Voting, lobbying, and trade policy
A structural estimation framework

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Abstract

Political economy explanations of the politics of trade argue that policy-makers are politically motivated, and choose trade policy in response to the demands by voters and privileged groups most affected by trade flows. Empirical approaches often rely on reduced-form estimates of parameters derived from different variants of traditional political economy models of trade to explain the influence of winners and losers from trade on the formation of trade policy. Yet there is an important mismatch between theoretical and empirical contributions, which is reflected in our inability to reconcile a strong empirical regularity: a lack of correspondence between legislative voting patterns on trade policy and district level predictors of trade policy stance, as reflected in the political backlash to the China-shock. In this paper we take a first stab at a framework linking theory and empirics: we develop a structural estimation of a formal model inspired by the Grossman and Helpman's (GH) model of trade politics. Our modeling strategy differs from GH in a fundamental way: we model the vector of tariffs that would be chosen by a local decision-maker representing a district (or region) within a larger polity populated by numerous regions. We are, thus, able to compare the vector of tariffs enacted by a central planner from the solution that would be preferred by the local decision-maker. Ultimately the policy enacted will reflect the implicit weights that reflect the preference aggregation protocol resulting from the institutional structure in the polity. Using data for the 435 Congressional districts in the U.S. and the vector of sectoral tariffs enacted by Congress, we are able to estimate the implicit weights placed by the federal government on different actors, sectors and regions. We are also able to document sizable differences between the legislated tariffs and the implicit demand for protection at the Congressional District level.

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1 Introduction

Political economy explanations of trade politics posit that policy-makers are politically motivated and grant protection in response to demands by voters and privileged groups most affected by trade. Empirical contributions in the *endogenous tariff* tradition have relied on reduced-form estimates of parameters, derived formally or informally from canonical political economy models of trade to explain the relative influence of winners and losers from trade on the formation of trade policy. Recent developments in trade theory suggest that free trade is likely to benefit broader segments of the electorate and highly productive firms. A new body of empirical literature incorporating these insights has followed. Yet most of the empirical approaches, old and new, cannot explain a strong empirical regularity: a mismatch between legislative voting patterns on trade policy and district level predictors of trade policy stance, which as been reflected in political backslash against trade and globalization. We argue that this mismatch reflects our partial understanding of trade politics and suggest that, with rare exceptions, the empirical exercises to date do not put enough theoretical capital on the line.

In this paper we take a first stab at framework linking theory and empirics by developing a structural estimation of a formal framework of the political economy of trade. Our framework is based on the ubiquitous Grossman and Helpman (1996) model (henceforth GH) of trade politics.[1] We depart from GH in a fundamental way: given that the authority to enact trade policy in the U.S. resides in Congress we develop our version of the political economy model of trade by building up from a decision-maker representing a district (or region) within a larger polity populated by numerous decision-makers (legislators) from different regions whose acquiescence is required to enact trade policy. While in the GH model a centralized decision-maker (a central planner choosing the optimal level of protection in Grossman and Helpman (1994), or parties choosing trade policy platforms

[1] See also Grossman and Helpman (1994).

in Grossman and Helpman (1994)) chooses the policy that maximizes an aggregate welfare function in the shadow of campaign contributions and voter backlash, in our model the decision-making process includes the participation of district representatives in the legislature. These representatives are (at least partially) responsible of choosing and enacting a vector of tariffs, which they choose to earn the support of economic actors operating in different sectors of the economy in their districts whose wellbeing is affected positively or negatively by free trade, without internalizing the impact of the tariff on other districts. Yet individual legislators cannot adopt their district's preferred vector of tariffs; they need to coalesce with other legislators to form a legislative majority that would enact sectoral tariffs that apply to all regions in the country. Ultimately the trade policy enacted will reflect the implicit weights that reflect the preference aggregation protocol that results from institutional structure in the polity. Our setup allows for a comparison between the vector of tariffs enacted by a centralized policymaker from the solution that would be preferred by a local decision-maker. We are also able to estimate the mismatch between the latent demand for protection across sectors and Congressional districts and the observed tariffs and non-tariff measures.

Using data from the U.S. mapped at the legislative district level we structurally estimate a general version of our model of the political economy of trade. We derive the implied weights on districts and sectors of the economy that can be retrieved from the observed pattern of protection in the U.S.. Our theoretical lens helps reconcile the mapping from district level demands and policy outcomes and provides important insights to understanding the determinants of trade policy over the many decades, including the political consequences of the China shock. Once calibrated, the model allows us to derive analytical predictions of trade policy choices under different institutional settings and construct counterfactual scenarios of based on different aggregations of political and economic geography. The setup can be extended to assess the expected impact party competition, electoral dynamics, economic shocks, and lobbying by organized interests.

2 Motivation

Adam Smith warned that when making trade policy "The legislature, were it possible that its deliberations could be always directed, not by the clamorous importunity of partial interests, but by an extensive view of the general good" Smith (1776, p. 472). The perception that government agents are beholden to special interests, to the detriment of the well-being of the general public, is problematic as it undermines the confidence democratic institutions. The backlash against political elites in Europe and the Americas in recent electoral cycles is a reflection of this trend. The backlash has been fueled by the belief that catering to demands from privileged groups and the influence of lobbying by large corporations are reflected in trade policies that result in unemployment, wage loss and growing inequality.

In developed countries rising economic integration with the global South (the *China shock*) has coincided with falling relative wages of less skilled workers and a sharp drop in manufacturing employment. There is some evidence suggesting that the drop in the demand for unskilled labor in the U.S. can be partially attributed to trade with China and other emerging countries (Autor et al. (2015)). We have learned that large and productive firms have preferences for opening up foreign markets ((Kim, 2017, Osgood, 2016)), yet we lack conclusive evidence linking trade liberalization to lobbying activities by concentrated economic interests. In fact, recent empirical analyses on firm lobbying in the U.S. suggest that this is not necessarily the case. There is systematic evidence that few firms lobby; that larger firms are more likely to lobby; and that lobbying is persistent over time (see Kerr et al. (2014). Moreover, when looking at lobbying on trade policy, Bombardini (2008) finds that there is no lobbying by firms below a size threshold (usually populated by less productive firms which only serve the local market); above this threshold lobbying activity (i.e., participation in lobbying) scales with size, but at at a decreasing rate Bombardini (2008, p. 339). Bombardini (2008) also uncovers two important results that cast doubt on received wisdom about the direct mapping from lobbying to trade policy outcomes: first, the marginal effect of firm size on lobbying expenditure is low; and second, a sizable number of large firms do not make contributions at all Bombardini (2008, p. 339). This finding that lobbying expenditures are small relative to size of the contributing firms and relative to the expected benefits accruing to those firms has been documented for other issue areas by Ansolabehere et al. (2003).[2] As Bombardini (2008) eloquently puts it: "Although participation is correlated with size, some large firms do not contribute. More work is needed to determine whether these large firms participate in political activity through channels other than PAC contributions or they do not participate at all (and why)." (Bombardini (2008, p. 339).)

Anecdotal evidence suggests that the Supreme Court decision on the 2010 *Citizens United v. Federal Election Commission* case has had an important impact in the amount of political contributions to parties and political action committees by U.S. corporations. Yet we do not have systematic evidence suggesting that the pattern of "missing lobbying" documented in earlier literature, has changed dramatically since this ruling. This conclusion does not imply that lobbying has no impact on trade policy; on the contrary, large and highly productive firms are likely to get their way. At times those lobbying efforts align with district level interests, such as consumers of intermediate and final goods, pushing for trade liberalization. Other times firms and economic agents in import competing sectors in the district organize in groups to lobby for protection. We argue that in order to understand the role of lobbying, voting and other forms of political influence on trade policy outcomes we need to model the incentive structure faced by policy-makers, which includes catering to voters, raking up campaign contributions, and responding to party leaders and coalition partners. In the end trade policy will reflect the choices made by legislators and the executive, which are a function of the regional distribution of economic

[2]Given these results, Ansolabehere et al. (2003) argue that "... campaign contributions should be viewed primarily as a type of consumption good, rather than as a market for buying political benefits.

activity, electoral institutions, political and personal motivations.

3 Our contribution

There is now a vast body of theoretical and empirical work on the political economy of trade that could help dispel conventional wisdom about the dominant role of lobbying. On theory, there is a broad agreement on a framework built around Hilman's *political support function*.[3] The workhorse model in this tradition was developed by Grossman and Helpman (1994). Yet with rare exceptions (Goldberg and Maggi (1999); Gawande and Bandyopadhyay (2000)), empirical work in the "old" endogenous tariff formation or in the "new" heterogeneous firms traditions rely on reduced-form estimation of hypotheses derived formally or informally. In most cases, comparative statics exercises derive predictions from those model, which are subjected to an empirical tests. The aim of the test is to accept or reject the predictions from the model. In the process we have accumulated a body of fairly consistent regularities: namely that special interests matter (Caves (1976); Baldwin 1985; Trefler (1993); business cycles and changing market conditions matter (Bohara and Kaempfer 1991;Lohmann and O'Halloran (1994)); geographic concentration and dispersion of industries matters (McGillivray 2004); that industry size matters (Caves 1976; Mansfield and Busch (1995)); that electoral institutions and other political incentives matter (Dutt and Mitra (2002), Rogowski and Kayser (2002), Park and Jensen (2007)); and that firm size and productivity matter (Osgood (2016), Baccini et al. (2017), Kim (2017)).[4]

Empirical research is extremely valuable, but appears to have a one-sided benefit: while we keep adding new findings that leave us with more questions than answers, it is still unclear how we can reconcile these findings under a common theoretical framework,

[3]See Hillman (1982).

[4]See also Baldwin (1985), Lee and Swagel (1997), McGillivray (2004).

to falsify an existing theory, or help develop a new theory motivated by the empirical findings. We can draw a sharp contrast with trade theory: the *gravity model* of trade, which has been pervasively used in international economics and politics, has been expanded to account for empirical "regularities" and has resulted is new predictions grounded in theory (Eaton and Kortum, 2002, Eaton et al., 2011). This interaction between theory and empirics, where theory provides theoretical foundations to empirical research, and empirics informs further theoretical refinements, could serve as a model for the development of the positive political economy of trade. The objective is to develop a unified framework for understanding the politics of trade, where empirical research puts theoretical capital on the line. The exercise aims at estimating rather than testing parameters of interest, and identifying the scope conditions under which different theoretical predictions hold, and where they are more likely to fail.

