimate the welfare weights of specific and mobile factors implied by the model. We consider two stylized legislative "coalitions", one based on geography and the other on political alignments at the state and district levels. They yield substantively similar results: specific factor owners in import-competing activities located in districts that can deliver a majority in Congress receive positive welfare weights in the determination of national tariffs.

The large body of research in the political economy of protectionism that the paper addresses has largely ignored the role of exporters. A key contribution of the paper is to account for the influence of specific factor owners in exporting sectors. For this, the model is extended to account for terms of trade effects (the large country case). Using predictions from the extended model, we estimate a new set of welfare weights separately for specific factor owners employed in exporting and those employed in import-competing industries, and find that specific factor owners in exporting receive welfare weights on par with factor owners in import-competing industries. Further, once we account for exporters, only specific factor owners located in safe Republican districts in battleground states or in states that voted Republican in the 2000 Presidential elections receive positive weights. The influence of exporter interests reflects how the political process in the U.S. has internalized market access concerns in the formation of the country's trade policy. These are important and novel results that add significantly to the literature.

By formally integrating districts - whose representatives serve their local economies by bargaining in the legislature for the trade policies preferred by their constituents - into a specific factors model of trade, our paper builds a bridge between two influential and important bodies of literature that had remained distant from each other. The model and estimations provide theoretically motivated and empirically grounded micro-foundations for the low tariffs in the U.S. despite the growing public backlash against globalization in the face of the surge of Chinese manufacturing imports starting in the late 1990s and culminating in the "China shock".

Finally, the framework naturally extends in several relevant directions. While labor market effects are abstracted in our model, the paper offers a framework for integrating local labor market effects into a political economy model of trade. Second, intermediate goods (see e.g. Gawande et al. (2012)) may be easily incorporated into the model. Accounting for intermediate goods can result in more accurate measurement of district tariff preferences and national tariffs, specifically for district-goods whose output is used intensively in downstream district-goods. Third, the model may be extended to examine the role of lobbies in determining trade protection.[37] The analysis would need to allow for lobbies to organize not just at the sectoral level, as in previous studies, but regionally or nationally. Within such a framework, lobbies would emerge endogenously (Mitra, 1999) and target their activities to influence either the local or the national decision-making process. Their decisions would depend, among other things, on the relative ability of lobbying efforts to steer policy in their favor. We hope the paper paves the way for future research in this rich and important area.

[37]Online Technical Appendix B (section 1.3) develops an extension with lobbying *à la* Grossman and Helpman.

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APPENDICES:

Appendix A.1 – District-level Industry Output and First Stage Regressions with Bartik IVs

Figure A.1.1: Distribution of $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$ for NAICS 3-digit industries, Lorenz curve and Gini

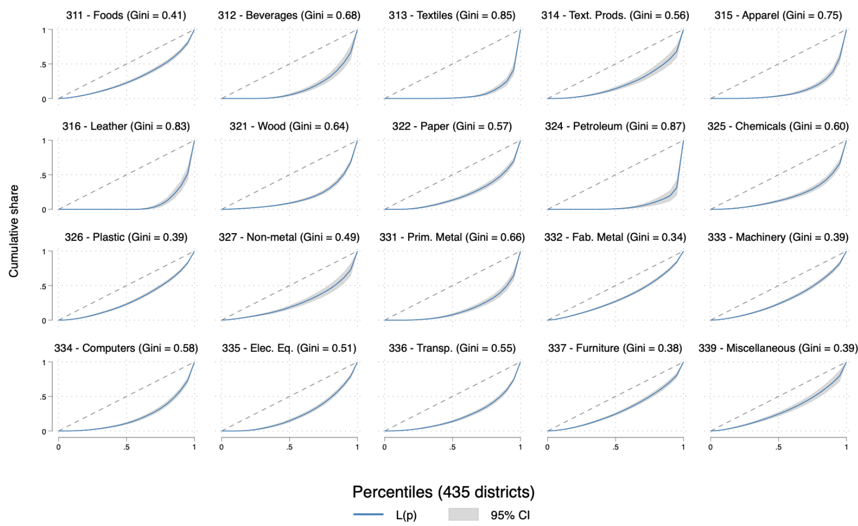

Figure A.1.2: Predicted district-level tariffs by NAICS-3 industries

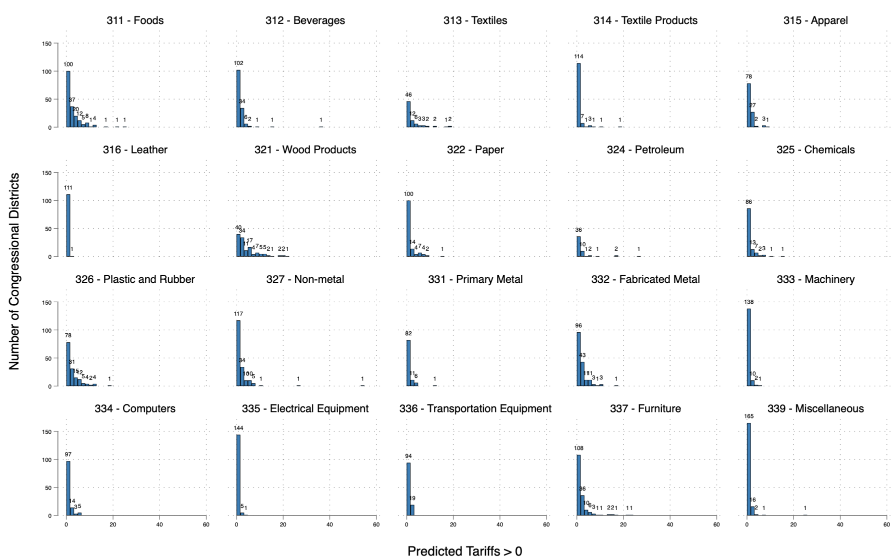

Figure A.1.3: Number of NAICS 3-digit industries with predicted district-level tariffs

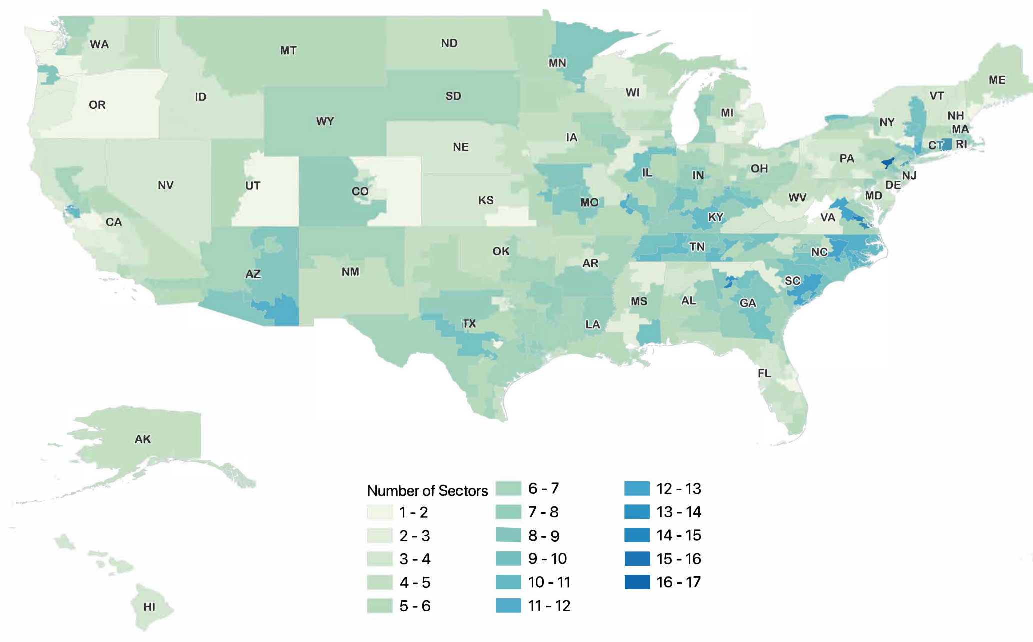

Table A.1.1: Average tariffs and NTMs by NAICS-3 industry

NAICS-3 Industry No. & Label	Tariffs No. of lines	Tariffs Average	Core NTMs No. of lines	Core NTMs Average	Predicted τ_{jr}	No. of CDs with $\tau_{jr} > 0$
311 - Foods	1,061	0.056	966	0.411	1.225	190
312 - Beverages	78	0.017	74	0.094	0.546	147
313 - Textiles	695	0.078	606	0.181	0.477	77
314 - Text. Prods.	225	0.044	211	0.234	0.276	128
315 - Apparel	588	0.092	584	0.353	0.294	111
316 - Leather	301	0.080	196	0.109	0.042	112
321 - Wood	177	0.011	143	0.172	1.357	131
322 - Paper	242	0.005	139	0.000	0.479	132
324 - Petroleum	43	0.010	19	0.000	0.295	53
325 - Chemicals	1,768	0.026	1,553	0.051	0.401	113
326 - Plastic	242	0.023	175	0.005	0.948	152
327 - Non-metal	310	0.038	292	0.001	0.850	179
331 - Prim. Metal	584	0.022	449	0.000	0.240	100
332 - Fab. Metal	441	0.024	389	0.031	0.812	169
333 - Machinery	879	0.011	819	0.041	0.232	151
334 - Computers	719	0.017	535	0.061	0.291	119
335 - Elec. Eq.	303	0.016	278	0.163	0.164	150
336 - Transp.	236	0.013	229	0.161	0.207	113
337 - Furniture	55	0.004	54	0.055	0.898	172
339 - Miscellaneous	507	0.023	499	0.029	0.354	185
Total (Average)	9,454	(0.035)	8,210	(0.131)	(0.519)	(134)

Notes: Averages weighted by the number of tariff and NTM lines in columns (3) & (5). Simple average over 433 CDs in columns (6) & (7).

Table A.1.2: First Stage Regressions for **Small** Country results in Tables 2 and 3. Using Bartik IVs (BIV) constructed as in (19).

	Endogenous Variables:							
	$\frac{q_{j1}/M_{j1}}{-\epsilon_j}$ Region 1 New England	$\frac{q_{j2}/M_{j2}}{-\epsilon_j}$ Region 2 Mid-Atlantic	$\frac{q_{j3}/M_{j3}}{-\epsilon_j}$ Region 3 E-N Central	$\frac{q_{j4}/M_{j4}}{-\epsilon_j}$ Region 4 W-N Central	$\frac{q_{j5}/M_{j5}}{-\epsilon_j}$ Region 5 S Atlantic	$\frac{q_{j6}/M_{j6}}{-\epsilon_j}$ Region 6 E-S Central	$\frac{q_{j7}/M_{j7}}{-\epsilon_j}$ Region 7 W-S Central	$\frac{q_{j9}/M_{j9}}{-\epsilon_j}$ Region 9 Pacific
BIV $Region = 1$	-1.616	-2.425	-1.913	-5.815	-1.61	-0.86	-3.149	-2.052
	(2.240)	(2.550)	(1.990)	(3.360)	(1.960)	(1.020)	(4.280)	(3.160)
BIV $Region = 2$	5.338	4.383	6.953	14.47	0.663	-6.719	5.075	4.824
	(1.710)	(1.000)	(1.860)	(2.200)	(0.160)	(1.090)	(1.730)	(1.760)
BIV $Region = 3$	5.683	6.957	12.03	21.93	9.779	12.26	12.85	8.411
	(2.880)	(2.640)	(4.630)	(5.640)	(3.120)	(4.140)	(4.600)	(3.840)
BIV $Region = 4$	2.361	2.696	2.804	6.338	2.386	2.183	3.256	2.985
	(3.950)	(3.260)	(3.770)	(5.150)	(2.350)	(2.550)	(4.140)	(4.120)
BIV $Region = 5$	-5.958	-8.479	-12.30	-21.00	-4.367	-6.22	-11.29	-6.915
	(2.620)	(2.630)	(4.540)	(4.730)	(1.250)	(1.860)	(3.990)	(2.840)
BIV $Region = 6$	1.099	1.612	2.338	4.221	0.92	1.18	2.164	1.291
	(2.310)	(2.440)	(4.230)	(4.650)	(1.250)	(1.750)	(3.710)	(2.520)
BIV $Region = 7$	-10.30	-9.468	-15.91	-31.53	-17.07	-13.50	-13.52	-12.53
	(4.030)	(2.540)	(4.840)	(5.810)	(4.090)	(3.810)	(3.820)	(4.160)
BIV $Region = 8$	-1.519	-1.917	0.713	-2.746	-0.831	2.278	0.0162	-1.846
	(1.570)	(1.360)	(0.400)	(1.000)	(0.740)	(1.100)	(0.010)	(2.010)
BIV $Region = 9$	14.83	12.6	11.72	37.65	17.81	7.793	5.019	17.81
	(3.380)	(1.940)	(1.740)	(3.030)	(3.510)	(1.170)	(0.890)	(3.980)
Constant	-6.288	-2.165	-1.654	-14.47	-2.532	6.016	3.508	-7.923
	(1.930)	(0.460)	(0.340)	(1.640)	(0.690)	(1.070)	(0.890)	(2.600)
N	9,454	9,454	9,454	9,454	9,454	9,454	9,454	9,454
R^2	0.516	0.454	0.587	0.547	0.769	0.508	0.529	0.443

