TECHNICAL APPENDIX

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

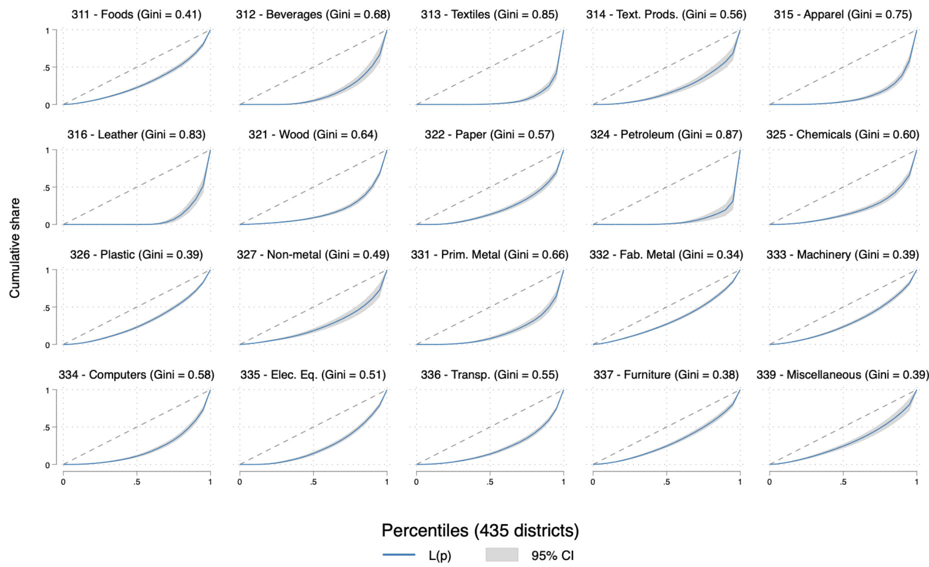

Figure A.1.2: Predicted district-level tariffs by NAICS-3 industries

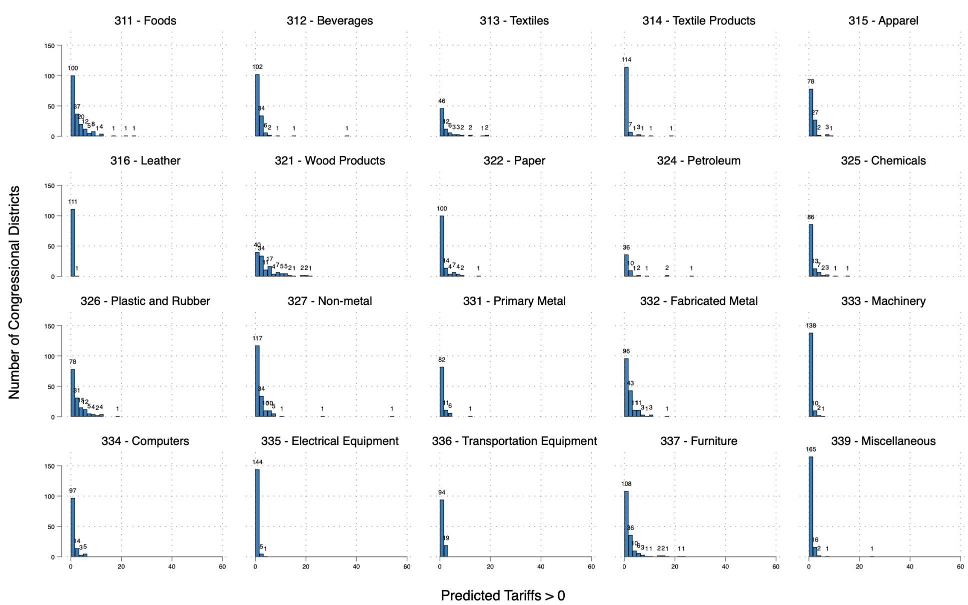

Figure A.1.3: Number of NAICS 3-digit industries with predicted district-level tariffs