In this paper we take a first stab at the enterprise of linking theory and empirics by developing a structural estimation framework of the politics of trade politics. The model describes an economy populated by individuals endowed with labor and shares of sector specific capital; the sectors are distributed across regions, which can represent individual or groupings of Congressional Districts. Labor is mobile across sectors within the region or district; capital is specific to a sector and district. Changing prices through raising or lowering tariffs impacts production and consumption, and hence the well-being of actors depending on their endowment of labor and specific capital. Policymakers choose trade policy (a vector of tariffs) to maximize well-being of their constituencies. The general version of the model includes voters and lobbyists who may enter with different weights in the objective function of the policymaker. In the structural estimation we start with a parsed down version of the model of trade politics, where lobbying is not present and legislators choose the tariff vector that maximizes aggregate welfare in their own district. This, in turn, depends on the distribution of economic activity across regions and on the weights the local decision-maker places on winners and losers from trade, which will vary depending on the political agents allegiance to workers, capitalists, specific industries or economic actors depending on the assumed underlying model of trade.

In the ensuing sections we discuss our political economy model of trade, characterize the optimal tariffs derived from the model, and present a strategy for structurally estimating the parameters from those solutions. We focus in two particular cases: first, we present the solution where the central planner responds to weights across all sectors and all regions of the economy. Next, we characterize the tariff profile preferred by representatives of Congressional districts, which may not coincide with the solution enacted by a centralized planner as assumed in extant models of the PE of trade. The vector of tariffs depends on the regional allocation of sectoral activity, the weights districts place on different groups of individuals, and the process aggregating local preferences to national policy, all of which result from political economy considerations. While Congress has delegated trade promotion authority to the Executive, the negotiated external tariffs are subject to an up and down vote, and hence likely to reflect local weights to muster sufficient support from a majority of representatives in Congress. With this setup we are also able to characterize the vector of sectoral non-tariff measures (NTMs) which are enacted under a different institutional and preference aggregation protocol: they result from statutory authority delegated by Congress to the Executive, and they are more likely to reflect the weights placed by the President on different sectors, regions and districts in the shadow of Congressional oversight (Destler, 2005).

4 Our Model

The model, presented in full in the Appendix, describes an economy populated by two groups of individuals: one group endowed with labor, and the other with sector specific capital. The production of different goods is geographically dispersed, so sectors are distributed across regions. We characterize the sectoral tariff preferred by a policy-maker representing a particular region, and contrast this solution to the sectoral tariff that would be enacted by a policy-maker who maximizes the welfare of the whole economy, *the centralized solution*. In the model the weights that the central decision-maker places on different regions, sectors or groups can vary; the weights that the local decision-maker places on groups of individuals or sectors within the region can also vary and may differ from those considered in the centralized solution. As a result, the tariffs preferred by a representative depend on the weights placed on different actors within a region. The actual observed tariffs also varies depending on the protocol for preference aggregation across regions.

Framework

We can think about the trade policy in our model as the result of a two-stage political process. Stage two is played out in the legislature where representatives of R districts form coalitions and come to a bargain about national tariffs on J sectors. Stage 1 determines the tariff preferences (a J-vector of tariffs) for each district r. The R representatives of the districts take these preferences to the second stage. In this way, our model accurately portrays the institutional setting in which U.S. trade policy is legislated (Destler, 2005).

A district's trade policy preferences are determined by a specific-factors trade model. Districts are indexed by r and sectors by j. The population of district r consists of two types of agents: workers who own labor (L) and owners of sector-specific capital (K). We will index the two classes of factor owners with $m = L, K$. Agents are immobile across districts or regions. Within a region, workers are mobile across sectors, but capital is sector-specific and immobile. Workers are abundant and wage-takers. All workers own one unit of labor l_r and all capitalists own one unit of specific factor k_{jr}. Sector j in district r employs n_{jr}^K capital owners and n_{jr}^L workers. The population of region r, $n_r = n_r^K + n_r^L = \sum_{j=1}^{J}(n_{jr}^K + n_{jr}^L)$. Note that not all sectors are necessarily active in district

r.

Goods are mobile across the country, with no transport cost, so their prices are determined by national demand and supply. In district r, output in the numeraire sector, *sector 0*, is produced using only labor with linear technology, $q_{0r} = w_{0r}\ell_{0r}$ where $(w_{0r} > 0)$. The unit of output is chosen such that the price p_0 equals 1. District r workers employed in *sector 0* therefore receive wage w_{0r}. Prices in the other non-numerarire J sectors are expressed in these units. Output in sector j is produced with CRS technology. In district r this technology combines labor ℓ_{rj} and (a fixed amount of) sector specific capital k_{rj}. Specific capital earns $\pi_{rj}(p_j)$ while labor, being abundant and perfectly mobile across sectors, earns the numeraire wage w_{0r}. The domestic output of sector j in district r is $q_{rj} = \pi'_{rj}(p_j)$.

Individuals (agents) have homogeneous tastes, given by quasi-linear utility functions $U = x_0 + \sum_{j=0}^{J} u_j(x_j)$. Solving the first order condition $-p_j + u'_j(x_j) = 0$ results in (separable) demand functions $x_j = d(p_j)$. Indirect utility for an agent spending E on consumption is $E + \sum_j \phi_j(p_j)$, where $\phi_j(p_j) = d_j(p_j) - p_j.d_j(p_j)$ is the agent's consumer surplus from consuming good j.[5]

The only policy instrument we consider are import tariffs t_j.[6] Suppose the national demand for good j is $D_j(p_j) = nd_j(p_j)$, where n is the country's population. The national revenue from the import tariffs are $T = \sum(p_j - p^*)[D_j(p_j) - \sum_r q_{rj}(p_j)] = \sum(p_j - p^*)[M_j(p_j)]$, where $M_j(p_j)$ is sector j's import demand function and p^* is the world price.[7]

The higher is p_j, the greater the returns to specific capital in j. Therefore, it is in

[5] We dropped the index r on the demand functions because demand by agents do not change across districts (since prices are nationally determined). The basket of goods consumed by the two groups may differ. We can model heterogeneous tastes for the two classes of agents using utilities $U^m = x_0^m + \sum_{j=0}^{J} u_j^m(x_j^m)$, where m indexes owners of labor and owners of capital $m = \{L, K\}$. These yield demand functions $x_j^m = d_j^m(p_j)$ and consumer surplus $\sum_j \phi_j^m(p_j) = \sum_j [d_j^m(p_j) - p_j d_j^m(p_j)]$, $m = L, K$.

[6] As in Grossman and Helpman (1994), the model can be extended to import subsidies, export taxes and export subsidies.

[7] We adopt the small country assumption so the effect of the tariff is to raise domestic price above the world price by the amount of the tariff. Relaxing this assumption could result in higher tariffs exploiting terms of trade effects.

the interest of j-specific capital to demand for protection to raise p_j. So far, the model follows the framework of Grossman and Helpman (1994). In the Grossman and Helpman (1994) model, owners of specific factors organize into lobbies for the purpose of influencing government to bend trade policy in their favor. A strong assumption of the model is the government is a unitary agency, capable on its own of supplying trade policy. The amount of distortion its policy introduces is determined by balancing the cost (welfare losses to its citizens) with benefits (contributions it receives from lobbies). Government's objective function $aW + C$, where W is societal welfare and C are campaign contributions, determines the rate a at which the government trades welfare for contribution dollars. A high a indicates a government that is welfare-oriented and hard for lobbies to entice. A low a indicates a government that will cheaply deviate from free trade (See Appendix).

Our model diverges from the Grossman and Helpman (1994) from this point. Heterogeneity in production across regions imply heterogeneity in districts' demands for tariffs $\mathbf{t}_r$, $r = 1, \ldots, R$, where $\mathbf{t}_r$ is the preferred tariff vector in district r. If, for example, district r produces nothing except good j, and faces import competition, owners of j-specific capital will demand a high tariff t_{rj} on imports of j, which need not internalize the loss in consumer surplus in other districts. Elected representatives from each district take their preferences to Congress where they form coalitions and bargain to determine the national trade policy $\mathbf{t}$. Therefore the determination of tariffs can be thought of as taking place in two stages. In the first stage each district's tariff preference is determined. In the second stage the national tariffs are determined by legislative bargaining. We do not explicitly model the electoral competition in the first stage nor the formation of winning coalitions in legislature in the second stage; we leave this for future extensions of the framework. We view our paper as providing guidance to structural research on both these fronts with our findings.[8] We adopt a political objective function that is a weighted sum of individuals' utility. In the Grossman and Helpman (1994) framework, welfare of citizens is weighted

[8] Grossman and Helpman (1994) exemplifies a first-stage model of electoral competition.

by a, and the welfare of specific factor owners who politically organize to lobby the government earns a weight $a + 1$. In this version of the framework we are agnostic about the process that determines these relative weights on different classes of factor owners. They may be due to quid pro quo contributions, or to the lobbying prowess of specific factor owners in communicating information to politicians, to an institutional bias that makes it hard to change a historical status quo, or to ideological bias of the electorate or the representatives. What is important is that we introduce general heterogeneity in weights across classes of factor owners not just across districts, but also within districts across sectors. So a sector in which many capital owners employ their specific capital can be more politically influential than a sector that employs specific capital of a few capital owners. Concern for consumers in a district results in a larger weight placed on their welfare than on the welfare in another district. All else held constant, the former district will not demand a higher tariff in any sector than the latter district. Once these weights are assigned, a local "decision-maker" maximizes the district's objective function and determines the tariff preference of the district. In the second stage, tariffs are determined. In Section D in the Appendix, we present an extension of our setup incorporating lobbying à la Grossman and Helpman (1994).

District-Specific Tariff Preferences

Total welfare in region r is defined as a weighted sum of individual utility. This utility depends on income, which is the sum of the returns to the production factors owned by each individual (wages earned by labor and profits earned by specific capital), plus tariff revenue per capita, and by consumer surplus. Since we assume, at least initially, that owners of labor and owners of capital have the same utility function and since tariff revenues are equally distributed, actors only differ in their returns. Aggregate welfare at the district level requires weighting the well-being of each individual in the district.