Note: (i) t-values in parentheses. Errors clustered at HS 2-digits. (ii) Nine Bartik-like IVs for each endogenous variable $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$, $Region = 1, \ldots, 9$ constructed as in (19). 2SLS results are robust to using, instead, instrumenting each endogenous variable $\frac{q_{jr}/M_{jr}}{-\epsilon_j}$ using the nine share ratios z_{jd}/z_{jr} $d = 1, \ldots, 9$. (iii) See notes and weak-instrument statistics in Table 2.

Table A.1.3: First Stage Regressions for **Large** Country results in Tables 2 and 3. Using Bartik IVs (BIV) constructed as in (19)

.

	Endogenous Variables: $\frac{q_{j4}/M_{j4}}{-\delta_j}$ Region 4 W-N Central	$\frac{q_{j5}/M_{j5}}{-\delta_j}$ Region 5 S. Atlantic	$\frac{q_{j7}/M_{j7}}{-\delta_j}$ Region 7 W-S Central	$\mu_j\,\theta_{jg}\,.\,\frac{Q_g/M_j}{-\delta_j}$
BIV $Region = 1$	-8.445	-2.345	-3.933	-0.239
	(4.42)	(2.97)	(3.79)	(1.47)
BIV $Region = 2$	16.91	3.4	5.977	0.402
	(3.89)	(1.28)	(2.70)	(1.81)
BIV $Region = 3$	20.11	6.834	9.929	0.116
	(5.96)	(3.72)	(5.40)	(0.31)
BIV $Region = 4$	6.421	2.142	2.890	-0.142
	(5.08)	(2.98)	(4.31)	(1.32)
BIV $Region = 5$	0.856	2.95	-0.716	0.709
	(0.17)	(1.02)	(0.22)	(0.85)
BIV $Region = 6$	-0.879	-0.768	-0.216	-0.236
	(0.74)	(1.15)	(0.28)	(1.17)
BIV $Region = 7$	-25.94	-12.39	-9.811	0.293
	(5.55)	(4.64)	(3.88)	(1.21)
BIV $Region = 8$	-5.066	-2.016	-1.387	0.0787
	(3.22)	(2.92)	(1.49)	(0.82)
BIV $Region = 9$	32.21	14.30	5.29	-0.501
	(4.30)	(4.35)	(1.34)	(0.89)
Constant	-30.65	-9.054	-5.922	-0.677
	(3.52)	(2.46)	(1.20)	(1.08)
N	8,735	8,735	8,735	8735
R^2	0.529	0.776	0.521	0.537

Notes: (i) t-values in parentheses; errors clustered at HS 2-digits. (ii) Nine Bartik-like IVs for each endogenous variable $\frac{q_{jr}/M_{jr}}{-\delta_j}$, $r = 1, \ldots, 9$ constructed as in (19). 2SLS results are robust to using the nine share ratios $\frac{z_{jd}}{z_{jr}}$ $d = 1, \ldots, 9$, as instruments for each endogenous variable $\frac{q_{jr}/M_{jr}}{-\delta_j}$. (iii) Additional notes and weak-instrument statistics are reported in Table 2.

Table A.1.4: 2SLS estimates for models (16) and (27). with Political Coalitions
Dependent Variable: *Applied Tariff+ Ad-valorem NTMs* 2002

	Small Country Eq. (16)	$\frac{Q_{gr}}{Q_r}$	Large Country Eq. (27)
β_1: Competitive State, Competitive District	0	0.09	0
β_2: Competitive State, Safe (DEM) District	0	0.09	0
β_3: Competitive State, Safe (REP) District	0.350 (0.035)	0.09	0.322 (0.056)
β_4: Safe (DEM) State, Competitive District	0	0.12	0
β_5: Safe (DEM) State, Safe (DEM) District	0.261 (0.041)	0.27	0
β_6: Safe (DEM) State, Safe (REP) District	0	0.15	0
β_7: Safe (REP) State, Competitive District	0	0.05	0
β_8: Safe (REP) State, Safe (DEM) District	0.151 (0.056)	0.12	0
β_9: Safe (REP) State, Safe (REP) District	0.252 (0.035)	0.06	0.439 (0.035)
β^X: $\mu_j\ \theta_{jg}\,.\,\frac{Q_g/M_j}{-\delta_j}$			2.690 (0.281)
α: $\frac{Q_j/M_j}{-\epsilon_j}$	-1		
α: $\frac{Q_j/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}} + \mu_j\ \theta_{jg}\,.\,\frac{D_g/M_j}{-\delta_j}$			-1
N	8210		7675
First Stage Statistics			
Anderson-Rubin χ^2(10 df)	1099		676.4
Anderson-Rubin p-value	(0.00)		(0.00)
Kleibergen-Paap weak IV	539.2		2566

Notes: (1) Standard errors (in parentheses) clustered at 2-digit HS. (2) α is constrained to equal -1 required by (16) and (27). (3) Equations (16) and (27) require dropping the constant term in the regressions. (4) Q_{gr}/Q_r is the share of the output of export industry COMPUTER (3-digit NAICS=334) for each coalition r. Larger shares (in blue) suggest export-oriented coalitions. (6) In the **large country case:** (i) unconstrained estimates of β_1, β_2, β_4, β_5, β_6, β_7 and β_8 are negative and constrained to zero to disallow import subsidies or export taxes. (ii) μ_j is assumed to equal 1 (equal bargaining strength) for all j. (iii) θ_{jg} is calculated as in 26.

Appendix A.2 – Comparison with Grossman-Helpman Predictions

Expression (12) in Proposition 3 may be used to draw a comparison with GH, beyond those performed earlier, in relation to district tariff preferences in equations (3) and (5). Consider the GH model in which all sectors are organized as lobbies, and α^K denotes the fraction of the population that owns specific factors and whose interests lobbies represent. In our model, this fraction is $\alpha^K = n^K/n$. While Grossman and Helpman (1994) unitary government dispenses with legislatures and districts we are able to compare Proposition 2 in GH as the GH counterpart to equation (12) in our model. Proposition 2 in GH is:

$$\frac{\tau_j}{1+\tau_j} = \frac{(1-\alpha^K)}{a+\alpha^K}\left(\frac{Q_j/M_j}{-\epsilon_j}\right). \tag{1}$$

Eliminating districts in (12) is achieved by reducing the coefficients on the $\left(\frac{q_{jr}/M_j}{-\epsilon_j}\right)$ terms to a constant. Forcing the welfare weight on each owner of specific factors to be invariant across regions r "folds" the model in this manner. Suppose $\Gamma^K_{jr} = \Gamma^K$ for all j and r. Then, noting $\Gamma^K n^K = \gamma^K$ (aggregate welfare weight to owners of specific capital), (12) can be written as:

$$\frac{\tau_j}{1+\tau_j} = \sum_{r=1}^{R} \frac{\Gamma^K n^K}{\gamma^K+\gamma^L}\frac{1}{\alpha^K}\left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right) = \left(\frac{\gamma^K}{\gamma^K+\gamma^L}\frac{1}{\alpha^K}-1\right)\left(\frac{Q_j/M_j}{-\epsilon_j}\right).$$

The first equality uses $\alpha^K = n^K/n$, while the second equality uses $\sum_r q_{jr} = Q_j$. Defining $\widetilde{\gamma}^K$ as the share $\widetilde{\gamma}^K = \gamma^K/(\gamma^K+\gamma^L)$ yields

$$\frac{\tau_j}{1+\tau_j} = \frac{(\widetilde{\gamma}^K-\alpha^K)}{\alpha^K}\left(\frac{Q_j/M_j}{-\epsilon_j}\right). \tag{2}$$

In the GH model, equation (1), τ_j approaches zero as $a \to \infty$, i.e., the government becomes singularly welfare-minded. In our model, folded to simulate a unitary government, τ_j approaches zero as $\widetilde{\gamma}^K \to \alpha^K$. This is the same situation noted above where the mobile factor (L) and specific factors (K) owners get exactly the same welfare weights (α^K is the proportion of the population with specific factor ownership). If owners of capital and owners of labor are treated equally, the classic free trade result obtains.

The unitary government chooses positive tariffs in the GH model if a is finite. In the folded version of our model, with no role for legislative bargaining, the reason for positive tariffs is that $\tilde{\gamma}^K > \alpha^K$. But the reason why specific factors get a larger representation than their numbers is left unexplained since legislative bargaining is folded. The GH model builds a lobbying structure to provide an explanation.

A closer parallel with the GH model is possible by letting the weight on specific capital owners be sector-varying before folding, or $\Gamma^K_{jr} = \Gamma^K_j$ for all r. From (12),

$$\frac{\tau_j}{1+\tau_j} = \sum_{r=1}^{R} \frac{\Gamma^K_j n^K_j}{\gamma^K + \gamma^L} \frac{1}{\alpha^K_j} \left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right) = \frac{(\tilde{\gamma}^K_j - \alpha^K_j)}{\alpha^K_j} \left(\frac{Q_j/M_j}{-\epsilon_j}\right).$$

Using $\alpha^K_j = n^K_j/n$, the fraction of specific factor owners that are employed in sector j, yields the first equality. Defining $\tilde{\gamma}^K_j = \Gamma^K_j n^K_j/(\gamma^K + \gamma^L)$, the share of aggregate welfare given to specific factors in sector j, yields the second equality. In this way, sector j interests are represented by the continuous variable $(\tilde{\gamma}^K_j - \alpha^K_j)/\alpha^K_j$ – akin to the binary existence-of-lobbying-organization variable in the GH model – bringing our version closer to GH. The mechanism determining the national tariff in our model as a function of legislative bargaining is, however, different from GH.

Appendix A.3 – Sensitivity Analysis

Estimates from equation (27) in Tables 3 and 6 have assumed US and RoW have equal bargaining strength, that is, $\mu = 1$. Here, we investigate the sensitivity of K^X-share, the welfare weight shares of specific factors employed in exports, to a range of μ values.[1] A smaller μ implies lower bargaining strength for the U.S. Recall from the equilibrium condition (21), given by $\frac{d\Omega^{US}}{d\tau_j} - \frac{d\Omega^{US}}{d\tau^*_g}\left[\frac{d\Omega^{RoW}/d\tau_j}{d\Omega^{RoW}/d\tau^*_g}\right] = 0$, incorporates the terms of the "agreement". Suppose, as mentioned in the text, that the agreement allows RoW to use a retaliatory tariff in response to a unilateral U.S. tariff increase on imports of j, to keep RoW's welfare at the status quo. Then, this retaliatory tariff increase is given by $\frac{d\tau^*_g}{d\tau_j} = -\frac{d\Omega^{RoW}/d\tau_j}{d\Omega^{RoW}/d\tau^*_g}$. The magnitude of the retaliation $\frac{d\tau^*_g}{d\tau_j}$ characterizes U.S. "bargaining strength", μ, which is assumed to be constant across goods j (sensitivity analyses for different μ_j are also possible).

In Table A.3.1, small values of μ imply lower U.S. bargaining strength. These results indicate that when U.S. bargaining strength is low, the welfare weight on

[1] In equation (27), since μ is not separately identified from the price ratio $(p_j/\overline{p}_j)/(p^*_g/\overline{p}_g)$ in equation (26), the thought experiment is to explore sensitivity to μ conditional on $(p_j/\overline{p}_j)/(p^*_g/\overline{p}_g) = 1$.

Table A.3.1: Sensitivity Analysis of Large Country results

Bargaining strength	Geography-based coalitions		Politics-based Coalitions	
μ	K^X-share	Γ^{K^X}/Γ^L	K^X-share	Γ^{K^X}/Γ^L
0.33	0.436	11.66	0.324	7.56
0.50	0.318	6.62	0.214	4.87
0.75	0.242	4.40	0.192	3.51
1.00	0.204	3.48	0.166	2.91
1.25	0.181	2.99	0.150	2.57
1.50	0.165	2.67	0.140	2.35
3.00	0.127	1.95	0.113	1.84

Notes: Results for $\mu = 1$ correspond to estimates from Table 3 and Table 6..

export interests is high. Export interests and *RoW* bargaining strength work as complements to discourage U.S. tariffs. When U.S. bargaining strength is high, the ability of the U.S. to increase welfare by imposing optimal tariffs diminishes the role of U.S. export interests. Strikingly, even when U.S. bargaining power is high ($\mu_j = 3$), the share of the total welfare weight placed on export interests remains significant, equal to 0.127 in the case of geography-based coalitions of districts and 0.113 in the case with politics-based coalitions. Quantifying welfare weights on export interests to counterfactual μ_j's is informative about the role of export interests: If it is believed that U.S. has lower bargaining strength, export interests have even greater influence in shaping trade policy.

Appendix B – Technical Appendix

1 Model with importing sectors

1.1 General framework

Notation. The following notation is used throughout this section:

- The economy consists of J sectors, with $j = 0, 1, ..., J$, and R regions, with $r = 1, ..., R$. There are two types of economic agents: $m = L$, owners of a non-specific factor (often defined as a mobile factor of production); $m = K$, and owners of sector-specific factors of production (often defined as sector-specific capital).

- Non-sector specific factor: Mobile across sectors, but immobile across regions.
  - L_r: units of nonspecific factors in region r.
  - n_r^L: number of type-L individuals in r.
  - $\mathbf{n}_r^L = (n_{0r}^L, n_{1r}^L, n_{2r}^L, \ldots, n_{Jr}^L)$: allocation of the mobile factor across sectors in district r (vector).
  - $n^L = \sum_r n_r^L$: total number of owners of the mobile factor in the economy.

- Owners of specific factors: Immobile across sectors and regions.
  - K_r: number of owners of the specific factor of production in region r.
  - n_{jr}^K: number of type-K individuals producing in sector j in r; $n_{jr}^K \geq 0$ (not all regions are active in sector j).
  - $\mathbf{n}_r^K = (n_{1r}^K, n_{2r}^K, \ldots, n_{Jr}^K)$: distribution of the specific factor across sectors (vector); the distribution of endowments may differ across regions r.
  - $n_r^K = \sum_{i \in J} n_{ir}^K$: number of type-$K$ individuals in r.
  - $n^K = \sum_r n_r^K$: total number of specific factor owners in the economy.

- Total population in region r is $n_r = n_r^L + n_r^K$, and total population in the economy is $n = n^L + n^K$, where $n^L = \sum_r n_r^L$, $n^K = \sum_r n_r^K$.

- Welfare weights: District and national weights may differ.
  - Λ_{jr}^m: weight district r places on a type-m agent in sector j;
  - Γ_{jr}^m: weight placed at the national level on a type-m agent in sector j and district r.

- Prices:[2] Domestic prices are denoted by $p_0 = 1$, $\mathbf{p} = (p_1, ..., p_J)$, and world prices by $\overline{\mathbf{p}} = (\overline{p}_1, ..., \overline{p}_J)$.

- Tariffs: Specific tariffs are denoted by t_j, so that $p_j = \overline{p}_j + t_j$, and ad-valorem tariffs by τ_j, so that $p_j = (1 + \tau_j)\overline{p}_j$.

Preferences. Following the literature on trade protection, we assume preferences are represented by a quasi-linear utility function: $u^m = x_0 + \sum_{i \in J} u_i^m(x_i)$. Good 0, the numeraire, is sold at price $p_0 = 1$. Goods x_j, the imported goods, are sold domestically at prices p_j. In general, preferences for the imported goods j may differ across types $m = L, K$.[3]

Demand for goods. Consider the utility maximization problem for a representative consumer of type m in region r, with income z_r^m: $\max_{\{x_{jr}^m, j=1,...,J\}} u_r^m = z_r^m - \sum_i p_i x_{ir}^m + \sum_i u_i^m(x_{ir}^m)$. From the FOCs, $-p_j + u^{m\prime}(x_{jr}^m) = 0 \Rightarrow d_{jr}^m \equiv d_{jr}^m(p_j)$, where d_{jr}^m is the demand for good j of a representative consumer of type m in region r. Then, $n_r^m d_{jr}^m$ is the demand for good j of all consumers of type m in region r, and $D_j^m = \sum_r n_r^m d_{jr}^m$ is the aggregate demand for good j for all individuals of type m. Consumers of type m are identical across regions r, so the demand for good j for all individuals of type m is $D_j^m = \left(\sum_r n_r^m\right) d_j^m = n^m d_j^m$. Finally, aggregate demand for good j is $D_j = \sum_m D_j^m = \sum_m n^m d_j^m$.

Consumer surplus. Consumer surplus for a type-m individual from the consumption of good j is defined by $\phi_j^m(p_j) = v_j^m(d_j^m) - p_j d_j^m$, where $v_j^m(p_j) \equiv u_j^m[d_j^m(p_j)]$. Summing over all goods gives the surplus $\sum_i \phi_i^m$. Therefore, consumer surplus for type-m individuals in region r is $\phi_r^m(\mathbf{p}) = n_r^m \sum_i [v_i^m(d_i^m) - p_i d_i^m] = n_r^m \sum_i \phi_i^m = n_r^m \phi^m$, and aggregate consumer surplus for type-m individuals is $\Phi^m = \sum_r \phi_r^m = \sum_r n_r^m \sum_i \phi_i^m = n^m \phi^m$. Note that $\partial \Phi^m / \partial p_j = -n^m d_j^m = -D_j^m$. The indirect utility can be expressed as $v_r^m(\mathbf{p}, z_r^m) = z_r^m + \sum_i [v_i^m(p_i) - p_i d_i^m] = z_r^m + \sum_i \phi_i^m(p_i)$. When individuals have identical preferences, $\Phi^m = n^m \phi = n^m \sum_i \phi_i$.

Production. The production of good 0 only requires the mobile non-specific factor of production and uses a linear technology represented by $q_{0r} = w_{0r} n_{0r}^L$, where $w_{0r} > 0$. The wage received by workers in sector $\{0r\}$ is w_{0r}. Good j is produced domestically using a CRS production function $q_{jr} = F_{jr}(n_{jr}^K, n_{jr}^L) = f_{jr}(n_{jr}^L)$, where n_{jr}^K is sector-

[2]Initially, we develop a framework that does not include terms-of-trade effects (we assume that world prices are taken as exogenously given). We later extend this framework and include terms-of-trade effects.

[3]The analysis performed in the text assumes that agents have identical preferences.

region specific (immobile across sectors and regions). We omit, to simplify notation, n_{jr}^K from the production function from now onwards.

Profits. Profits in sector-region $\{jr\}$ are $\pi_{jr} \equiv p_j f_{jr}(n_{jr}^L) - w_{jr} n_{jr}^L$, and the demand for the mobile factor in sector-region jr is defined by $p_j f'_{jr}(n_{jr}^L) = w_{jr}$, which defines $n_{jr}^{L,D} \equiv n_{jr}^L(p_j, w_{jr})$. The profit function becomes $\pi_{jr}(p_j, w_{jr}) \equiv p_j f_{jr}(n_{jr}^{L,D}) - w_{jr} n_{jr}^{L,D}$. The production of good j in region r (using the envelope theorem) is given by $\partial \pi_{jr}(p_j, w_{jr})/\partial p_j = q_{jr}(p_j, w_{jr})$. Aggregate production of good j is $Q_j = \sum_r q_{jr}$. Workers employed in sector $\{jr\}$ receive w_{jr}, $j = 0, 1, ..., J$. Since workers are perfectly mobile across sectors, $w_{0r} = w_{jr} = w_r$ in equilibrium.

Imports and tariff revenue Imports of good j are $M_j = D_j - Q_j$. Let $\overline{p}_j$ denote the internationally given price of good j. Revenue generated from tariff collection is $T = \sum_i t_i M_i$, where $t_i = p_i - \overline{p}_i$. Note that

$$\frac{\partial T}{\partial t_j} = M_j + t_j M_j' = M_j \left(1 + \frac{t_j}{p_j}\epsilon_j\right), \text{ where } \epsilon_j \equiv M_j' p_j / M_j.$$

Total utility. The total utility of the mobile factor in sector-region $\{jr\}$ is

$$W_{jr}^L = w_{jr} n_{jr}^L + n_{jr}^L \frac{T}{n} + n_{jr}^L \phi_r^L = w_{jr} n_{jr}^L + n_{jr}^L \frac{T}{n} + n_{jr}^L \frac{\Phi^L}{n^L}.$$

An increase in the tariff on good j affects the utility of the mobile factor as follows:

$$\frac{\partial W_{jr}^L}{\partial p_j} = \frac{n_{jr}^L}{n}\frac{\partial T}{\partial p_j} + \frac{n_{jr}^L}{n^L}\frac{\partial \Phi^L}{\partial p_j} = \frac{n_{jr}^L}{n}(M_j + t_j M_j') - n_{jr}^L \frac{D_j^L}{n^L}.$$

The total utility of specific factor owners in sector-region $\{jr\}$ is

$$W_{jr}^K = \pi_{jr} + n_{jr}^K \frac{T}{n} + n_{jr}^K \frac{\Phi^K}{n^K}.$$

Note that

$$\frac{\partial W_{jr}^K}{\partial p_j} = q_{jr} + \frac{n_{jr}^K}{n}(M_j + t_j M_j') - n_{jr}^K \frac{D_j^K}{n^K}.$$

Region r's welfare. The welfare of mobile factors in region r is $\Omega_r^L = \sum_i \Lambda_{ir}^L W_{ir}^L$, or

$$\Omega_r^L = \sum_i \Lambda_{jr}^L w_{jr} n_{jr}^L + \frac{\sum_i \Lambda_{ir}^L n_{ir}^L}{n} T + \frac{\sum_i \Lambda_{ir}^L n_{ir}^L}{n^L} \Phi^L = \lambda_r^L \left(w_r + \frac{T}{n} + \frac{\Phi^L}{n^L}\right),$$

where $\lambda_r^L = \sum_{i=0}^J \Lambda_{ir}^L n_{ir}^L$, and $\Phi^L = n^L \sum_i \phi_i^L$. The welfare of specific factor owners in region r is given by $\Omega_r^K = \sum_i \Lambda_{ir}^K W_{ir}^K$, or

$$\Omega_r^K = \sum_i \Lambda_{ir}^K \pi_{ir} + \frac{\sum_i \Lambda_{ir}^K n_{ijr}^K}{n} T + \frac{\sum_i \Lambda_{ijr}^K n_{ir}^K}{n^K} \Phi^K = \sum_i \Lambda_{ir}^K n_{ir}^K \left(\frac{\pi_{ir}}{n_{ir}^K}\right) + \lambda_r^K \left(\frac{T}{n} + \frac{\Phi^K}{n^K}\right),$$

where $\lambda_r^K = \sum_i \Lambda_{ir}^K n_{ir}^K$. For region r, welfare is given by $\Omega_r = \Omega_r^L + \Omega_r^K = \sum_i \sum_m \Lambda_{ir}^m W_{ir}^m$, or

$$\Omega_r = \lambda_r^L \left(w_r + \frac{T}{n} + \frac{\Phi^L}{n^L}\right) + \sum_i \Lambda_{ir}^K n_{ir}^K \left(\frac{\pi_{ir}}{n_{ir}^K}\right) + \lambda_r^K \left(\frac{T}{n} + \frac{\Phi^K}{n^K}\right)$$

When preferences are identical,

$$\Omega_r = \lambda_r^L w_r + \sum_i \Lambda_{ir}^K n_{ir}^K \left(\frac{\pi_{ir}}{n_{ir}^K}\right) + \lambda_r \left(\frac{T}{n} + \phi\right),$$

where $\lambda_r = \lambda_r^L + \lambda_r^K$, and and $\Phi = n\phi = n\sum_i \phi_i$.