We differentiate welfare weights by district, by sector, and by the two groups of factor owners: in district r, labor employed in sector j gets welfare weight Λ^L_{jr}, and specific capital employed in sector j gets welfare weight Λ^K_{jr}. Therefore, district r's aggregate welfare is

$$\Omega_r \;=\; \sum_j \Lambda^L_{jr} W^L_{jr} + \sum_j \Lambda^K_{jr} W^K_{jr},$$

where W^L_{jr} and W^K_{jr} depend on domestic prices $\mathbf{p}_r$. Since there is a one-to-one relationship between the tariff t_j and price p_j (the world price is exogenously determined), aggregate welfare for the two classes are fully functions of tariffs $\mathbf{t}_r$. Recall that this first stage determines not the national tariffs, but each district's preferred tariffs, $\mathbf{t}_r$. A "decision maker" who cares only about the welfare of agents in district r, Ω_r, maximizes this welfare to determine the district's preferred tariff vector. At the second stage, the decision maker from district r represents these preferences in the legislature and tries to build coalitions that will legislate a national tariff as close as possible to district r's preference. Breaking down welfare into the sum of its three components yields

$$\Omega_r \;=\; \sum_j \Lambda^L_{jr} n^L_{jr} \left(w_{0r} + \frac{T}{n} + \phi \right) + \sum_j \Lambda^K_{jr} n^K_{jr} \left(\frac{\pi_{jr}}{n^K_{jr}} + \frac{T}{n} + \phi \right) \tag{1}$$

On the right-hand side of (1), T/n is per capita tariff revenue, and $\phi = \sum_j \phi_j$ is per capita consumer surplus. The first expression weights the sum of per capita wage, tariff revenue and consumer surplus to arrive at the aggregate welfare of owners of labor residing in district r. The weights are the product of Λ^L_{jr}, the welfare weights that the district r planner assigns to each individual worker employed in sector j, and the number of district r workers employed in sector j, n_{jr}. The second expression is different in the first component, the per capita returns to owners of sector j-specific capital, π_{jr}/n^K_{jr}. The sum of the three components is aggregated using the weights $\Lambda^K_{jr} n^K_{jr}$ to obtain the welfare of district r's specific-capital owners.[9]

Noting that T, ϕ and π_{jr} are functions of tariffs $\mathbf{t}_r$, the tariffs preferred by district r are obtained by maximizing (1). As derived in detail in the Appendix, district r's preferred tariff on imports of good j is

$$\begin{aligned} t_{jr} &= -\frac{n}{M_j'}\left[\frac{\Lambda_{jr}^K n_{jr}^K}{\sum_j\left(\Lambda_{jr}^K n_{jr}^K+\Lambda_{jr}^L n_{jr}^L\right)}\left(\frac{q_{jr}}{n_{jr}^K}\right)-\frac{D_j}{n}+\frac{M_j}{n}\right] \\ &= -\frac{n}{M_j'}\left[\underbrace{\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\left(\frac{q_{jr}}{n_{jr}^K}\right)}_{(i)}-\underbrace{\frac{D_j}{n}}_{(ii)}+\underbrace{\frac{M_j}{n}}_{(iii)}\right], \quad j=1,\ldots,J, r=1,\ldots,R, \end{aligned} \tag{2}$$

where $\lambda_r=\sum_j\left(\Lambda_{jr}^K n_{jr}^K+\Lambda_{jr}^L n_{jr}^L\right)$ is the aggregate welfare weight on residents of district r, D_j/n is per capita demand for good j, and M_j/n is per capita imports of good j. The expression captures both producer and consumer interests.

The term (i) in expression (2) indicates that the tariff would increase with output through the tariff's positive impact on profits.[10] The term (ii) indicates the tariff declines with demand through the tariff's negative impact on consumer surplus. And the term (iii) indicates that the tariff increases with imports through it's impact on tariff revenue which is redistributed in a lump-sum way to domestic residents.[11]

[9]The Grossman and Helpman (1994) model may be viewed as a special case of this model with $\Lambda_{jr}^L=a$ and $\Lambda_{jr}^K=\mathbf{1}_j+a$, where $\mathbf{1}_j$ is an indicator function which is equal to 1 if sector j is politically organized to lobby, and 0 otherwise, and a is the weight on (a dollar of) welfare relative to (a dollar of) contributions in the government's political objective function $aW+C$.

[10]By the envelope theorem the derivative of profits with respect to price is output, and term (i) reflects this impact of the tariff on returns to owners of specific capital. On the other hand, since labor is perfectly mobile across sectors within region r, $w_{0r}=w_{jr}$ for all j in region r, where w_{0r} determined by labor's productivity in the numeraire sector. A change in the price of j through a tariff t_j do not effect labor income.

[11]If preferences between the two classes of factor owners are heterogeneous,

$$t_{jr}=-\frac{n}{M_j'}\left[\underbrace{\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\left(\frac{q_{jr}}{n_{jr}^K}\right)}_{(1)}-\underbrace{\frac{\lambda_r^L}{\lambda_r}\left(\frac{D_j^L}{n^L}\right)-\frac{\lambda_r^K}{\lambda_r}\left(\frac{D_j^K}{n^K}\right)}_{(2)}+\underbrace{\frac{M_j}{n}}_{(3)}\right],$$

We can rewrite expression (2) using good j's import demand elasticity, which will aid in our estimation of the model parameters, as:

$$t_{jr} = \frac{\Lambda^K_{jr} n^K_{jr}}{\lambda_r} . \frac{n}{n^K_{jr}} . \left(\frac{q_{jr}/M_j}{-\epsilon_j} \right) - \left(\frac{D_j/M_j}{-\epsilon_j} \right) + \frac{1}{-\epsilon_j}, \tag{3}$$

National Tariffs

National tariffs are set by maximizing national welfare

$$\Omega \quad = \quad \sum_r \sum_j \Gamma^K_{jr} W^K_{jr} + \sum_r \sum_j \Gamma^L_{jr} W^L_{jr}. \tag{4}$$

This is different from maximizing the sum across regions of Ω_r since the weights Γ^K_{jr} and Γ^L_{jr} can be different from the weights Λ^K_{jr} and Λ^L_{jr} used earlier to determine district r's preferred tariffs. Heterogeneity in production and factor ownership across regions results in different tariff preferences. A district producing much of the nation's iron and steel, but little else will want protection from import competition on steel and no tariffs on other goods that its residents consume. More diversified districts will have tariff preferences spread over many sectors j, depending on the distribution of factor owners in the district. National tariffs aggregate these preferences in a way that is impossible to satisfy every district, or even most districts. At this second stage, a representative from district r seeks to join coalitions of like-minded representatives; with log-rolling she may even join coalitions with unlike-minded representatives seeking to trade across issues, in this case,

where D^m_j / n^m is per capita demand for good j by agent in class $m = \{L, K\}$, nationally, and M_j/n is per capita imports of good j nationally. The counterpart to (3) with heterogeneous preferences is

$$t_{jr} = \frac{\Lambda^K_{jr} n^K_{jr}}{\lambda_r} . \frac{n}{n^K_{jr}} . \frac{(q_{jr}/M_j)}{-\epsilon_j} - \frac{\lambda^L_r}{\lambda_r} \frac{n}{n^L} \frac{(D^L_j/M_j)}{-\epsilon_j} - \frac{\lambda^K_r}{\lambda_r} \frac{n}{n^K} \frac{(D^K_j/M_j)}{-\epsilon_j} + \frac{1}{-\epsilon_j},$$

where $\lambda^L_r = \sum_{j=1}^J \Lambda^L_{jr} n^L_{jr}$, $\lambda^L_r = \sum_{j=1}^J \Lambda^L_{jr} n^L_{jr}$ denote the aggregate weights given to the two classes of factor owners in region r, and the total weight for all agents in district r is $\lambda_r = \lambda^K_r + \lambda^L_r$.

give in on trade under the tacit understanding that the coalition give in to her preference on a non-trade issue.

The literature on legislative bargaining is large and growing and we contribute to the direction of its growth by estimating and revealing what these preference parameters look like, in the context of the US trade policy. We are agnostic about the specific process by which coalitions form; we leave these for future extensions of the model and estimations. Our focus is to reveal the relative weights each district's factor ownership was able to earn from such bargaining. Winning coalitions won tariffs, losing coalitions did not. Who were they? What did they win? Did the national tariffs satisfy their districts' tariff preferences? These are the questions that are of interest in this paper and for which we can provide some tentative answers.

The national tariff for each sector j, derived in the Appendix, is[12]

$$\begin{aligned} t_j^{\Omega} &= \sum_{r=1}^{R} \frac{\Gamma_{jr}^K n_{jr}^K}{\sum_r \sum_j \left(\Gamma_{jr}^K n_{jr}^K + \Gamma_{jr}^L n_{jr}^L\right)} . \frac{n}{n_{jr}^K} . \left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{D_j/M_j}{-\epsilon_j} + \frac{1}{-\epsilon_j}\right) \\ &= \sum_{r=1}^{R} \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma^K + \gamma^L} . \frac{n}{n_{jr}^K} . \left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{D_j/M_j}{-\epsilon_j}\right) + \frac{1}{-\epsilon_j}, \end{aligned} \tag{5}$$

where $\gamma^L = \sum_j \sum_r \Gamma_{jr}^L n_{jr}^L$ and $\gamma^K = \sum_j \sum_r \Gamma_{jr}^K n_{jr}^K$ are the aggregate national welfare weights for the two groups of factor owners, and the total national welfare weight sums to $\gamma = \gamma^K + \gamma^L$. Equation (5) has two components. The first term on the right hand side is a demand-for-protection component of the type familiar from the Grossman and Helpman (1994) model where the tariff on sector j imports increases with the output-to-import ratio. Since $-\epsilon > 0$, the tariff decreases as the absolute import demand elasticity increases, in keeping with the Ramsey rule of minimizing the distortion from the tariff.

[12] With heterogeneous preferences between the two classes of factor owners,

$$t_j^{\Omega} = \sum_{r=1}^{R} \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma^K + \gamma^L} . \frac{n}{n_{jr}^K} . \frac{(q_{jr}/M_j)}{-\epsilon_j} - \frac{\gamma^L}{\gamma} \frac{n}{n^L} \frac{(D_j^L/M_j)}{-\epsilon_j} - \frac{\gamma^K}{\gamma} \frac{n}{n^L} \frac{(D_j^K/M_j)}{-\epsilon_j} + \frac{1}{-\epsilon_j}.$$

The second term is a consumption distortion component. Note that t_j^Ω decreases with the national consumption-to-import ratio.

Additionally, suppose the welfare weights are equal for all j, r, m, such that $\Gamma_{jr}^m = \Gamma$. In other words, suppose political economy considerations do not have any influence on the outcome. Then the resulting tariffs are zero and there is free trade. The reason is that, in this case, the weights reduce to a constant times population sizes, which eventually cancel out. To see this note that $\gamma^m = \Gamma \sum_r \sum_s n_{sr}^m = \Gamma n^m$, and $\gamma = \Gamma(n^L + n^K) = \Gamma n$. Then (5) reduces to:

$$t_j^\Omega = \frac{-n}{M_j'}\left[\sum_r \frac{n_{jr}^K}{n}\frac{q_{jr}}{n_{jr}^K} - \left(\frac{D_j}{n} - \frac{M_j}{n}\right)\right] = \frac{-1}{M_j'}\left[\sum_r q_{jr} - (D_j - M_j)\right] = 0.$$

The last equality follows from the fact that $Q_j = \sum_r q_{jr}$, and market clearing for good j implies $D_j = Q_j + M_j$. Note that this is not necessarily true for t_{jr}. In other words, the preferred tariff for sector j by district r is not necessarily zero when weights are equal for all sectors and groups. This is because a policymaker representing district r does not internalize the impact of the tariff on lost consumer surplus in other regions.