Aggregate welfare. National total welfare is $\Omega = \sum_r \sum_i \sum_m \Gamma_{ir}^m W_{ir}^m$, or

$$\Omega \;\; = \;\; \sum_r w_r \sum_i \Gamma_{ir}^L n_{ir}^L + \gamma^L \left(\frac{T}{n} + \frac{\Phi^L}{n^L}\right) + \sum_r \sum_i \Gamma_{ir}^K n_{ir}^K \left(\frac{\pi_{ir}}{n_{ir}^K}\right) + \gamma^K \left(\frac{T}{n} + \frac{\Phi^K}{n^K}\right),$$

where $\gamma^m = \sum_r \sum_i \Gamma_{ir}^m n_{ir}^m$. Note that the weights used at the national level, Γ_{jr}^m, may not coincide with those considered at the district level, Λ_{jr}^K. When preferences are identical

$$\Omega \;\; = \;\; \sum_r w_r \sum_i \Gamma_{ir}^L n_{ir}^L + \sum_r \sum_i \Gamma_{ir}^K n_{ir}^K \left(\frac{\pi_{ir}}{n_{ir}^K}\right) + \gamma \left(\frac{T}{n} + \frac{\Phi}{n}\right),$$

where $\gamma = \gamma^L + \gamma^K$, and $\Phi = n\phi = n\sum_i \phi_i$.

1.2 Tariffs

District specific tariffs. Consider the case of specific tariffs with no terms-of-trade effects, i.e. $p_j = \overline{p}_j + t_j$, where $\overline{p}_j$ is taken as exogenously given, so that $\partial p_j/\partial t_j = 1$. The tariff vector that maximizes the total welfare of region r, Ω_r, is determined by the following FOCs:

$$\frac{\partial \Omega_r}{\partial p_j} \equiv \lambda_r^L \left[\frac{1}{n}\left(M_j + t_j M_j'\right) - \frac{D_j^L}{n^L}\right] + \Lambda_{jr}^K n_{jr}^K \left(\frac{q_{jr}}{n_{jr}^K}\right) + \lambda_r^K \left[\frac{1}{n}\left(M_j + t_j M_j'\right) - \frac{D_j^K}{n^K}\right] = 0,$$

for $j = 1, ..., J$, where $D_j^m = n^m d_j^m$. Isolating t_{jr} gives

$$t_{jr} = -\frac{n}{M_j'} \left[\underbrace{\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r} \frac{q_{jr}}{n_{jr}^K}}_{(i)} - \underbrace{\left(\frac{\lambda_r^L}{\lambda_r} \frac{D_j^L}{n^L} + \frac{\lambda_r^K}{\lambda_r} \frac{D_j^K}{n^K} \right)}_{(ii)} + \underbrace{\frac{M_j}{n}}_{(iii)} \right] \tag{3}$$

where $\lambda_r = \lambda_r^L + \lambda_r^K$. Expression (i) in (3) captures the effect of tariff t_j on domestic producers of good j in region r. This effect would tend to rise t_j. Expression (ii) captures the impact of the tariff on consumer surplus. The effect is different for the different groups of individuals L and K. This term tends to put downward pressure on t_j. Finally, expression (iii) captures the impact of the tariff on tariff revenue. Since domestic residents benefit from tariff revenue, this term would tend to increase t_j.

Note that expression (i) reflects the impact of the tariff on the returns to the specific factors, in this case, owners of specific factors in sector j. Given that the model assumes the nonspecific factor is perfectly mobile across sectors within region r (but not across regions), $w_r = w_{jr}$ for all j in region r. Changes in tariffs do not have an impact on the income of the mobile factor because w_r does not depend on t_j.[4]

When agents have identical preferences i.e., $D_j^L/n^L = D_j^K/n^K = D_j/n$, expression (3) can written as

$$t_{jr} = -\frac{n}{M_j'} \left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r} \frac{q_{jr}}{n_{jr}^K} - \frac{n_j^K}{n} \frac{Q_j}{n_j^K} \right). \tag{4}$$

Moreover, if $\Lambda_{jr}^L = \Lambda_{jr}^K = \Lambda_r$,

$$t_{jr} = -\frac{n}{M_j'} \left(\frac{n_{jr}^K}{n_r} \frac{q_{jr}}{n_{jr}^K} - \frac{n_j^K}{n} \frac{Q_j}{n_j^K} \right).$$

Then, $t_{jr} > 0$ if and only if $(n_{jr}^K/n_r)(q_{jr}/n_{jr}^K) > (n_j^K/n)(Q_j/n_j^K)$, or $q_{jr}/n_r > Q_j/n$.

National tariffs. The tariff that maximizes aggregate welfare satisfies

$$\frac{\partial \Omega}{\partial p_j} = \sum_r \Gamma_{jr}^K n_{jr}^K \frac{q_{jr}}{n_{jr}^K} + t_j \gamma \frac{M_j'}{n} - \left(\gamma^L \frac{D_j^L}{n^L} + \gamma^K \frac{D_j^K}{n^K} - \gamma \frac{M_j}{n} \right),$$

[4]If the mobile factor were completely immobile across sectors (also sector-specific), then changes in tariffs would have a differential effect on wages across sectors as well.

where $\gamma = \gamma^L + \gamma^K$. Isolating t_j gives

$$t_j = -\frac{n}{M_j'}\left[\sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K} - \left(\frac{\gamma^L}{\gamma}\frac{D_j^L}{n^L} + \frac{\gamma^K}{\gamma}\frac{D_j^K}{n^K}\right) + \frac{M_j}{n}\right]. \tag{5}$$

If preferences are identical across groups, then

$$t_j = -\frac{n}{M_j'}\left(\sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right). \tag{6}$$

Ad-valorem Tariffs Suppose, as before, that world prices are fixed (i.e., there are no terms-of-trade effects), but tariffs are now ad-valorem. Specifically, $p_j = (1+\tau_j)\overline{p}_j$. This means that $\partial p_j/\partial \tau_j = \overline{p}_j$. Note that $\tau_j = (p_j - \overline{p}_j)/\overline{p}_j$, which means that $\tau_j/(1+\tau_j) = (p_j - \overline{p}_j)/p_j$. When agents have identical preferences i.e., $D_j^L/n^L = D_j^K/n^K = D_j/n$. Then, the district-preferred and national ad-valorem tariffs can be expressed, respectively as

$$\frac{\tau_{jr}}{1+\tau_{jr}} = \frac{n}{-\epsilon_j M_j}\left[\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right], \quad \frac{\tau_j}{1+\tau_j} = \frac{n}{-\epsilon_j M_j}\left[\sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right], \tag{7}$$

where $\epsilon_j \equiv M_j' p_j / M_j < 0$.

Comparing district tariff preference with national tariffs. How does the vector of preferred tariffs by district r differ from those effectively chosen at the national level? Evaluated at the solution obtained when tariffs are set at τ_j, the difference between τ_{jr} and τ_j can be written as:

$$\tau_{jr} - \tau_j = \frac{n}{(-\epsilon_j M_j)}\left[\left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \sum_\ell \frac{\Gamma_{j\ell}^K n_{j\ell}^K}{\gamma}\frac{q_{j\ell}}{n_{j\ell}^K}\right)\right], \tag{8}$$

where the subindex ℓ is used to sum over districts. This expression identifies three sources of discrepancy between district r's preferred tariff on good j, τ_{jr}, and the central tariff τ_j. The sign of $(\tau_{jr} - \tau_j)$ depends on (i) the difference between the weights Λ_{jr}^K and Γ_{jr}^K, (ii) the spatial distribution of n_{jr}^K, and (iii) the production levels of good q_{jr} across all locations r.[5] Even when each district r places the same weights to each sector j and group m as those chosen at the central or national level, expression (8) may still be different from zero if the

[5]Note that if $n_{jr} = 0$, then since capital is essential in the production of good j, $q_{jr} = 0$. However, to the extent that $q_{jr} > 0$, not only the spatial distribution of activity but also the scale, represented by q_{jr}/n_{jr}^K becomes relevant in determining tariffs and explaining the difference between τ_{jr} and τ_j.

allocation of production across jurisdictions is not homogeneous, i.e., n^K_{jr} differs across locations r. In other words, there will be districts that win and districts that lose just because of a non-uniform allocation of activity across space, and the legislative bargaining carried out at the national level.[6]

1.3 Tariffs and Lobbying

Suppose lobbying is organized at the national level and owners of the specific factors (sectors) are in charge of deciding the level of political contributions. Moreover, lobbying is decided at the sectoral level. Specifically, a subset of sectors $\mathcal{O} \subset J$ are organized and engaged in lobbying, and the "central authority" chooses the tariff vector $\mathbf{t} \equiv \{t_1, \ldots, t_J\}$ that maximizes $(C + a\Omega)$, where C are campaign contributions, Ω aggregate welfare, and a captures the trade-off between welfare and contribution dollars (as in GH). The latter is equivalent to maximizing $\mathcal{U} = \sum_{i \in \mathcal{O}} W^K_i + a\Omega$ w.r.t. $\mathbf{t}$, or

$$\max_{\{t_1,\ldots,t_J\}} \mathcal{U} \;=\; a\sum_r \sum_i \Gamma^L_r W^L_{ir} + a\sum_r \sum_{i \in J\backslash\mathcal{O}} \Gamma^K_{ir} W^K_{ir} + \sum_r \sum_{i \in \mathcal{O}} (1 + a\Gamma^K_{ir}) W^K_{ir}.$$

For organized sectors $j \in \mathcal{O}$, the specific tariff becomes

$$t^{\mathcal{O}}_j = -A\,\frac{n}{M'_j}\left\{\sum_r \left(\frac{\Gamma^K_{jr} n^K_{jr}}{\gamma} + \frac{n^K_{jr}}{a\gamma}\right)\frac{q_{jr}}{n^K_{jr}} - \left[\frac{\gamma^L}{\gamma}\frac{D^L_j}{n^L} + \left(\frac{\gamma^K}{\gamma} + \frac{n^K_j}{a\gamma}\right)\frac{D^K_j}{n^K}\right] + \frac{1}{A}\frac{M_j}{n}\right\},$$

where $A \equiv a\gamma/(a\gamma + n^K_j)$. For sectors that are not organized (i.e., $j \in J\backslash\mathcal{O}$), the tariff t_j is the same as before.