Comparing tariffs

Next, we compare the vector of preferred tariffs derived from stage one to those effectively chosen at stage two. Evaluating the FOC for t_{jr} at the FOC that determines t_j^{Ω} gives[13]

$$t_{jr} - t_j^{\Omega} = -\frac{n}{M_j'}\left[\left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K}\right)\right]. \tag{6}$$

This expression identifies three sources of discrepancy between district r's preferred tariff on good j, t_{jr}, and the central tariff t_j^{Ω}. The sign of $(t_j^{\Omega} - t_{jr})$ 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.[14]

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 (6) may still be different from zero if the allocation of production across jurisdictions is not homogeneous, i.e., n_{jr}^K differs across locations r. In other words, there will be districts that win and districts that lose just because of heterogeneous allocation of activity across space, and the legislative bargaining going on in the second stage.

[13]When preference differ across groups, expression (6) becomes

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

The last two terms capture the impact of the tariff on consumption. The effects contribute positively or negatively to the difference $(t_{jr} - t_j^{\Omega})$ depending on the relationship between the weights attached the each group by region r.

[14]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 t_{jr} and t_j^{Ω}.

5 From Theory to Data

Estimating the welfare weights in expression (4) for each sector j and region r requires an empirical strategy. The basic building block of this strategy is estimating the weight that capital employed in sector j in region r receives, or $\Gamma_{jr}^{K} n_{jr}^{K}$. Equation (5) indicates how to estimate this fundamental weight as a proportion of the total weight labor and capital receive nationally,

$$\frac{\Gamma_{jr}^{K} n_{jr}^{K}}{\sum_r \sum_j \left(\Gamma_{jr}^{K} n_{jr}^{K} + \Gamma_{jr}^{L} n_{jr}^{L}\right)}. \tag{7}$$

The set of parameters $\{\Gamma_{jr}^{K}, \Gamma_{jr}^{L}\}$, $r = 1, \ldots, R, j = 1, \ldots, J$, are excessive. The first step in our strategy is to eliminate the over-parameterization so the welfare weights in (7), which are the result of legislative bargaining in the second stage, are identified and can estimated.

Legislative Coalitions

The model is designed to not only estimate the regional weights, but to identify the legislative bargains that are likely to deliver those weights. This requires us to commit to a clustering of representatives before they bargain. That is, the 435 representatives do not act as independent agents. They find allies who agree to bargain as a bloc. We begin with a baseline case, where regions are defined as geographic subdivisions, and explain step by step how we proceed with estimating these welfare weights. The baseline case aggregates the 435 districts into nine geographic regions, $r = 1, \ldots, 9$.[15] We estimate two additional sets of weights: a second grouping combining geography and party of the representative elected in the Congressional District, and a third purely political grouping based on competitiveness of the state in the 2000 Presidential Election and competitiveness of the latest Congressional race in the district.

[15] These regions, defined by the US Census, are: New England, Mid-Atlantic, South Atlantic, East North Central, West North-Central, East South Central, West South Central, Mountain, and Pacific.

The geographic aggregation of regions commits us to a baseline clustering representatives in a manner that is arguable exogenous to political dynamics. In this aggregation the 435 representatives form into nine regional blocs before sitting at the bargaining table in Congress. The national tariff vector $\{t_j^{\Omega}\}$ is the result of the ensuing bargain. At this stage we treat the details of the bargain as a black box. An important next step in this research agenda is unpacking the black box by introducing bargaining structures and other institutional determinants of preference aggregation and legislative bargaining, based on institutional and other political considerations.

In this base case, our goal is to estimate regional welfare weights in (5) for the nine geographical regions that are implied by the observed vector of tariffs. These are the welfare weights earned by the winning legislative coalitions (blocs) in determining the vector of national tariffs. A bloc with no influence over these tariffs earns zero welfare weight. The absolute welfare weights $\Gamma_{jr}^{L} n_{jr}^{L}$ and $\Gamma_{jr}^{K} n_{jr}^{K}$ are not identified without strong assumptions. However, it is sufficient for our purpose to estimate the relative welfare weights $\Gamma_{jr}^{K} n_{jr}^{K}/(\gamma^K + \gamma^L)$ in (7), which are identified after resolving the over-parameterization problem. Reducing the dimensionality of these parameters is in line with real-world legislative coalitions. Riker (1962)'s seminal contribution postulated that a winning coalition consisted of the minimum number required to win the vote and make policy (see also Diermeier et al. (2008)). This would support the forming of blocs such as the nine-region geographic aggregation. We return to the nine-region case to discuss how we estimate the welfare weights. Development of the econometric specification and dimension reduction applies to the general model.

Since demand $D_j = q_j + M_j$, equation (5) may be written with measurable variables:

$$t_j^{\Omega} \;\; = \;\; \sum_{r=1}^{R} \frac{\Gamma_{jr}^{K} n_{jr}^{K}}{\gamma^K + \gamma^L} . \frac{n}{n_{jr}^{K}} . \left(\frac{q_{jr}/M_j}{-\epsilon_j} \right) - \left(\frac{q_j/M_j}{-\epsilon_j} \right) . \tag{8}$$

(8) differentiates our approach from the Grossman-Helpman view. In their model, a

unitary government is hired as an agent of industry j lobbies (principals) who pay to buy protection. For every dollar of lobbying contributions it receives, the government is willing provide an amount of protection that imposes (no more than) $1/a$ dollars of welfare loss on the public. Previous studies have found a to be large in the U.S., meaning protection is not easily sold in the U.S. (Goldberg and Maggi; Gawande and Bandyopadhyay). Other countries sell out more cheaply (Gawande, Krishna and Olarreaga). While Grossman and Helpman have a simple model on the supply side, by design so as to focus attention on a structural model of the demand for protection, the *institutions* that serve to check and balance (and simultaneously also represent interests) are the driving force of our model. The structure of lobbying takes a back seat (but see appendix xx for how our model extends to lobbying).

The predicted tariff in (8) distinguishes how U.S. institutions deliver tariffs from how a unitary government does. If all sectors are organized the GH counterpart to (8) may be written as $t_j = \frac{1}{a}\left(\frac{q_j/M_j}{\epsilon_j}\right)$.[16] Then, t_j approaches zero as a increases. The paths to zero tariffs in (8), on the other hand lead to zero tariffs are under the following conditions (trivially, if good j is not produced in the nation, $q_j = 0$ and therefore $t_j^{\Omega} = 0$). Suppose all weights are identical. That is, if $\Gamma_{jr}^{K} = \Gamma_{jr}^{K} = \Gamma$, then $t_j^{\Omega} = \sum_{r=1}^{R}\left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{q_j/M_j}{-\epsilon_j}\right) = 0$. Thus, if owners of capital and owners of labor are treated equally, the classic free trade result obtains. If capital weights in industry j, Γ_{jr}^{K}, are zero then $t_j^{\Omega} = 0$. Finally, suppose j is produced only in one region, say region r. Then $q_{jr} = q_j$ and j is protected only if $\sum_{r=1}^{R}\frac{\Gamma_{jr}^{K}n_{jr}^{K}}{\gamma^K+\gamma^L}\cdot\frac{n}{n_{jr}^{K}} > 1$. Thus, whether regionally concentrated industries get protection more easily than regionally dispersed industries depends on this condition.

Grossman and Helpman are agnostic about what determines a and why it is high in the U.S. relative to other countries. We provide an answer. The welfare weight a that guides (a unitary) government to decision about the level of protection t_j^{Ω} to provide industries

[16]While not a fair characterization of the Grossman-Helpman model, which is built to emphasize the difference between organized from unorganized industries, we do so to make he contrast with our approach clear.

$j = 1, \ldots, J$ is determined in two steps. In the first, representatives of districts are elected and represent their districts' trade policy preferences, $t_j^r, r = 1, \ldots, R, j = 1, \ldots, J$. The actual national policy, the J-vector of tariffs for all industries, $t_j^\Omega, j = 1, \ldots, J$, is the outcome of legislative bargaining among coalitions of the R representatives which form in the process of determining which industry gets what. Many coalitions may favor consumer interests over producer interests, forcing down tariffs. If each district were a country that separately demanded its own tariff, the structure of tariffs would almost certainly not be the uniform national tariff that prevails in this second stage. Taking (8) to the data reveals which coalitions lost, Which coalitions won, and what they won.

Expressing the demand-for-protection term in (8) with *regional* output-to-imports ratios q_{jr}/M_{jr} imparts a GH flavor to the tariff equation. However, M_{jr}, sector j imports by region r, is unobservable. We approximate it as $M_{jr} = M_j \times (n_r/n)$, apportioning national sector j imports to region r according to r's population share. Using this approximation, the national tariff for sector j is[17]

$$t_j^\Omega \;=\; \sum_{r=1}^{R} \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma^K + \gamma^L} . \frac{n_r}{n_r^K} . \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j} \right) - \left(\frac{q_j/M_j}{-\epsilon_j} \right). \tag{9}$$

Equation (9) succinctly pits the demand for protection in sector j, whose intensity is measured by a weighted sum of the output-to-import ratio in each region r scaled by import demand elasticity, against the interests of the consumers of j whose intensity is measured by the national output-to-import ratio scaled by import demand elasticity.

[17]The tariff equation is different from GH in two fundamental respects. First, there are R separate regional-interest components whose conflicting interests are resolved, that is, the coefficients are determined, via legislative bargaining. Second, the GH model emphasizes the role of lobbying which is absent from our model to maintain our focus on the two-stage process by which trade policy is actually determined. Lobbying may be incorporated in a manner similar to work testing the GH model (Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000)). A lobbying indicator I_{rj}, measuring the presence of a sector j lobby in region r may be interacted with the output-to-imports ratios q_{jr}/M_{jr}, thereby accounting for the differential impact of lobbying on tariff determination in the legislative bargaining stage. We leave this for future research, noting that a primary contribution of such work would be original measures of lobbying at region-sector not just at sector as in previous studies.

Data. We construct a spatial data set with output (q_{jr}), imports (M_j), import demand elasticities (ϵ_j) and tariffs (t_j). Our data on sectoral tariffs, trade flows, output, wages, employment and consumption come from a variety of sources, and are at different levels of geographical and industry aggregation. Output and employment data are from the Census Bureau (County Business Patterns: 2002); the import and tariff data are from the United States International Trade Commission's Dataweb (dataweb.usitc.gov); tariffs are duties collected at customs (from USTradeOnline, available at HS10).[18] We also provide results using ad valorem equivalents of core non-tariff measures (NTMs) from Kee et al. (2009). Import elasticity data comes 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 the 435 Congressional Districts for the 107th Congress (2002), the earliest year for which we could get detailed data for the variables required to conduct a structural estimation of the parameters in the model.[19]

The share of workers in region r who own specific capital in any sector, n_r^K/n_r, in (9) is measured in two steps. We assume that a significant part of the compensation of white collar (non-production) workers is rents due to their sector-specificity, while the compensation of blue collar (production) workers, who are not "stuck" to a sector, is earned wage.[20] From the 2000 Census of Manufacturing we calculate the proportion of non-production workers in every NAICS sector (nationally, non-production workers constituted 28% of the total manufacturing workforce in 2000). The ratio n_r^K/n_r is then computed as the average of the national proportions using region r's sectoral manufacturing employment as weights. Region 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).

[18] Using MFN tariffs instead produces results that are qualitatively close to those reported in the paper.

[19] The economic and trade data from the early 2000s reflect the impact of the China shock.

[20] While this is stylized - blue collar autoworkers have specificity in the auto sector and white collar accountants are mobile across sectors - the national ratio of 0.28 has been used as a fair approximation of the proportion of workers who stand to lose the most from displacement due to import competition.

Sectoral output data are missing for 49 of the 435 districts. This occurs in districts with few manufacturing firms so that identifying a sector's output would reveal information about the firm, therefore negating their confidentiality. The Census does not report this information to protect confidentiality. For these districts we have available data on the number of employees by sector. Using the employment data we predict sectoral output in the missing districts from a regression estimated using data on districts with both employment and output. The regressions have a strong fit and allow us to include these 49 districts in the analysis.

Specification and Identification. The welfare weights are estimated by OLS from an econometric specification based on (9):

$$t_j = \sum_{r=1}^{R} \beta_r \left(\frac{q_{jr}/M_{jr}}{-\epsilon_j} \right) + \alpha \left(\frac{q_j/M_j}{-\epsilon_j} \right) + u_j, \tag{10}$$

where the coefficient β_r are functions of the welfare weights $\Gamma^K_{jr} n^K_{jr}$ and $\Gamma^L_{jr} n^L_{jr}$, and $\alpha = -1$. However, these welfare weights are under-determined due to the problem of dimensionality described above. From the R parameters $\beta_r, r = 1, \ldots, R$ ($R = 9$ in the geographical region base case) it is not possible to uniquely estimate the $2 \times (J \times R)$ region-sector welfare weights $\Gamma^K_{jr} n^K_{jr}$ and $\Gamma^L_{jr} n^L_{jr}$. To identify the welfare weights we make two plausibly tenable assumptions. First, we assume no within-region variation in welfare weights for each class of factor owner. In district r ownership of capital specific to sector j is treated equal to ownership of capital specific to any other sector. That is, $\Gamma^K_{jr} = \Gamma^K_r$.[21] Second, we assume the same applies to labor, $\Gamma^L_{jr} = \Gamma^L_r$.

[21] Any departure from this assumption should be structurally supported in the model. For example, a lobbying structure may be introduced into the model to distinguish capital specific to one sector versus another.

Under these assumptions, the coefficient β_r becomes:

$$\beta_r = \frac{\Gamma_r^K n_r^K}{\gamma^K + \gamma^L} . \frac{n_r}{n_r^K} = \frac{\Gamma_r^K n_r^K}{\left(\sum_r \Gamma_r^K n_r^K + \sum_r \Gamma_r^L n_r^L\right)} . \frac{n_r}{n_r^K}, \tag{11}$$

where within-sector variation welfare weights is eliminated, and $\frac{n_r}{n_r^K}$ is measured as described above. There are $2R$ parameters, $\Gamma_r^K n_r^K$ and $\Gamma_r^L n_r^L$, $r = 1, \ldots, R$, but for our purpose it is sufficient to recover $R+1$ parameters: the welfare weights on specific capital in each region, $\Gamma_r^K n_r^K, r = 1, \ldots, R$ and the collective economy-wide welfare weight on labor, $\gamma^L = \sum_r \Gamma_r^L n_r^L$. This is straightforward, once we have estimates of $\beta_r, r = 1, \ldots, R$ in hand.

Case 1: Geographic Coalitions

Table 1 reports coefficient estimates from the regression (10) for the base case, with the coefficient α on $\left(\frac{q_j/M_j}{-\epsilon_j}\right)$, that is, the consumption-side variable, constrained to equal -1.[22]

The estimated coefficients, β_r, are constrained to be non-negative. There are two reasons for this. First, we disallow negative welfare weights on capital, so the lower bound on weights is zero. Second, negative coefficients may be caused by collinearity, and therefore affect other coefficients. The estimates indicate positive welfare weights on capital ownership in all but two regions. The regional output-to-imports ratio is influential in determining these weights, but equally, if not even more, important are the bargaining coalitions that form in legislature.

[22]The 433 districts (out of the 435) for which we were able to assemble 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 first column of Table 2 shows the number of districts in each regional bloc.

Table 1: Regression model for second-stage welfare weights

Dependent Variable: *Applied Tariff, 2002*	
	Eq. (10)
β_1	0.046
New England	(0.013)
β_2	0.115
Mid-Atlantic	(0.016)
β_3	0.269
East North Central	(0.015)
β_4	0
West North Central	
β_5	0.171
South Atlantic	(0.010)
β_6	0
East South Central	
β_7	0.127
West South Central	(0.039)
β_8	0.026
Mountain	(0.013)
β_9	0.188
Pacific	(0.030)
α	-1
$(q_j/M_j)/\|\epsilon_j\|$	
Constant	0.043
	(0.020)
N	8315
Pseudo R^2	0.173

Notes: (1) Standard errors are clustered at NAICS 3-digits. (2) In the unconstrained model, β_4 and β_6 are estimated with negative coefficients. Since we disallow negative welfare weights, we impose non-negativity constraints on β_r coefficients. (3) R-squared is not reported for constrained regressions. We report the squared correlation of predicted tariffs with actual tariffs.

Our results indicate that regions 4 and 6, West North Central and East South Central, respectively, are not members of the winning coalition and get no weight in determining the nations tariff preferences. The small set of variables is able to explain a significant proportion of the variation in the 8315 HS 8-digit tariff lines. Since constrained regressions do not report fit, we report the squared correlation of actual and predicted tariffs, computed to be 0.173. Further, the regressors are measured at the 3-digit NAICS level of 18 manufacturing sectors.[23] This indicates some clustering in the determination of tariffs in legislature.[24] If observed tariffs were independently determined line by line, the regression would show a poor fit. If, as we have modeled, sector-based interests determine tariff preferences, tariffs that are legislated are likely to be conceptualized at the sector level. This gives our measures of bloc-level sectoral interests nontrivial explanatory power. Moreover, while representatives may have limited interest in the detailed 8-digit tariff lines, they are likely to be responsive to the impact of the tariff on aggregated sectors.[25]

What welfare weights do these estimates imply for owners of specific capital in the nine regions? Table 2 shows these results. The second column of the table presents estimates of the ratio of the welfare weight afforded to owners of capital in region r to the aggregate welfare weight on all capital owners and labor nationally.

Table 2: Second Stage Welfare Weights on Capital Owners, by Geography

Estimated weights on K_r to aggregate

Region	#Districts	Normalized K-wt
1. New England	23	0.019
2. Mid-Atlantic	65	0.047
3. East North Central	73	0.098
4. West North Central	31	0.000
5. South Atlantic	75	0.068
6. East South Central	26	0.000
7. West South Central	47	0.052
8. Mountain	24	0.011
9. Pacific	69	0.080
Total	433	0.375

Notes: (1) Normalized K weight is the proportion of the national weight that is placed on a region's capital ownership, or $\frac{\Gamma_r^K n_r^K}{\sum_r \Gamma_r^K n_r^K + \sum_r \Gamma_r^L n_r^L}$. (2) $\frac{\text{Aggregate L weight}}{\text{Aggregate L + K weight}} = 1 - 0.375 = 0.625$. (3) Normalized L weights may be calculated by distributing this aggregate L-to-total weight (=0.625) across regions according to the size of their workforce.

[23] Three export-oriented sectors are dropped: Printing (NAICS=323), Beverage and Tobacco (312) and Food Processing (311)).

[24] Some evidence for this is in Conconi et al. (2014) and Bohara et al. (2005).

[25] In this stylized version, sector-level tariffs determined by the winning legislative coalition are administratively translated to the line level by applying the same tariff to a cluster of line-level products.

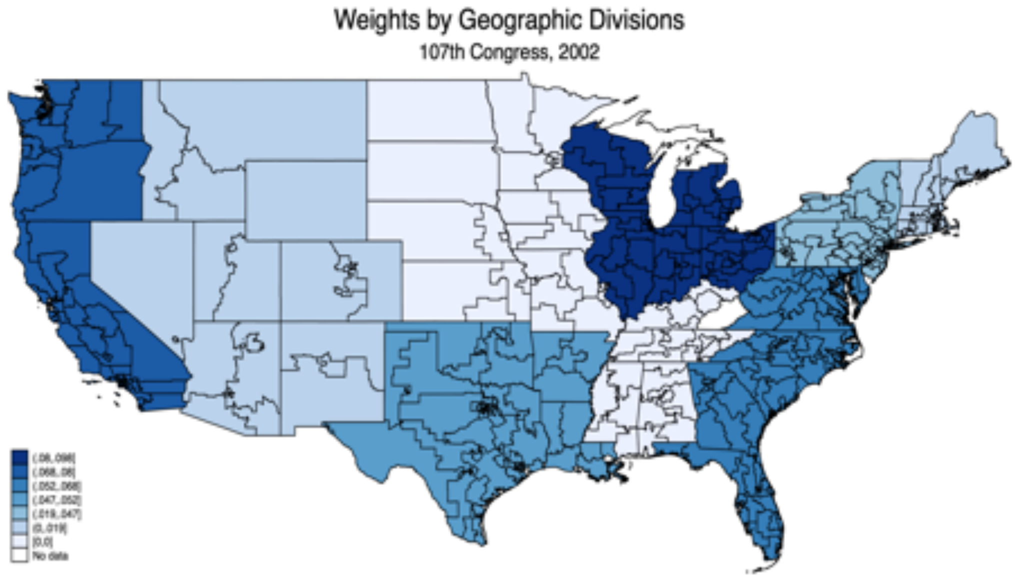

Figure 1: Estimated Weights based on Geographic Subdivisions

Capital owners in districts comprising the East North Central region - the mid-western states of Illinois, Indiana, Michigan, Ohio, and Wisconsin - were collectively afforded a welfare weight equal to 9.8% of the aggregate national welfare weight to capital and labor (see Figure 1). While these industrial states had their say at the bargaining table, so did consumers at large, in our model represented by labor. The legislative bargain favored consumer interests, including exporters and consumers of intermediate imports, by a factor of 0.625/0.375 or 1.67 over the protectionist interests of owners of industry specific capital. The end result were tariffs that were on average low. The winning coalitions representing the protectionist interest of specific-capital owners came from above-mentioned Mid-Western states and the Pacific states, but not from New England, other Mid-Western states, East South Central states or the Mountain region.

Case 2: Political Geography Coalitions, 2000

The base case, while informative, is perhaps not an adequate representation of how historically legislative coalitions have formed to determine the nation's tariff preferences.

Political alignments are missing from the coalition model based purely on the nine geographical subdivisions from the Census. We introduce politics and consider coalitions formed on both geography and politics. We measure political alignment by the party representing each districts in the House in 2000, the year closest to our trade and output data. Table 3 indicates the number of districts that comprise the $9x2$ political geography “regions". Legislative bargains are made with regions forming into blocs, or bargaining individually, to determine trade policy.