Comparing tariffs How do the (specific) tariffs change if a sector becomes organized and lobbies for protection? We now compare the tariff t_j derived earlier in (5) to $t^{\mathcal{O}}_j$. Specifically,

$$t^{\mathcal{O}}_j - t_j \;=\; \frac{n^K_j}{\left(a\gamma + n^K_j\right)}\left[\frac{n}{M'_j}\left(\frac{D^K_j}{n^K} - \frac{Q_j}{n^K_j} - \frac{M_j}{n}\right) - t_j\right].$$

[6] When preferences differ across groups, expression (8) becomes

$$\tau_{jr} - \tau_j = \frac{n}{(-\epsilon_j M_j)}\left[\left(\frac{\Lambda^K_{jr} n^K_{jr}}{\lambda_r}\frac{q_{jr}}{n^K_{jr}} - \sum_\ell \frac{\Gamma^K_{j\ell} n^K_{j\ell}}{\gamma}\frac{q_{j\ell}}{n^K_{j\ell}}\right) - \left(\frac{\lambda^L_r}{\lambda_r} - \frac{\gamma^L}{\gamma}\right)\frac{D^L_j}{n^L} - \left(\frac{\lambda^K_r}{\lambda_r} - \frac{\gamma^K}{\gamma}\right)\frac{D^K_j}{n^K}\right].$$

The last two terms capture the impact of the tariff on consumption. The effects contribute positively or negatively to the difference $(\tau_{jr} - \tau_j)$ depending on the relationship between the weights attached to each group by region r. Suppose $\Gamma^m_{jr} = \Gamma$ and $\Lambda^m_{jr} = \Lambda$. Then, $\lambda^m_r/\lambda_r = n^m_r/n_r$ and $\gamma^m/\gamma = n^m/n$. If the proportion of group m in district r is the same as the respective average proportion, then the last two terms of the previous expression cancel out. Finally, if preferences are identical such that $d^L_j = d^K_j$, the last two terms cancel out.

As $a \to \infty$, $A \to 1$, and $(t_j^{\mathcal{U}} - t_j) \to 0$; this means that tariffs are exactly the same. If $a = 0$, then the tariff for sector j becomes $t_j^{\mathcal{U}} = (n/M_j')[(D_j^K/n^K) - (Q_j/n_j^K) - (M_j/n)]$. Note that in this case, the tariff does not depend on Γ_{jr}^m.

2 Model with importing and exporting sectors

Suppose now that there are two countries: country US (or the domestic country), and country RoW (the foreign country, or, the rest of the world). We will the symbol "$*$" to denote variables referring to country RoW. We also incorporate into the present framework terms of trade (TOT) effects, so that tariffs imposed by an individual country may affect equilibrium world prices.

Notation. From the perspective of the domestic country US, the economy can be described as follows. There are three types of goods: a numeraire good 0, or sector 0, importable goods: $i = 1, ..., \langle j \rangle, ..., J$, or sector M (exportable sector for RoW or M^*), and exportable goods: $g = 1, ..., \langle s \rangle, ..., G$, or sector X (importable sector for RoW, or X^*). Factors of production are allocated across sectors as follows: $n^L = n^{L^0} + n^{L^M} + n^{L^X}$, $n^L = n^{L^0} + n^{L^M} + n^{L^X}$, and $n = n^L + n^K$, where $n^{L^0} = \sum_r n_r^{L^0}, n^{L^M} = \sum_r \sum_i n_{ir}^{L^M}, n^{L^X} = \sum_r \sum_g n_{gr}^{L^X}$, $n^{K^M} = \sum_r \sum_i n_{ir}^{K^M}, n^{K^X} = \sum_r \sum_g n_{gr}^{K^X}$. Moreover, since there are only two "countries" (US and RoW), the set of importable goods for US is equal to the set of exportable goods for RoW, and the set of exportable goods for US is equal to the set of importable goods for RoW. Additionally, the market clearing conditions are given by $D_j^M - Q_j^M = Q_j^{M^*} - D_j^{M^*}$, and $D_s^X - Q_s^X = Q_s^{X^*} - D_s^{X^*}$.

Ad-valorem tariffs. Suppose that countries set ad-valorem tariffs on importable goods, but they cannot use export subsidies. Specifically, country US sets tariffs on importable goods from RoW, τ_j^M, and country RoW sets tariffs on importable goods from country US, $\tau_s^{X^*}$. The domestic price of good j in country US (p_j^M) and the foreign country RoW ($\overline{p}_j^M$) are, respectively,

$$p_j^M = (1 + \tau_j^M)\overline{p}_j^M, \quad p_j^{M*} = \overline{p}_j^M, \tag{9}$$

$$p_s^X = \overline{p}_s^X, \quad p_s^{X^*} = (1 + \tau_s^{X^*})\overline{p}_s^X. \tag{10}$$

where $\overline{p}_j^M$ is the international (world) price of good j, and $\overline{p}_s^X$ is the international (world) price of good s.[7] Note that $\tau_j = (p_j^M - \overline{p}_j^M)/\overline{p}_j^M$, and $(1+\tau_j) = p_j^M/\overline{p}_j^M$, so that $\tau_j/(1+\tau_j) = (p_j^M - \overline{p}_j^M)/p_j^M$. This is the wedge between domestic and world price as a proportion of the **domestic price** p_j^M.

[7]Since good j is imported by country US, then country US chooses $\tau_j^M \geq 0$. For the foreign country RoW, $\tau_j^{M*} = 0$, i.e., RoW does not subsidize exports of good j.

Given the tariffs, the equilibrium prices are determined by the following equations (from the perspective of country US):

$$M_j(p_j^M) = X_j^*(\overline{p}_j^M), \quad \text{market for importable goods,} \tag{11}$$
$$X_s(\overline{p}_s^X) = M_s^*(p_s^{X^*}), \quad \text{market for exportable goods.} \tag{12}$$

It follows from (9) and (11) that $p_j^M(\tau_j^M)$ and $\overline{p}_j^M(\tau_j^M)$. Similarly, from (10) and (12), $p_s^{X^*}(\tau_s^{X^*})$ and $\overline{p}_s^{X^*}(\tau_s^{X^*})$.

Comparative static analysis: Domestic country US. Consider good j imported by country US. Differentiating the system of equations (9) and (11) with respect to τ_j^M gives

$$\frac{\partial \overline{p}_j^M}{\partial \tau_j^M} = \frac{\overline{p}_j^M M_j'(p_j^M)}{X_j^{*\prime}(\overline{p}_j^M) - (1+\tau_j^M)M_j'(p_j^M)} < 0, \frac{\partial p_j^M}{\partial \tau_j^M} = \frac{\overline{p}_j^M X_j^{*\prime}(\overline{p}_j^M)}{X_j^{*\prime}(\overline{p}_j^M) - (1+\tau_j^M)M_j'(p_j^M)} > 0.$$

We define elasticities as

$$\epsilon_j^M = \frac{\partial M_j}{\partial p_j^M}\frac{p_j^M}{M_j}, \quad \epsilon_j^{X^*} = \frac{\partial X_j^*}{\partial \overline{p}_j^M}\frac{\overline{p}_j^M}{X_j^*}, \quad \epsilon_{\tau_j^M}^{p^M} = \frac{\partial p_j^M}{\partial \tau_j^M}\frac{\tau_j^M}{p_j^M}, \quad \epsilon_{\tau_j^M}^{\overline{p}^M} = \frac{\partial \overline{p}_j^M}{\partial \tau_j^M}\frac{\tau_j^M}{\overline{p}_j^M}.$$

Rewriting the comparative static results in terms of elasticities:

$$\frac{\partial \overline{p}_j^M}{\partial \tau_j^M} = \frac{\overline{p}_j^M}{(1+\tau_j^M)}\frac{\epsilon_j^M}{(\epsilon_j^{X^*} - \epsilon_j^M)}, \quad \frac{\partial p_j^M}{\partial \tau_j^M} = \overline{p}_j^M \frac{\epsilon_j^{X^*}}{(\epsilon_j^{X^*} - \epsilon_j^M)},$$

or

$$\epsilon_{\tau_j^M}^{\overline{p}_j^M} = \frac{\tau_j^M}{(1+\tau_j^M)}\frac{\epsilon_j^M}{(\epsilon_j^{X^*} - \epsilon_j^M)}, \quad \epsilon_{\tau_j^M}^{p_j^M} = \frac{\tau_j^M}{(1+\tau_j^M)}\frac{\epsilon_j^{X^*}}{(\epsilon_j^{X^*} - \epsilon_j^M)} \quad \Rightarrow \quad \frac{\epsilon_{\tau_j^M}^{\overline{p}_j^M}}{\epsilon_{\tau_j^M}^{p_j^M}} = \frac{\epsilon_j^M}{\epsilon_j^{X^*}}.$$

Note that

$$\frac{\partial \overline{p}_j^M / \partial \tau_j^M}{\partial p_j^M / \partial \tau_j^M} = \frac{M_j'}{X_j^{*\prime}} = \frac{1}{(1+\tau_j^M)}\frac{\epsilon_j^M}{\epsilon_j^{X^*}}, \quad \text{and} \quad \frac{\overline{p}_j^M}{\partial p_j^M / \partial \tau_j^M} = 1 - \frac{\epsilon_j^M}{\epsilon_j^{X^*}}.$$

Comparative statics: Foreign country RoW. Differentiating the system of equations (10) and (12) with respect to $\tau_s^{X^*}$ gives

$$\frac{\partial \overline{p}_s^X}{\partial \tau_s^{X^*}} = \frac{\overline{p}_s^X M_s^{*\prime}(p_s^{X^*})}{X_s{}'(\overline{p}_s^X) - (1+\tau_s^{X^*})M_s^{*\prime}(p_s^{X^*})} < 0, \frac{\partial p_s^{X^*}}{\partial \tau_s^{X^*}} = \frac{\overline{p}_s^X X_s'(\overline{p}_s^X)}{X_s{}'(\overline{p}_s^X) - (1+\tau_s^{X^*})M_s^{*\prime}(p_s^{X^*})} > 0.$$

Using elasticities,

$$\frac{\partial \overline{p}_s^X}{\partial \tau_s^{X^*}} = \frac{\overline{p}_s^X}{(1+\tau_s^{X^*})} \frac{\epsilon_s^{M^*}}{(\epsilon_s^X - \epsilon_s^{M^*})} = \frac{(\overline{p}_s^X)^2}{p_s^{X^*}} \frac{\epsilon_s^{M^*}}{(\epsilon_s^X - \epsilon_s^{M^*})}, \quad \frac{\partial p_s^{X^*}}{\partial \tau_s^{X^*}} = \overline{p}_s^X \frac{\epsilon_s^X}{(\epsilon_s^X - \epsilon_s^{M^*})},$$

or

$$\epsilon_{\tau_s^{X^*}}^{\overline{p}_s^X} = \frac{\tau_s^{X^*}}{(1+\tau_s^{X^*})} \frac{\epsilon_s^{M^*}}{(\epsilon_s^X - \epsilon_s^{M^*})}, \quad \epsilon_{\tau_s^X}^{p_s^{X^*}} = \frac{\tau_s^{X^*}}{(1+\tau_s^{X^*})} \frac{\epsilon_s^X}{(\epsilon_s^X - \epsilon_s^{M^*})},$$

where ϵ_s^X is the elasticity of exports of good s from the domestic country US, and $\epsilon_s^{M^*}$ is elasticity of imports of good s by the foreign country RoW.

Tariff revenue. Using ad-valorem tariffs, the tariff revenue is given by $T = \sum_i \tau_i^M \overline{p}_i^M M_i$. Note that $T \geq 0$, since export subsidies are not allowed in our model. Differentiating T with respect to τ_j^M:

$$\frac{dT}{d\tau_j^M} = \frac{\partial T}{\partial \tau_j^M} + \frac{\partial T}{\partial p_j^M} \frac{\partial p_j^M}{\partial \tau_j^M} = \overline{p}_j^M M_j + \frac{\tau_j^M}{(1+\tau_j^M)} M_j \delta_j \frac{\partial p_j^M}{\partial \tau_j^M},$$

where $\delta_j = \epsilon_j^M \left(\frac{1+\epsilon_j^{X^*}}{\epsilon_j^{X^*}} \right) < 0$. Note that in the absence of TOT effects, $\delta_j = \epsilon_j^M$.