Table 3: Districts, by Political Geography of 2000

	Republican	Democrat
1. New England	5	18
2. Mid-Atlantic	29	36
3. East North Central	39	34
4. West North Central	19	12
5. South Atlantic	48	27
6. East South Central	16	10
7. West South Central	24	23
8. Mountain	18	6
9. Pacific	25	44
Total	223	211

The welfare weights on each region's sector-specifiic capital, as a proportion of the total welfare weight on capital and labor ownership nationally, is presented in Table 4. A stylized way to think of the legislative bargain is the following. First, coalitions form to determine how the welfare pie is split nationally between owners of specific capital and owners of labor (proxying for interests of consumers of intermediate and final products). In this case, the welfare pie splits 0.371 to capital and 0.639 to labor. This is similar to what we find in the pure geography case, and appears to be determined based on the number of white collar versus blue collar workers nationally, and not on output. Next, given capital's share of the total welfare weight, new coalitions form to determine how to distribute it across regions. Once that is determined, national tariffs t_j^{Ω} are set according to (9).

Table 4: Second Stage Welfare Weights, by Political Geography of 2000

Estimated weights on K_r to aggregate

	Republican	Democrat
1. New England	0.000	0.015
2. Mid-Atlantic	0.000	0.056
3. East North Central	0.055	0.050
4. West North Central	0.000	0.000
5. South Atlantic	0.034	0.050
6. East South Central	0.000	0.000
7. West South Central	0.000	0.028
8. Mountain	0.000	0.000
9. Pacific	0.022	0.062
Total	0.111	0.260

Notes: (1) Cells contain Normalized K weight or the proportion of total national welfare weight that is placed on a "region's" owners of specific capital, $\frac{\Gamma_r^K n_r^K}{\sum_r \Gamma_r^K n_r^K + \sum_r \Gamma_r^L n_r^L}$. (2) Normalized L weights may be calculated by distributing the aggregate L-to-total weight (=0.629) across the 18 "regions" according to the size of their workforce.

Figure 2 provides a look into how our model visualizes the intensity of preferences each regional coalition brings to the table. Table 4 and Figure 2 show that though Democrats held fewer districts in the House, owners of specific capital in those districts earned 0.260 or 70% of their share of the welfare weights pie, while capital owners in Republican-held districts earned 30%. This is despite the Democrats holding fewer and less populous Congressional Districts than the Republicans in 2000. The economic structure regions appears to play a more important role than the number of workers in determining the regional distribution of capital's welfare weights.

The distribution of weights across the 9 rows (the row sums) is consistent with the distribution in Table 3. For example, districts in East North Central get a similar weight (0.105 compared with 0.098). Here it is split equally between Democrat and Republican held districts. In the two Pacific regions, Democrats earn larger welfare weights for their capital owners by a factor of 3.

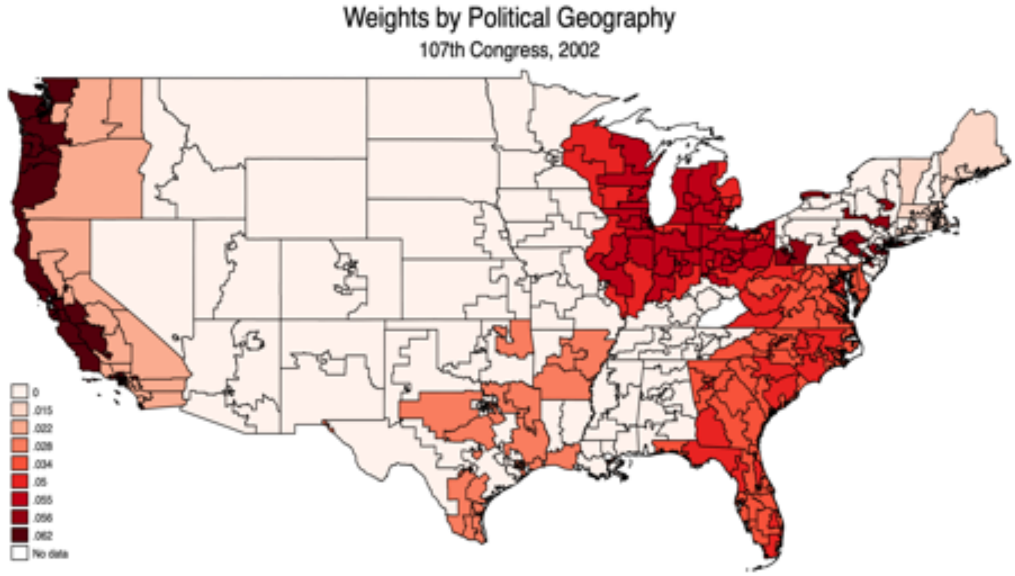

Figure 2: Estimated Weights based on Geography and Representative's Party

The structure of our model is based on workers, some with capital ownership and others owning only labor. A possible refinement of the model, aligning it with prevailing institutions, might take the district as the fundamental unit. The House Ways and Means Committee is powerful in setting trade policy agendas and determining the course of trade policy-making (Destler (2005), Devereaux and Watkins (2006), Lohmann and O'Halloran (1994)). Taking the district as the basic unit for determining the distribution of welfare weights in the second stage makes it possible to structurally begin to model positions of power in trade policy such as representatives from districts who are members of the Ways and Means Committee, have seniority, or build a reputation for being reliable partners in vote trading.

Case 3: Coalitions based on electoral dynamics

In the third case, politics drives coalitions, given the underlying economic structure. Coalitions are stylized based on how states voted in the 2000 Presidential elections and how districts voted the same year in elections to the House of Representatives. Districts are formed into nine blocs, three based on each election outcome. States in which a Presidential candidate won more than 52% of the vote then (districts in those) states were considered safe. Otherwise they were considered competitive in the Presidential elections. Districts in which a candidate to the House won more than 52% of the vote were considered safe. Otherwise they were considered competitive in the House elections. Table 5 indicates how the districts were distributed across the nine political blocs after the 2000 elections. In brackets we also indicate the proportion of the nation's manufacturing workforce represented by the nine blocs.

Table 5: Districts, by Political Blocs based on 2000 Election Outcomes

State-wide Vote in Presidential Election	**Districts in House elections** Competitive	Safe Democrat	Safe Republican	Total
Competitive	17	17	83	172
	[.03]	[.16]	[.22]	[.41]
Safe Democrat	8	75	42	125
	[.02]	[.16]	[.09]	[.27]
Safe Republican	5	51	80	136
	[.02]	[.11]	[.20]	[.33]
Total	30	198	205	433
	[.07]	[.43]	[.51]	[1.00]

Notes: (1) Cells contain the number of districts. (2) In brackets is the proportion of manufacturing workforce in the cell.

Table 6 and Figure 3 report the estimated welfare weights placed on capital ownership in this stylized legislative bargain. The distribution of welfare weights is in line with the distribution of manufacturing workers the cells represent (in brackets in Table 5). This is consistent with what we are measuring. Recall that welfare weight Γ^K (and Γ^L) is the weight an individual owner of factor K (and factor L, respectively) receives. What we are measuring is the weight the *total* ownership of K in region r (a cell in Table 5) receives.

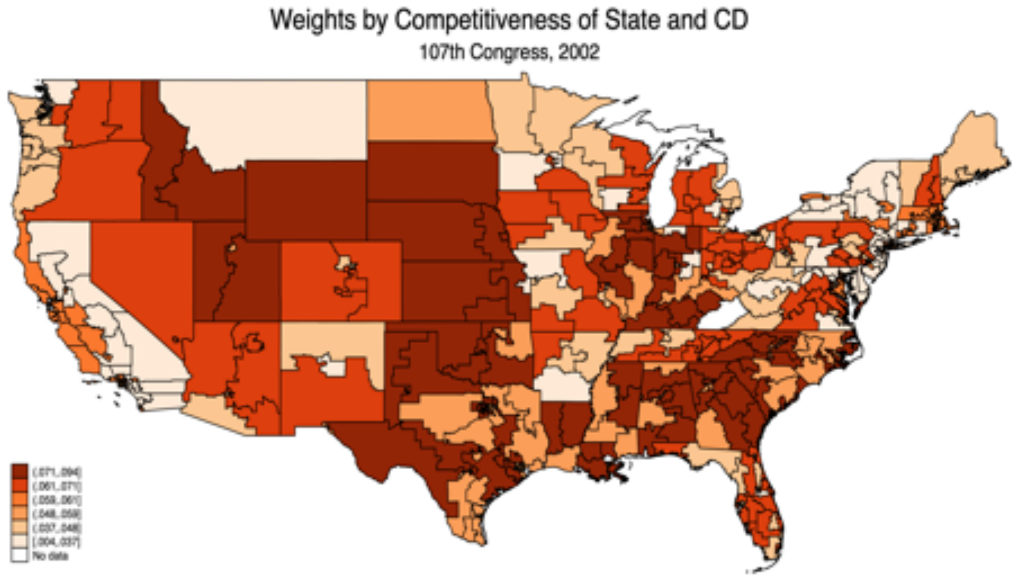

Figure 3: Estimated Weights from Coalitions based on Competitiveness of State and District

Table 6: Second Stage Welfare Weights, by Political Blocs in 2000

State-wide Vote in Presidential Election	**Districts in House elections** Competitive	Safe Democrat	Safe Republican	Total
Competitive	0.010	0.048	0.071	0.129
Safe Democrat	0.014	0.061	0.037	0.112
Safe Republican	0.004	0.059	0.094	0.157
Total	0.028	0.168	0.202	0.398

Notes: (1) Cells contain Normalized K weight or the proportion of total national welfare weight that is placed on a "region's" owners of specific capital, $\frac{\Gamma_r^K n_r^K}{\sum_r \Gamma_r^K n_r^K + \sum_r \Gamma_r^L n_r^L}$. (2) Normalized L weights may be calculated by distributing the aggregate L-to-total weight (=0.604) across the 9 "regions" according to the size of their workforce.

Conceptually, when representatives meet at the bargaining table they are able to bring the weight of the workers and specific factors owners they represent to the table. The economic structure lies behind the winning coalitions that determine tariff preferences; yet individual legislators are not able to translate their district's preferences to policy outcome. The pattern of implicit weights suggest that electoral dynamics in the Presidential and district level play an important role: specific factors in states with a larger voting margin in favor of the Republican Presidential candidate and safe Republican Congressional districts seem to receive higher weights in the formation of trade policy. We use these estimates to derive the implicit (unobserved) district level sectoral tariff preferences and compare them to the observed tariffs and non-tariffs measures enacted to regulate trade policy.