Total welfare. The aggregate welfare (in both countries) includes the welfare of both owners of the mobile factor and owners of the specific factors across all sectors: $\Omega = \Omega^L + \Omega^K = \Omega^{L^0} + \Omega^{L^M} + \Omega^{L^X} + \Omega^{K^M} + \Omega^{K^X}$, where[8]

$$\begin{aligned}
\Omega^L &= \sum_r \left(\Gamma_r^{L^0} n_{0r}^{L^0} w_{0r} + \sum_i \Gamma_{ir}^{L^M} n_{ir}^{L^M} w_r + \sum_g \Gamma_{gr}^{L^X} n_{gr}^{L^X} w_r \right) + \gamma^L \Upsilon, \\
\Omega^K &= \sum_r \left[\sum_i \Gamma_{ir}^{K^M} n_{ir}^{K^M} \left(\frac{\pi_{ir}^M(p_i^M)}{n_{ir}^{K^M}} \right) + \sum_g \Gamma_{gr}^{K^X} n_{gr}^{K^X} \left(\frac{\pi_{gr}^X(p_g^X)}{n_{gr}^{K^X}} \right) \right] + \gamma^K \Upsilon, \\
\Upsilon &= \sum_i \phi_i^M(p_i^M) + \sum_g \phi_g^X(p_g^X) + \frac{T}{n}, \\
\gamma^L &= \sum_r \left(\Gamma_r^{L^0} n_{0r}^L + \sum_i \Gamma_{ir}^{L^M} n_{ir}^{L^M} + \sum_g \Gamma_{gr}^{L^X} n_{gr}^{L^X} \right), \\
\gamma^K &= \sum_r \left(\sum_i \Gamma_{ir}^{K^M} n_{ir}^{K^M} + \sum_g \Gamma_{gr}^{K^X} n_{gr}^{K^X} \right).
\end{aligned}$$

Suppose that $\Gamma_r^{L^0} = \Gamma_{jr}^{L,M} = \Gamma_{sr}^{L,X} = \Gamma_r^L$, and $\Gamma_{jr}^{K^M} = \Gamma_{sr}^{K^X} = \Gamma_r^K$ for all j, s. Then, $\gamma^L = \sum_r \Gamma_r^L n_r^L$, and $\gamma^K = \sum_r \Gamma_r^K n_r^K$.

[8] We assume identical preferences for the two types of agents.

2.1 Nash Bargaining

Tariffs are the outcome of the following Nash Bargaining game between the domestic country US and the RoW: choose the vectors of tariffs $\{\tau^M, \tau^{X^*}\}$ that maximize $N = \left(\Omega^{US} - \overline{\Omega}^{US}\right)^{\sigma} \left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)^{(1-\sigma)}$ taking the tariffs of the other country as given. Equivalently, the tariffs are the solution to the problem: $\max_{\{\tau^M,\tau^{X^*}\}} N = \sigma Log\left(\Omega^{US} - \overline{\Omega}^{US}\right) + (1-\sigma) Log\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)$, where $\tau^M = (\tau_1^M, ..., \tau_j^M, ..., \tau_J^M)$, and $\tau^{X^*} = (\tau_1^{X^*}, ..., \tau_s^{X^*}, ..., \tau_G^{X^*})$. The FOCs with respect to each τ_j^M (chosen by the domestic country) and $\tau_s^{X^*}$ (chosen by the foreign country) are given by:[9]

$$\tau_j^M \quad : \quad \frac{\sigma}{\left(\Omega^{US} - \overline{\Omega}^{US}\right)} \frac{d\Omega^{US}}{d\tau_j^M} + \frac{(1-\sigma)}{\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)} \frac{d\Omega^{RoW}}{d\tau_j^M} = 0, \tag{13}$$

$$\tau_s^{X^*} \quad : \quad \frac{\sigma}{\left(\Omega^{US} - \overline{\Omega}^{US}\right)} \frac{d\Omega^{US}}{d\tau_s^{X^*}} + \frac{(1-\sigma)}{\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)} \frac{d\Omega^{RoW}}{d\tau_s^{X^*}} = 0. \tag{14}$$

Intuition from a two-good model. Suppose that country US produces one importable good j and one exportable good s (this means that the foreign country exports the good j and imports the good s). Rearranging (13) and (14) gives

$$\frac{d\Omega^{US}/d\tau_j^M}{d\Omega^{US}/d\tau_s^{X^*}} = \frac{d\Omega^{RoW}/d\tau_j^M}{d\Omega^{RoW}/d\tau_s^{X^*}} \quad \Rightarrow \quad \frac{d\Omega^{US}}{d\tau_j^M} - \left[\frac{d\Omega^{RoW}/d\tau_j^M}{d\Omega^{RoW}/d\tau_s^{X^*}}\right] \frac{d\Omega^{US}}{d\tau_s^{X^*}} = 0. \tag{15}$$

Consider the following interpretation of expression (15). Suppose that the agreement between countries U and RoW is such that when a country US raises the tariff on exports from country RoW, RoW is "entitled" to increase the tariff on exports from U such that the utility in RoW is unchanged (similarly if RoW is the country raising the tariff). In other words, $\frac{d\Omega^{RoW}/d\tau_j^M}{d\Omega^{RoW}/d\tau_s^{X^*}} = \frac{d\tau_s^{X^*}}{d\tau_j^M}$, because RoW increases its tariff so that Ω^{RoW} remains constant. In this case, the expression between $[\cdot]$ in (15) would represent the increase in the tariff by country RoW in response to an increase in the tariff by country US "authorized" by the agreement in place. Now, this increase in $\tau_s^{X^*}$ would negatively affect country US's (net) welfare because a higher $\tau_s^{X^*}$ lowers the price received by exporters from US.[10]

General case. Now, assume country US (RoW) imports (exports) J goods and exports (imports) G goods. The analysis below focuses on the determination of tariffs from the

[9] Remember that countries only choose import tariffs, i.e., countries cannot subsidy exports.

[10] We say "net" because the lower price would benefit consumers of the exportable good s in US.

perspective of the domestic country US. From (13):

$$\frac{d\Omega^{US}}{d\tau_j^M} + \left[\frac{(1-\sigma)/\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)}{\sigma/\left(\Omega^{US} - \overline{\Omega}^{US}\right)}\right]\frac{d\Omega^{RoW}}{d\tau_j^M} = 0. \tag{16}$$

We want to derive an expression for $[\cdot]$ in (16) above. Summing (14) over all goods exported (imported) by country US (RoW):

$$\frac{\sigma}{\left(\Omega^{US} - \overline{\Omega}^{US}\right)}\sum_g \frac{d\Omega^{US}}{d\tau_g^{X^*}} + \frac{(1-\sigma)}{\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)}\sum_g \frac{d\Omega^{RoW}}{d\tau_g^{X^*}} = 0. \tag{17}$$

Isolating $[\cdot]$ from the previous expression gives

$$\left[\frac{(1-\sigma)/\left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)}{\sigma/\left(\Omega^{US} - \overline{\Omega}^{US}\right)}\right] = -\frac{\sum_g d\Omega^{US}/d\tau_g^{X^*}}{\sum_g d\Omega^{RoW}/d\tau_g^{X^*}}. \tag{18}$$

Substituting (18) into (16) and rearranging, we obtain

$$\frac{d\Omega^{US}}{d\tau_j^M} - \left[\frac{d\Omega^{RoW}/d\tau_j^M}{\sum_g d\Omega^{RoW}/d\tau_g^{X^*}}\right]\sum_g \frac{d\Omega^{US}}{d\tau_g^{X^*}} = 0. \tag{19}$$

where

$$\frac{d\Omega^{US}}{d\tau_j^M} = \frac{\partial\Omega^{US}}{\partial p_j^M}\frac{\partial p_j^M}{\partial\tau_j^M} + \frac{\partial\Omega^{US}}{\partial\tau_j^M}, \quad \text{and} \quad \frac{d\Omega^{US}}{d\tau_s^{X^*}} = \frac{\partial\Omega^{US}}{\partial\overline{p}_s^X}\frac{\partial\overline{p}_s^X}{\partial\tau_s^{X^*}}. \tag{20}$$

Note that in the previous expression $\partial\Omega^{US}/\partial\tau_s^{X^*} = 0$, since the impact of $\tau_s^{X^*}$ on the welfare of country US only takes place through the TOT effects, and for ad-valorem tariffs, $\partial p_j^M/\partial\tau_j^M = \overline{p}_j^M + \tau_j^M\frac{\partial\overline{p}_j^M}{\partial\tau_j^M}$.

Interpretation of the term between $[\cdot]$ in (19). When country US increases τ_j^M, it affects RoW because τ_j^M has a negative impact on $\overline{p}_j^M$. This effect is captured by $d\Omega^{RoW}/d\tau_j^M$. The increase in τ_j^M "triggers" a response by country RoW, which reacts by raising potentially all tariffs in $\mathbf{t}^{X^*}$.[11] This increase ultimately affects producers and consumers of the exportable goods in country US (because $\tau_s^{X^*}$ negatively affects $\overline{p}_s^X$).

Suppose country US is "small" relative to RoW. In this case, $\partial\overline{p}_j^M/\partial\tau_j^M = 0$ and $d\Omega^{US}/d\tau_j^M = \partial\Omega^{US}/\partial\tau_j^M$, which is the same expression we obtained earlier when only importable goods are considered. However, if $\partial\overline{p}_j^M/\partial\tau_j^M = 0$, then $d\Omega^{RoW}/d\tau_j^M = 0$, so there is no interaction between US and RoW.

[11] Note that this is a simultaneous decision.

2.2 Effect of changes in prices and tariffs on welfare

Impact of a change in $\overline{p}_s^X$. What is the impact on the welfare of US of a change in the international price of exports (due to a change in tariffs by the foreign country RoW)? A change in $\overline{p}_s^X$ (a decrease in $\overline{p}_s^X$ when country RoW imposes a higher import tariff on good s) affects both producers and consumers of good s in US. Producers of good s are active in different regions r in the domestic country. Therefore, the impact of a change in $\overline{p}_s^X$ is spread across all (active) regions in country US affecting welfare in U as follows:

$$\frac{\partial \Omega^{US}}{\partial \overline{p}_s^X} = \sum_r \Gamma_{sr}^{K^X} n_{sr}^{K^X} \left(\frac{q_{sr}^X}{n_{sr}^{K^X}} \right) - \frac{\gamma}{n} D_s^X.$$

However, country RoW chooses a vector of tariffs τ^{X^*} that affect all prices received by domestic producers of exportable goods, $\overline{p}_g^X$. The impact of such change on the domestic country US is

$$\sum_g \frac{\partial \Omega^{US}}{\partial \overline{p}_g^X} = \sum_r \sum_g \Gamma_{gr}^{K^X} n_{gr}^{K^X} \left(\frac{q_{gr}^X}{n_{gr}^{K^X}} \right) - \frac{\gamma}{n} \sum_g D_g^X.$$

Impact of change in p_j^M. The direct impact of changes in domestic prices on the domestic country's welfare (the first term of (20)) is given by

$$\frac{\partial \Omega^{US}}{\partial p_j^M} = \sum_r \Gamma_{jr}^{K^M} n_{jr}^{K^M} \left(\frac{q_{jr}^M}{n_{jr}^{K^M}} \right) + \frac{\gamma}{n} (\tau_j^M \overline{p}_j^M M_j' - D_j).$$

Direct impact of a change in τ_j^M. A change in τ_j^M also affects Ω^{US} by affecting tariff revenue T directly and through its impact on the equilibrium world price $\overline{p}_j^M$:

$$\frac{\partial \Omega^{US}}{\partial \tau_j^M} = \frac{\gamma}{n} \left(\overline{p}_j^M + \tau_j^M \frac{\partial \overline{p}_j}{\partial \tau_j^M} \right) M_j.$$

2.3 Solution - Ad-valorem tariffs

Suppose the weights placed on fixed factors producing importable (exportable) goods is the same across sectors j (g). Specifically, $\Gamma_{jr}^{K^M} = \Gamma_r^{K^M}$, $\Gamma_{sr}^{K^X} = \Gamma_r^{K^X}$. Substituting the previous expressions into (19), gives

$$\left[\sum_r \Gamma_r^{K^M} n_r^{K^M} \left(\frac{q_{jr}^M}{n_r^{K^M}} \right) + \frac{\tau_j^M}{1+\tau_j^M} \frac{\gamma M_j \delta_j}{n} - \frac{\gamma D_j^M}{n} \right] \frac{\partial p_j^M}{\partial \tau_j^M} = -\frac{\gamma \overline{p}_j^M M_j}{n} - \mu_j^{MF} \sum_g \frac{d\Omega^{US}}{dt_g^{X^*}}.$$

Isolating $\tau_j^M/(1+\tau_j^M)$ gives

$$\begin{aligned}
\frac{\tau_j^M}{1+\tau_j^M} &= -\frac{1}{\delta_j}\sum_r\left[\frac{\Gamma_r^{K^M}n_r^{K^M}}{\gamma}\left(\frac{n_r}{n_r^{K^M}}\right)\left(\frac{q_{jr}^M}{M_{jr}}\right)\right] \\
&\quad -\frac{1}{\delta_j}\sum_r\left[\frac{\Gamma_r^{K^X}n_r^{K^X}}{\gamma}\left(\frac{n_r}{n_r^{K^X}}\right)\mu_j^{MF}\sum_g\theta_{jg}\left(\frac{q_{gr}^X}{M_{jr}}\right)\right] \\
&\quad +\frac{1}{\delta_j}\left[\frac{\epsilon_j^M}{\epsilon_{X^*}}+\frac{Q_j^M}{M_j}+\mu_j^{MF}\sum_g\theta_{jg}\left(\frac{D_g^X}{M_j}\right)\right], \qquad (21)
\end{aligned}$$

where $\gamma^L=\sum_r\left(\Gamma_r^{L^0}n_{0r}^L+\Gamma_r^{L^M}n_r^{L^M}+\Gamma_r^{L^X}n_r^{L^X}\right)$, $\gamma^K=\sum_r\left(\Gamma_r^{K^M}n_r^{K^M}+\Gamma_r^{K^X}n_r^{K^X}\right)$, $\gamma=\gamma^L+\gamma^K$, $D_j^M=Q_j^M+M_j$, $M_{jr}=M_j(n_r/n)$, and

$$\delta_j=\epsilon_j^M\frac{(1+\epsilon_j^{X^*})}{\epsilon_j^{X^*}}<0,\ \theta_{jg}=\frac{\partial\overline{p}_g^X/\partial\tau_g^{X^*}}{\partial p_j^M/\partial\tau_j^M}<0,\ \mu_j^{MF}=-\frac{d\Omega^{RoW}/d\tau_j^M}{\sum_g d\Omega^{RoW}/d\tau_g^{X^*}}>0.$$

Expression $\theta_{jg}\left(\frac{D_g}{M_j}\right)$ can be rewritten as $\theta_{jg}\frac{D_g}{M_j}=\widetilde{\theta}_{jg}\frac{\overline{p}_g^X D_g}{p_j^M M_j}$ where

$$\widetilde{\theta}_{jg}=\frac{(p_j^M/\overline{p}_j^M)}{(p_g^{X^*}/\overline{p}_g^X)}\frac{\frac{\epsilon_g^{M^*}}{(\epsilon_g^X-\epsilon_g^{M^*})}}{\frac{\epsilon_j^{X^*}}{(\epsilon_j^{X^*}-\epsilon_j^M)}}<0.$$

3 Baron and Ferejohn (BF) legislative bargaining framework

This section develops a simplified version of the BF legislative bargaining framework used in the text. We illustrate the outcome of the bargaining process using a three-district example. We later discuss how the main results would apply more generally.[12]

3.1 A three-district BF model

We begin by deriving the tariff vector region r would choose if it could choose the national tariff unconditionally, i.e., if r is chosen as the agenda setter and has the ability to implement its preferred tariff. We next obtain the tariff that region r would choose conditional on attracting region r' and form a majority coalition.

[12]See **?**. To simplify the exposition, we consider only importing sectors and no terms-of-trade effects.

Unconditional preferred tariff

Suppose that region r can choose its preferred tariff unconditionally, i.e., without considering the impact of the tariffs on other regions in the federation.[13] This tariff is obtained by maximizing $\Omega_r = \Omega_r^L + \Omega_r^K = \sum_i \Lambda_{ri}^L n_{ri}^L \omega_{ri}^L + \sum_i \Lambda_{ri}^K n_{ri}^K \omega_{ri}^K$ with respect to $\mathbf{t}_r = \{t_{1r}, ..., t_{jr}, ..., t_{Jr}\}$, which gives

$$t_{jr} = \frac{n}{-M_j'(t_{jr})}\left[\frac{\lambda_{jr}^K}{\lambda_r}\frac{q_{jr}(t_{jr})}{n_{jr}^K} - \frac{Q_j(t_{jr})}{n}\right], \tag{22}$$

where $\lambda_{jr}^K = \Lambda_{jr}^K n_{jr}^K$ is the aggregate welfare weight placed on special interests in district r, and $\lambda_r = \Lambda_{0r}^L n_{0r}^L + \sum_m \sum_j \Lambda_{jr}^m n_{jr}^m$ is the aggregate welfare weight on the district r's population, and $m \in \{L, K\}$.[14] The solution vector, denoted by $\mathbf{t}_r$, is the vector of tariffs that district r would choose if it had the ability to impose its own preferences over the other districts. Note that the term $[-Q_j(t_{jr})/n]$ in (22) is the sum of per capita tariff revenue $(M_j(t_{jr})/n)$ and the loss in consumer surplus due to the tariff $[-D_j(t_{jr})/n]$. Also, all the endogenous terms are evaluated at $p_j = \bar{p}_j + t_{jr}$ so they depend on t_{jr} since $\bar{p}_j$ is given in this case.

Equation (22) can also be rewritten in terms of ad-valorem tariffs $\tau_{jr} = t_{jr}/\bar{p}_j$ as

$$\frac{\tau_{jr}}{(1+\tau_{jr})} = \frac{n}{-\epsilon_j(\tau_{jr})M_j(\tau_{jr})}\left[\frac{\lambda_{jr}^K}{\lambda_r}\frac{q_{jr}(\tau_{jr})}{n_{jr}^K} - \frac{Q_j(\tau_{jr})}{n}\right], \tag{23}$$

where $\tau_{jr}/(1+\tau_{jr}) = t_{jr}/p_j$, since $p_j = \bar{p}_j + t_{jr}$, and $\epsilon_j(\tau_{jr}) = M_j'(\tau_{jr})[p_j/M_j(\tau_{jr})]$. The solution is essentially the same as the district's preferred tariff derived in the text.

Conditional preferred tariff

Consider a one-period BF bargaining model with three districts, each one with the same number of residents $n_r = n/3$. District r is randomly selected to be the agenda setter and proposes a vector of tariffs. District r's proposal is implemented if at least one other district (a majority, in the three-district case), district r', joins to form a majority coalition.

The agenda setter, district r, solves the following problem:

1. Choose the vector of (specific) tariffs $\mathbf{t}_r = \{t_{1r}, \ldots, t_{jr}, \ldots, t_{Jr}\}$ that maximizes district r's welfare $\Omega_r(\mathbf{t}_r)$ subject to $\Omega_{r'}(\mathbf{t})_r \geq \Omega_{r'}(\bar{\mathbf{t}})$ for all $r' \neq r$ (the two other districts), where $\bar{\mathbf{t}}$ is the vector of existing (status-quo) tariffs.

2. Choose to form a coalition with the district that gives r the highest utility level.

[13] We still assume that the region is part of a federation of regions, which means that tariff revenue is uniformly distributed across all residents, and aggregate market clearing conditions hold.

[14] The subscript ℓ is the index used to sum over regions.

The first stage of this problem can be described as follows. The agenda setter, district r, maximizes the Lagrangian $\mathcal{L}_r = \Omega_r(\mathbf{t_r})+\rho_{r'}[\Omega_{r'}(\mathbf{t}_r)-\Omega_{r'}(\overline{\mathbf{t}})]$ with respect to $\mathbf{t}_r$, where $\rho_{r'} \geq 0$ denotes the Lagrange multiplier for each $r' \neq r$. Specifically, $\rho_{r'} = \text{Max}\left[-\frac{\partial\Omega_r/\partial t_j}{\partial\Omega_{r'}/\partial t_j}, 0\right]$. At an interior solution, when the constraint is binding, the numerator and denominator have opposite signs: conceding a higher t_j to satisfy r' lowers r's welfare. The size of $\rho_{r'}$ depends on the rate of this trade-off at the constrained maximum. The solution to this problem gives the vector of specific tariffs that district r would propose to district r', and district r' would accept. For each $j = 1, \ldots, J$, the solution tariff, denoted by $t^{r'}_{jr}$, is given by

$$t^{r'}_{jr} = \frac{n}{-M'_j(t^{r'}_{jr})}\left[\frac{\Lambda^K_{jr}n^K_{jr}[q_{jr}(t^{r'}_{jr})/n^K_{jr}] + \rho_{r'}\Lambda^K_{r'j}n^K_{r'j}[(q_{jr'}(t^{r'}_{jr})/n^K_{jr'}]}{\Lambda^L_{0r}n^L_{0r} + \sum_m\sum_j \Lambda^m_{jr}n^m_{jr} + \rho_{r'}\left(\Lambda_{r'0}n^L_{r'0} + \sum_m\sum_j \Lambda^m_{jr'}n^m_{jr'}\right)} - \frac{Q_j(t^{r'}_{jr})}{n}\right].(24)$$

The latter expression can be rewritten as:

$$\begin{aligned} t^{r'}_{jr} &= \frac{n}{-M'_j(t^{r'}_{jr})}\left[\frac{\lambda_r(\lambda^K_{jr}/\lambda_r)[q_{jr}(t^{r'}_{jr})/n^K_{jr}] + \rho_{r'}\lambda_{r'}(\lambda^K_{r'j}/\lambda_{r'})[q_{jr'}(t^{r'}_{jr})/n^K_{r'j}]}{\lambda_r + \rho_{r'}\lambda_{r'}} - \frac{Q_j(t^{r'}_{jr})}{n}\right], \\ &= \frac{n}{-M'_j(t^{r'}_{jr})}\left[\alpha_r\frac{\lambda^K_{jr}}{\lambda_r}\frac{q_{jr}(t^{r'}_{jr})}{n^K_{jr}} + (1-\alpha_r)\frac{\lambda^K_{r'j}}{\lambda_{r'}}\frac{q_{r'j}(t^{r'}_{jr})}{n^K_{r'j}} - \frac{Q_j(t^{r'}_{jr})}{n}\right], \end{aligned} \tag{25}$$

where $\lambda^m_{jr} = \Lambda^m_{jr}n^m_{jr}$, $\lambda^m_{jr'} = \Lambda^m_{jr'}n^m_{jr'}$, $\lambda_r = \Lambda^L_{0r}n^L_{0r} + \sum_m\sum_i \Lambda^m_{ir}n^m_{ir}$, $\lambda_{r'} = \Lambda_{r'0}n^L_{r'0} + \sum_m\sum_i \Lambda^m_{r'i}n^m_{r'i}$, and $\alpha_r = \frac{\lambda_r}{\lambda_r+\rho_{r'}\lambda_{r'}}$.