6 Discussion and Conclusion

In the previous sections we estimate a general version of our political economy of trade model. We derived the implied weights on districts and sectors of the economy that can be retrieved from the observed pattern of protection in the U.S..Using data for the observed pattern of trade tariffs across product lines we are able to derived the implicit weights that Congress places on actors distributed across Congressional Districts. The next step of this process will allow us to use the implicit weights to derive the district level demands for tariffs, which cannot be observed directly. This exercise should be relevant to political economy scholars: our findings answer a fundamental positive question about how far actual tariffs are from tariff preferences of districts. These lie at the heart of understanding the politics of how events like the China shock came to be, and what its political repercussions might be. A positive question for scholars in American politics is why the Democratic Party, which promised to deliver trade policy in line with the preferences from districts most hurt by trade openness, failed to enact those tariffs so even when they were in the majority across the decades when tariffs were legislated.

A large body of the research in the political economy of trade tradition has focused on the role of special interests and how they bend trade policy to their ends. While that may be true for some industries, our results indicate that interests of consumers (labor-as-consumers) matters a lot in the determination of US tariffs. Their interests overwhelm that of specific capital owners in the long run. The structure of US tariffs reveals an aggregate welfare weight on special interests that is one-third the aggregate welfare weight on consumers. The low average tariff is due to this bias.

On the normative side, understanding why institutions deliver policy outcomes far from socially preferred outcomes is an under-researched area and for which society needs answers. The answer may ultimately be trade liberalization but may structure institutions in a way that consider the manner in which trade should be liberalized. Or the answer may be liberalization with limits (the WTO has escape clauses for this reason) so that the US has options to put the brakes on a process that has reached a limit so the social impact is limited before it is ready for a second round of liberalization. Otherwise, as the China shock demonstrates, trade comes to be viewed as a zero sum mercantilistic game where society demands a sudden stop.

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Appendix

A The Model

Notation

The following notation is used throughout the paper:

- i: individuals; j: sectors, $j = 0, 1, ..., J$; r: regions, $r = 1, ..., R$.
- Population in region r: n_r.
- Two types of individuals: $m = L$ (labor), K (capital owners).
- Labor:
  - Labor is mobile across sectors, but immobile across regions. Each $i \in L$ is endowed with one unit of labor.
  - Labor in region r: $i \in L_r$.
  - n_r^L: number (measure) 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 labor across sectors in district r (vector).
  - Total number of labor: $n^L = \sum_r n_r^L$.
- Capital owners:
  - Specific factors: immobile across sectors and regions. Each $i \in K$ is endowed with one unit of the specific factor k_{jr}.
  - Owners of the specific factor of production in region r: $i \in K_r$.
  - n_{jr}^K: number of type-K individuals in r endowed with specific factor k_{jr}, $n_{jr}^K \geq 0$.
  - $\mathbf{n}_r^K = (n_{1r}^K, n_{2r}^K, \ldots, n_{Jr}^K)$: distribution of the specific factor across sectors (vector); the distribution of endowments may differ across regions r.
  - $n_r^K = \sum_{j \in J} n_{jr}^K$: number of type-$K$ individuals in r.
  - $\mathbf{k}_r = (k_{1r}, k_{2r}, \ldots, k_{Jr})$: vector of sector specific inputs, $k_{jr} \geq 0$.
  - In fact, $\mathbf{n}_r^K = \mathbf{k}_r$.
  - Total number of capital owners: $n^K = \sum_r n_r^K$.
- $n_r = n_r^L + n_r^K$: total population in region r.
- Total population: $n = n^L + n^K$, where $n^L = \sum_r n_r^L$, $n^K = \sum_r n_r^K$.

Preferences

Following the literature on trade protection, we assume preferences are represented by a quasi-linear utility function (subindex i has been omitted): $u^m = x_0 + \sum_{j \in J} u_j^m(x_j)$. 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 $m = L, K$.

Production

The production of good 0 only requires labor, and uses a linear technology represented by $q_{0r} = w_{0r}\ell_{0r}$, 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 $q_{jr} = F_{jr}(k_{jr}, \ell_{jr}) = f_{jr}(\ell_{jr})$, where k_{jr} is sector-region specific (immobile across sectors and regions). We omit, to simplify notation, k_{jr} from the production function from now onwards.

Profits in sector-region $\{jr\}$ are $\pi_{jr} \equiv p_j f_{jr}(\ell_{jr}) - w_{jr}\ell_{jr}.$, and demand for labor in sector-region jr is defined by

$$p_j f'_{jr}(\ell_{jr}) = w_{jr} \Rightarrow \ell_{jr}^D \equiv \ell_{jr}(p_j, w_{jr}).$$

The profit function becomes $\pi_{jr}(p_j, w_{jr}) \equiv p_j f_{jr}(\ell_{jr}^D) - w_{jr}\ell_{jr}^D$. The production of good j in region r (using the envelope theorem) is given by

$$\frac{\partial \pi_{jr}(p_j, w_{jr})}{\partial p_j} = q_{jr}(p_j, w_{jr}).$$

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, in equilibrium $w_{0r} = w_{jr}$.

Utility Maximization

Demand for goods. Consider the utility maximization problem for consumer i of type m in region r (subindex i is omitted below):

$$\max_{x_{jr}^m} \quad z_r^m - \sum_j p_j x_{jr}^m + \sum_j u^m(x_{jr}^m).$$

From the FOCs,

$$-p_j + u^m(x_{jr}^m) = 0 \Rightarrow d_{jr}^r \equiv d_{jr}^m(p_j),$$

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.

Note that consumers of type m are identical across regions r, i.e., $d^m_{ijr} = d^m_{ij\tilde{r}} = d^m_j$, so the demand for good j for all individuals of type m becomes

$$D^m_j = \left(\sum_r n^m_r\right) d^m_j = n^m d^m_j.$$

Finally, aggregate demand for good j is

$$D_j \;=\; \sum_m D^m_j = \sum_m n^m d^m_j.$$

Consumer surplus. Consumer surplus for a type-m individual in region r is

$$\begin{aligned} \phi^m_r(\mathbf{p}) &= n^m_r \sum_j \left[u^m(d^m_j) - p_j d^m_j\right], \\ &= n^m_r \sum_j \phi^m_j, \end{aligned}$$

where $\phi^m_j(p_j) = u^m(d^m_j) - p_j d^m_j$. Total consumer surplus for type-m individuals is

$$\begin{aligned} \Phi^m &= \sum_r \phi^m_r, \\ &= \sum_r n^m_r \sum_j \phi^m_j, \\ &= n^m \phi^m. \end{aligned}$$

Note that

$$\frac{\partial \Phi^m}{\partial p_j} \;=\; -n^m d^m_j = -D^m_j.$$

The indirect utility is given by $v^m_r(\mathbf{p}, z^m_r) = z^m_r + \phi^m_r(\mathbf{p})$.

Imports and Tariff Revenue

Imports of good j are $M_j = D_j - Q_j$. Let p^*_j denote the internationally given price of good j. We use the normalization $p^*_j = 1$. Revenue generated from tariff collection is $T = \sum_s t_s M_s,$, where $t_j = p_j - p^*_j = p_j - 1$. Note that

$$\begin{aligned} \frac{\partial T}{\partial t_j} &= M_j + t_j M'_j, \\ &= M_j(1 + \epsilon^M_j), \end{aligned}$$

where j is a representative sector $j \in J$ (abusing notation). Alternatively, defining tariff revenue as $T = \sum_j \left[t_j \left(D_j - Q_j\right)\right]$, then

$$
\begin{aligned}
\frac{\partial T}{\partial t_j} &= (D_j - Q_j) + t_j(D_j' - Q_j'), \\
&= D_j \left(1 + \frac{t_j}{D_j} D_j'\right) - Q_j \left(1 + \frac{t_j}{Q_j} Q_j'\right), \\
&= M_j - D_j \epsilon_j^D - Q_j \epsilon_j^Q.
\end{aligned}
$$

B Welfare

Labor welfare in region r. The utility of labor in in sector-region $\{jr\}$ is

$$
\begin{aligned}
W_{jr}^L &= w_{jr}\ell_{jr} + n_{jr}^L \frac{T}{n} + n_{jr}^L \phi_r^L, \\
&= w_{jr}\ell_{jr} + n_{jr}^L \frac{T}{n} + n_{jr}^L \frac{\Phi^L}{n^L} \qquad (12)
\end{aligned}
$$

An increase in the tariff on good s affects the utility of labor as follows:

$$
\frac{\partial W_{jr}^L}{\partial p_j} = \frac{n_{jr}^L}{n} \frac{\partial T}{\partial p_j} + \frac{n_{jr}^L}{n^L} \frac{\partial \Phi^L}{\partial p_j}. \qquad (13)
$$

Labor welfare in region r is

$$
\begin{aligned}
\Omega_r^L &= \sum_j \Lambda_{jr}^L W_{jr}^L, \\
&= \sum_j \Lambda_{jr}^L w_{jr}\ell_{jr} + \frac{\sum_j \Lambda_{jr}^L n_{jr}^L}{n} T + \frac{\sum_j \Lambda_{jr}^L n_{jr}^L}{n^L} \Phi^L, \\
&= w_{0r} \sum_j \Lambda_{jr}^L \ell_{jr} + \frac{\sum_j \Lambda_{jr}^L n_{jr}^L}{n} T + \frac{\sum_j \Lambda_{jr}^L n_{jr}^L}{n^L} \Phi^L, \\
&= \lambda_r^L \left(w_{0r} + \frac{T}{n} + \frac{\Phi^L}{n^L}\right), \qquad (14)
\end{aligned}
$$

where

$$
\lambda_r^L = \sum_j \Lambda_{jr}^L n_{jr}^L. \qquad (15)
$$

Welfare of capital owners in region r. The utility of capital owners in sector-region $\{jr\}$ is

$$\begin{aligned} W_{jr}^K &= \pi_{jr} + \frac{n_{jr}^K}{n} T + n_{jr}^K \phi_r^K, \\ &= \pi_{jr} + n_{jr}^K \frac{T}{n} + n_{jr}^K \frac{\Phi^K}{n^K}. \end{aligned} \tag{16}$$

Note that

$$\begin{aligned} \frac{\partial W_{jr}^K}{\partial p_j} &= q_{jr} + \frac{n_{jr}^K}{n} \frac{\partial T}{\partial p_j} + \frac{n_{jr}^K}{n^K} \frac{\partial \Phi^K}{\partial p_j}, \\ &= q_{jr} + \frac{n_{jr}^K}{n}(M_j + t_j M_j') - n_{jr}^K \frac{D_j^K}{n^K}. \end{aligned} \tag{17}$$