Expression (27) can be rewritten in terms of ad-valorem tariffs $\tau^{r'}_{jr}/(1+\tau^{r'}_{jr}) = t^{r'}_{jr}/p_j$ as follows:

$$\frac{\tau^{r'}_{jr}}{1+\tau^{r'}_{jr}} = \frac{n}{-\epsilon_j(t^{r'}_{jr})M_j(t^{r'}_{jr})}\left[\alpha_r\frac{\lambda^K_{jr}}{\lambda_r}\frac{q_{jr}(t^{r'}_{jr})}{n^K_{jr}} + (1-\alpha_r)\frac{\lambda^K_{jr'}}{\lambda_{r'}}\frac{q_{jr'}(t^{r'}_{jr})}{n^K_{jr'}} - \frac{Q_j(t^{r'}_{jr})}{n}\right]. \tag{26}$$

3.2 An Example

Suppose the utility of a representative consumer in region r is given by $u = c_0+\sum_i(\psi_i c_i - c_i^2)$, with $\psi_i > p_i$ (for all p_i considered here).[15] This means that $d_i \equiv d_i(p_i) = \psi_i - p_i$, and $D_i = nd_i$. Then, consumer surplus is therefore given by $\phi = \sum_i(\psi_i - p_i)^2/2 = \sum_i d_i^2/2$. On the production side, each unit of the sector-specific factor produces σ_{ri} units of good i in region r. This means that $q_{ri} = \sigma_{ri}n^K_{ri}$, denotes production of good i in region r, and $Q_i = \sum_r q_{ri}$ aggregate production of good i. Note that production is completely inelastic in this case. Finally, let $t_i = p_i - \overline{p}_i$, (specific tariffs) and $M_i = D_i - Q_i$. Note that in this case $M'_i = D'_i = -n$, so that $\epsilon_i = M'_i(p_i/M_i) = -n(p_i/M_i)$. Total welfare in region r is Ω_r

[15] We adopt some of the same assumptions as in **?**.

$= \Omega_r^L + \Omega_r^K = \sum_i \Lambda_{ri}^L n_{ri}^L \omega_{ri}^L + \sum_i \Lambda_{ri}^K n_{ri}^K \omega_{ri}^K$, where

$$\omega_{ri}^L = \underbrace{1 + \sum_i \frac{d_i^2}{2}}_{\text{indirect utility}} + \underbrace{\frac{1}{n}\sum_i (p_i - \overline{p}_i)(D_i - Q_i)}_{\text{per cap tariff revenue}}, \quad \omega_{ri}^K = \underbrace{p_{ri}\sigma_{ri} + \sum_i \frac{d_i^2}{2}}_{\text{indirect utility}} + \underbrace{\frac{1}{n}\sum_i (p_i - \overline{p}_i)(D_i - Q_i)}_{\text{per cap tariff revenue}}.$$

The unconditional preferred tariff is, in this case,

$$t_{jr} = \frac{\lambda_{jr}^K}{\lambda_r}\sigma_{jr} - \sum_\ell \sigma_{\ell j}\frac{n_{\ell j}^K}{n},$$

where $\lambda_{jr}^K = \Lambda_{jr}^K n_{jr}^K$ is the aggregate welfare weight placed on special interests in district r, and $\lambda_r = \Lambda_{0r}^L n_{0r}^L + \sum_m \sum_j \Lambda_{jr}^m n_{jr}^m$ is the aggregate welfare weight on the district r's population, and $m \in \{L, K\}$.

The conditional preferred tariff is given by

$$t_{jr}^{r'} \quad = \quad \alpha_r \frac{\lambda_{jr}^K}{\lambda_r}\sigma_{jr} + (1-\alpha_r)\frac{\lambda_{r'j}^K}{\lambda_{r'}}\sigma_{r'j} - \sum_\ell \sigma_{\ell j}\frac{n_{\ell j K}}{n}. \tag{27}$$

Note that (27) can therefore be expressed as

$$t_{jr}^{r'} \quad = \quad \alpha_r t_{jr} + (1-\alpha_r)t_{jr'}. \tag{28}$$

3.3 Extension: $r > 3$

The form of the solution in equation (30) generalizes to more than three districts. The characterization of the solution, however, gets more complicated as the number of districts R increases. This is because both the number of goods J and their regional distribution matter as well.

Consider an economy with R districts (with R assumed to be an odd number), one of which, district r, is the agenda setter. District r seeks to form a minimum winning coalition of $(R+1)/2$ members by proposing a tariff vector to the other districts. We denote by $\mathscr{C}_r$ the set of minimum winning coalitions that would allow district r to achieve a majority.[16]

In the first step, for each coalition $C_r \in \mathscr{C}_r$, the agenda setter r computes the vector of tariffs $\boldsymbol{\tau}_r^{C_r}$ that would satisfy districts in the coalition. In other words, the tariff vector $\boldsymbol{\tau}_r^{C_r}$ would offer those in the coalition a utility that is as large as what they can get in the status quo. The solution to this first step problem is basically an extension of (30): $\boldsymbol{\tau}_r^{C_r}$ is

[16]The agenda setter needs $(R-1)/2$ additional districts in order to form a majority. The set of $\mathscr{C}_r$ would therefore contain $\frac{(R-1)!}{\{[(R-1)/2]!\}^2} = \frac{\Gamma[R]}{\Gamma[(1+R)/2]^2}$ different coalitions, where $\Gamma[x] = (x-1)!$.

a convex combination of the preferred tariffs of the districts in the coalition:

$$\frac{\tau_{jr}^{C_r}}{1+\tau_{jr}^{C_r}} = \sum_{\iota \in C_r} \alpha_\iota \frac{\tau_{j\iota}}{1+\tau_{j\iota}}, \quad \text{for each } C_r \in \mathscr{C}_r, \tag{29}$$

where $\tau_{j\iota}$ is the preferred tariff of region ι for good j, $0 \leq \alpha_\iota \leq 1$ and $\sum_{\iota \in C_r} \alpha_\iota = 1$.

In the second step, the agenda-setter representing r can always remain in the status quo, or choose a coalition C_r that gives r the highest utility, conditional on r getting a utility level greater that the status quo. To the extent that the agenda setter is able to form a coalition that gives all members in the coalition a utility that is at least as high as the status quo, the solution tariff would look like (31).

3.4 Extension: $r > 3$

As shown in the previous section, the ad-valorem tariff on good j proposed by district-r agenda setter to (the representative of) district r' that would be accepted by r', is given by

$$\frac{\tau_{jr}^{r'}}{1+\tau_{jr}^{r'}} = \alpha_r \frac{\tau_{jr}}{1+\tau_{jr}} + (1-\alpha_r)\frac{\tau_{jr'}}{1+\tau_{jr'}}, \tag{30}$$

where τ_{jr} and $\tau_{jr'}$ are the unconstrained choices of districts r and r', respectively. The form of the solution in equation (30), however, generalizes to more than three districts. The characterization of the solution, however, gets more complicated as the number of districts R increases. This is because both the number of goods J and their regional distribution matter as well.

Consider an economy with R districts (with R assumed to be an odd number), one of which, district r, is the agenda setter. District r seeks to form a minimum winning coalition of $(R+1)/2$ members by proposing a tariff vector to the other districts. We denote by $\mathscr{C}_r$ the set of minimum winning coalitions that would allow district r to achieve a majority.[17]

In the first step, for each coalition $C_r \in \mathscr{C}_r$, the agenda setter r computes the vector of tariffs $\boldsymbol{\tau}_r^{C_r}$ that would satisfy districts in the coalition. In other words, the tariff vector $\boldsymbol{\tau}_r^{C_r}$ would offer those in the coalition a utility that is as large as what they can get in the status quo. The solution to this first step problem is basically an extension of (30): $\boldsymbol{\tau}_r^{C_r}$ is a convex combination of the preferred tariffs of the districts in the coalition:

$$\frac{\tau_{jr}^{C_r}}{1+\tau_{jr}^{C_r}} = \sum_{\iota \in C_r} \alpha_\iota \frac{\tau_{j\iota}}{1+\tau_{j\iota}}, \quad \text{for each } C_r \in \mathscr{C}_r, \tag{31}$$

[17] The agenda setter needs $(R-1)/2$ additional districts in order to form a majority. The set of $\mathscr{C}_r$ would therefore contain $\frac{(R-1)!}{\{[(R-1)/2]!\}^2} = \frac{\Gamma[R]}{\Gamma[(1+R)/2]^2}$ different coalitions, where $\Gamma[x] = (x-1)!$.

where $\tau_{j\iota}$ is the preferred tariff of region ι for good j, $0 \leq \alpha_\iota \leq 1$ and $\sum_{\iota \in C_r} \alpha_\iota = 1$.

In the second step, the agenda-setter representing r can always remain in the status quo, or choose a coalition C_r that gives r the highest utility, conditional on r getting a utility level greater that the status quo. To the extent that the agenda setter is able to form a coalition that gives all members in the coalition a utility that is at least as high as the status quo, the solution tariff would look like (31).

Appendix C – Congressional District Data

Employment Data

Source: Bureau of Labor Statistics. **File names:** 2002_qtrly_by_industry

Data Source: BLS Employment Data

1. Employment by State S and industry IND (E^S_{IND}).
2. Employment by State S for all the manufacturing sector (E^S_{MANUF}).
3. Employment by County C and industry IND (E^C_{IND}): there are non-disclosed observations at this level; however, these values represent a small proportion of total observations (less than 17% of the data).
4. Despite data being reported at the state level, there are a number of non-disclosed observations. In some instances, we use data available at the county level to impute the aggregate as follows:
   (a) Output per worker: $\bar{A}_i = \frac{Employment_i}{RealSectoralOutput_i}$,
   (b) Re-scaled output per worker: $A_i = n\frac{A_{ind}}{\sum_{ind \in I} \bar{A}_{ind}}$.

GDP Data

Source: Bureau of Economic Analysis (BEA). **Files names:** SAGDP2N and CAGDP2

Data Source: BEA Output Data

1. GDP by State S and industry IND, for all industries (Y^S_{IND}): these data are dissaggregated for most industries, except for $Y^S_{311-312} = Y^S_{311} + Y^S_{312}$; $Y^S_{313-314} = Y^S_{313} + Y^S_{314}$; and $Y^S_{315-316} = Y^S_{315} + Y^S_{316}$.
   We impute Y^S_{311}, Y^S_{312}, Y^S_{313}, Y^S_{314}, Y^S_{315}, Y^S_{316}, as follows:
   (a) Estimate weights using employment data calculated above:
   $\phi^S_{311} = \frac{N^S_{311}}{N^S_{311}+N^S_{312}}$; $\phi^S_{312} = \frac{N^S_{312}}{N^S_{311}+N^S_{312}}$; $\phi^S_{313} = \frac{N^S_{313}}{N^S_{313}+N^S_{314}}$; $\phi^S_{314} = \frac{N^S_{314}}{N^S_{313}+N^S_{314}}$; $\phi^S_{315} = \frac{N^S_{315}}{N^S_{315}+N^S_{316}}$; and $\phi^S_{316} = \frac{N^S_{316}}{N^S_{315}+N^S_{316}}$
   (b) Calculate Y^S_{311}, Y^S_{312}, Y^S_{313}, Y^S_{314}, Y^S_{315} and Y^S_{316} as:
   $Y^S_{311} = \phi^S_{311} * Y^S_{311-312}$; $Y^S_{312} = \phi^S_{312} * Y^S_{311-312}$; $Y^S_{313} = \phi^S_{313} * Y^S_{313-314}$; $Y^S_{314} = \phi^S_{314} * Y^S_{313-314}$; $Y^S_{315} = \phi^S_{315} * Y^S_{315-316}$; and $Y^S_{316} = \phi^S_{316} * Y^S_{315-316}$
2. GDP by county C and industry IND (Y^C_{IND}): In contrast to state level data, county GDP data are only available at the aggregated level of total manufacturing (and also durables, and non-durables). We construct Y^C_{IND} as follows:
   Calculate employment weights: $\phi^C_{31} = \frac{N^C_{31}}{N^C_{31}+N^C_{32}+N^C_{33}}$; $\phi^C_{32} = \frac{N^C_{32}}{N^C_{31}+N^C_{32}+N^C_{33}}$; $\phi^C_{33} = \frac{N^C_{33}}{N^C_{31}+N^C_{32}+N^C_{33}}$, and impute $Y^C_{31} = \phi^C_{31} * Y^C_{Manuf}$; $Y^C_{32} = \phi^C_{32} * Y^C_{Manuf}$; $Y^C_{33} = \phi^C_{33} * Y^C_{Manuf}$.
   We proceed similarly to construct each Y^C_{IND}.