The welfare of capital owners in region r is given by

$$\begin{aligned} \Omega_r^K &= \sum_j \Lambda_{jr}^K W_{jr}^K, \\ &= \sum_j \Lambda_{jr}^K \pi_{jr} + \frac{\sum_j \Lambda_{jr}^K n_{jr}^K}{n} T + \frac{\sum_j \Lambda_{jr}^K n_{jr}^K}{n^K} \Phi^K, \\ &= \sum_j \Lambda_{jr}^K n_{jr}^K \left(\frac{\pi_{jr}}{n_{jr}^K} \right) + \lambda_r^K \left(\frac{T}{n} + \frac{\Phi^K}{n^K} \right), \end{aligned} \tag{18}$$

where

$$\lambda_r^K = \sum_j \Lambda_{jr}^K n_{jr}^K. \tag{19}$$

Aside: Welfare of capital owners in sector j. As an aside, the utility of capital owners in sector j (aggregate utility across regions r) is given by

$$W_j^K = \sum_r \pi_{jr} + \frac{n_j^K}{n} T + \frac{n_j^K}{n^K} \Phi^K.$$

This means that welfare of capital owners in sector j:

$$\begin{aligned} \Omega_j^K &= \sum_r \Lambda_{jr}^K W_{jr}^K, \\ &= \sum_r \Lambda_{jr}^K \pi_{jr} + \frac{\sum_r \Lambda_{jr}^K n_{jr}^K}{n} T + \frac{\sum_r \Lambda_{jr}^K n_{jr}^K}{n^K} \Phi^K. \end{aligned} \tag{20}$$

Region r's welfare. Total welfare in region r is defined as

$$
\begin{aligned}
\Omega_r &= \sum_j \sum_m \Lambda_{jr}^m W_{jr}^m, \\
&= \Omega_r^L + \Omega_r^K, \\
&= \lambda_r^L \left(w_{0r} + \frac{T}{n} + \frac{\Phi^L}{n^L} \right) + \sum_j \Lambda_{jr}^K n_{jr}^K \left(\frac{\pi_{jr}}{n_{jr}^K} \right) + \lambda_r^K \left(\frac{T}{n} + \frac{\Phi^K}{n^K} \right) \qquad (21)
\end{aligned}
$$

Aggregate welfare. Total welfare at the national level is given by

$$
\begin{aligned}
\Omega &= \sum_r \sum_j \sum_m \Gamma_{jr}^m W_{jr}^m, \qquad (22) \\
&= \sum_r \sum_j \Gamma_{jr}^L n_{jr}^L w_{0r} + \gamma^L \left(\frac{T}{n} + \frac{\Phi^L}{n^L} \right) + \sum_r \sum_j \Gamma_{jr}^K n_{jr}^K \left(\frac{\pi_{jr}}{n_{jr}^K} \right) + \gamma^K \left(\frac{T}{n} + \frac{\Phi^K}{n^K} \right),
\end{aligned}
$$

where

$$
\gamma^m = \sum_r \sum_j \Gamma_{jr}^m n_{jr}^m. \qquad (23)
$$

C Tariffs

Maximizing region r's welfare

The tariff that maximizes the total welfare in region r, Ω_r, satisfies $\partial \Omega_r / \partial p_j = 0$. Isolating t_{jr} gives:

$$
t_{jr} = -\frac{n}{M_j'} \left[\underbrace{\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r} \frac{q_{jr}}{n_{jr}^K}}_{(1)} - \underbrace{\left(\frac{\lambda_r^L}{\lambda_r} \frac{D_j^L}{n^L} + \frac{\lambda_r^K}{\lambda_r} \frac{D_j^K}{n^K} \right)}_{(2)} + \underbrace{\frac{M_j}{n}}_{(3)} \right] \qquad (24)
$$

where $\lambda_r = \lambda_r^L + \lambda_r^K$. Expression (1) captures the effect tariff t_j has on domestic producers of good j in region r. This effect would tend to rise t_j. Expression (2) 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 a downward pressure on t_j. Finally, expression (3) captures the impact of the tariff on tariff revenue. Since domestic residents benefit from the tariff revenue, this term would tend to increase t_j.

Note that expression (1) reflects the impact of the tariff on the returns to the specific factors, in this case, owners of capital in sector j. Since the model assumes that labor is perfectly mobile across sectors within region r (but not across regions), $w_{0r} = w_{jr}$ for all j in region r. Given that w_{0r} is not affected by changes in the tariff, then changes in t_j

do not have an impact on labor income. We also consider, as an extension, the possibility that labor is completely immobile across sectors (i.e., it is also sector specific, the same as capital). In this case, changes in tariffs will have a differential effect on wages across sectors as well.

Finally, when the the groups have identical preferences i.e., $D_j^L/n^L = D_j^K/n^K = D_j/n$, expression (24) becomes

$$t_{jr} = -\frac{n}{M_j'}\left[\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \left(\frac{D_j}{n} - \frac{M_j}{n}\right)\right]. \tag{25}$$

Using the market clearing condition for good j, $D_j = Q_j + M_j$, it follows that

$$\begin{aligned} t_{jr} &= -\frac{n}{M_j'}\left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right), \\ &\quad -\frac{n}{M_j'}\left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \frac{n_j^K}{n}\frac{Q_j}{n_j^K}\right). \end{aligned} \tag{26}$$

Suppose that $\Lambda_{jr}^L = \Lambda_{jr}^K = \bar{\Lambda}_r$. Then,

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

So the tariff preferred by region r is positive if and only if $(n_{jr}^K/n_r)(q_{jr}/n_{jr}^K) > (n_j^K/n)(Q_j/n_j^K)$.

Maximizing aggregate welfare

The tariff that maximizes aggregate welfare satisfies

$$\frac{\partial \Omega}{\partial p_j} = t_j \gamma \frac{M_j'}{n} - \left(\gamma^L \frac{D_j^L}{n^L} + \gamma^K \frac{D_j^K}{n^K} - \gamma \frac{M_j}{n}\right) + \sum_r \Gamma_{jr}^K n_{jr}^K \frac{q_{jr}}{n_{jr}^K}, \tag{27}$$

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

$$t_j^\Omega = -\frac{n}{M_j'}\left[\sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K} - \left(\frac{\gamma^L}{\gamma}\frac{D_j^L}{n^L} + \frac{\gamma^K}{\gamma}\frac{D_j^K}{n^K}\right) + \frac{M_j}{n}\right]. \tag{28}$$

As before, if preferences are identical across groups, then

$$t_j^\Omega = -\frac{n}{M_j'}\left[\sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K} - \frac{Q_j}{n}\right]. \tag{29}$$

Comparing tariffs

Evaluating the FOC for t_{jr} at the FOC that determines t_j^Ω gives

$$t_{jr} - t_j^\Omega = \tag{30}$$
$$-\frac{n}{M_j'}\left[\left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K}\right) - \left(\frac{\lambda_r^L}{\lambda_r} - \frac{\gamma^L}{\gamma}\right)\frac{D_j^L}{n^L} - \left(\frac{\lambda_r^K}{\lambda_r} - \frac{\gamma^K}{\gamma}\right)\frac{D_j^K}{n^K}\right].$$

D Lobbying

Suppose that a subset of sectors $L \subset J$ are organized (at the national level). Then, the tariffs chosen in this case solve the following maximization problem:

$$\begin{aligned}
\max_{\{t_1,\ldots,t_J\}} \mathcal{U} &= \sum_{j\in L} W_j^K + a\Omega, \\
&= \sum_r \sum_{j\in L} W_{jr}^K + a\sum_r \sum_{j\in J}\sum_m \Gamma_{jr}^m W_{jr}^m, \\
&= a\sum_r \sum_j \Gamma_r^L W_{jr}^L + a\sum_r \sum_{j\in J\setminus L} \Gamma_{jr}^K W_{jr}^K + \sum_r \sum_{j\in L} (1 + a\Gamma_{jr}^K) W_{jr}^K
\end{aligned} \tag{31}$$

It is assumed the owners of the specific factor are engaged in lobbying, so only W_{jr}^K for those sectors that lobby ($j \in L$). The FOC for $j \in L$ are given by

$$\begin{aligned}
\frac{\partial \mathcal{U}}{\partial p_j} &= a\left\{t_j\left(\gamma + \frac{n_j^K}{a}\right)\frac{M_j'}{n} - \left[\gamma^L \frac{D_s^L}{n^L} + \left(\gamma^K + \frac{n_j^K}{a}\right)\frac{D_s^K}{n^K} - \left(\gamma + \frac{n_j^K}{a}\right)\frac{M_j}{n}\right] + \sum_r \Gamma_{sr}^K n_{sr}^K \frac{q_{sr}}{n_{sr}^K}\right\} \\
&\quad + \sum_r n_{jr}^K \frac{q_{jr}}{n_{jr}^K},
\end{aligned} \tag{32}$$

where $n_j^K = \sum_r n_{jr}^K$. Isolating t_j gives

$$\begin{aligned}
t_j^{\mathcal{U}} &= \frac{a\gamma}{(a\gamma + n_j^K)}\frac{n}{M_j'} \times \\
&\quad \left\{\left[\frac{\gamma^L}{\gamma}\frac{D_s^L}{n^L} + \left(\frac{a\gamma^K + n_j^K}{a\gamma}\right)\frac{D_s^K}{n^K} - \left(\frac{a\gamma + n_j^K}{a\gamma}\right)\frac{M_j}{n}\right] - \sum_r \left(\frac{1 + a\Gamma_{sr}^K}{a}\right)\frac{n_{sr}^K}{\gamma}\frac{q_{sr}}{n_{sr}^K}\right\}
\end{aligned} \tag{33}$$

The FOCs for sectors $j \in J\setminus L$ are

$$\frac{\partial \mathcal{U}}{\partial p_j} = a\sum_r \Gamma_{jr}^L \frac{\partial W_{jr}^L}{\partial p_j} + a\sum_r \Gamma_{jr}^K \frac{\partial W_{jr}^K}{\partial p_j}, \tag{34}$$

For these sectors, $t_j^{\mathcal{U}} = t_j^\Omega$.

Comparing tariffs

Evaluating the FOC for t_{jr} at the FOC that determines t_j^{Ω} gives

$$t_{jr} - t_j^{\Omega} = \frac{n}{M_j'}\left[\left(\frac{\lambda_r^L}{\lambda_r} - \frac{\gamma^L}{\gamma}\right)\frac{D_j^L}{n^L} + \left(\frac{\lambda_r^K}{\lambda_r} - \frac{\gamma^K}{\gamma}\right)\frac{D_j^K}{n^K} - \left(\frac{\Lambda_{jr}^K n_{jr}^K}{\lambda_r}\frac{q_{jr}}{n_{jr}^K} - \sum_r \frac{\Gamma_{jr}^K n_{jr}^K}{\gamma}\frac{q_{jr}}{n_{jr}^K}\right)\right]. \tag{35}$$

For $j \in L$:

$$t_j^{\mathcal{U}} - t_j^{\Omega} = \frac{n_j^K}{\left(a\gamma + n_j^K\right)}\left\{\frac{n}{M_j'}\left[\left(\frac{D_j^K}{n^K} - \frac{M_j}{n}\right) - \sum_r \frac{n_{jr}^K}{n_j^K}\frac{q_{jr}}{n_{jr}^K}\right] - t_j^{\Omega}\right\} \tag{36}$$