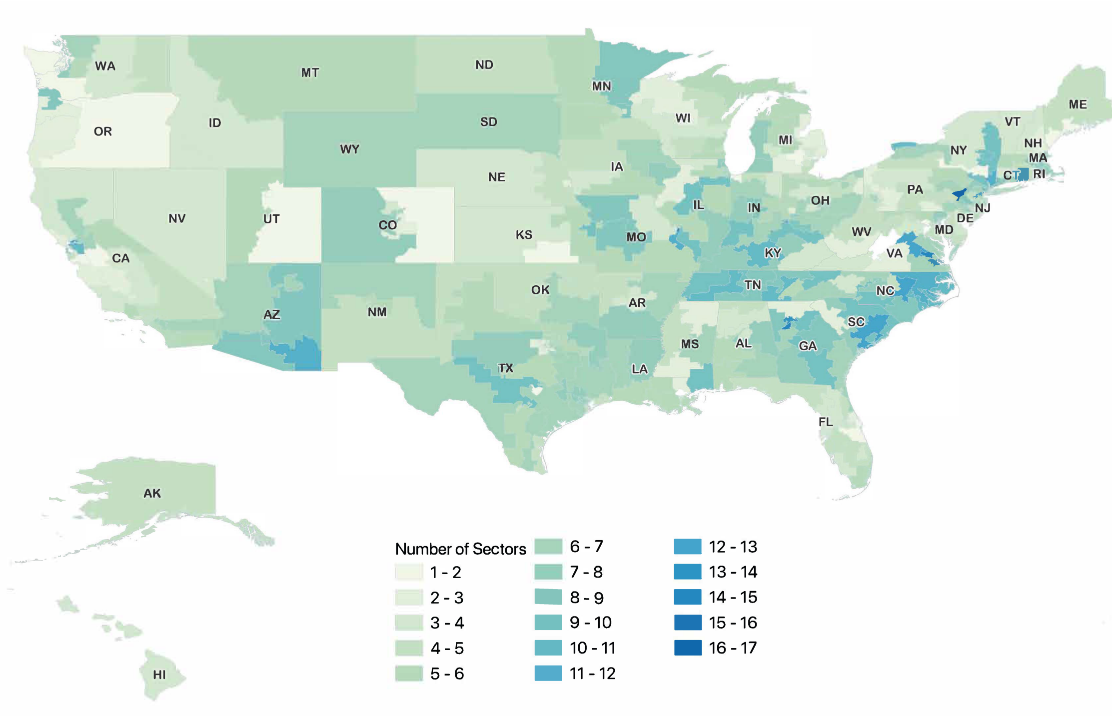

Table A.1.1: Average tariffs and NTMs by NAICS-3 industry

NAICS-3 Industry	Tariffs		Core NTMs		Predicted	No. of CDs
No. & Label	No. of lines	Average	No. of lines	Average	τ_{jr}	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 tariffs 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, about 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 can 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 is obtained.

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 $\tilde{\gamma}^K > \alpha^K$. However, 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 $\Gamma_{jr}^K = \Gamma_j^K$ for all r. From (12),

$$\frac{\tau_j}{1+\tau_j} = \sum_{r=1}^{R} \frac{\Gamma_j^K n_j^K}{\gamma^K + \gamma^L} \frac{1}{\alpha_j^K} \left(\frac{q_{jr}/M_j}{-\epsilon_j}\right) - \left(\frac{Q_j/M_j}{-\epsilon_j}\right) = \frac{(\tilde{\gamma}_j^K - \alpha_j^K)}{\alpha_j^K} \left(\frac{Q_j/M_j}{-\epsilon_j}\right).$$

Using $\alpha_j^K = n_j^K/n$, the fraction of specific factor owners that are employed in sector j, yields the first equality. Defining $\tilde{\gamma}_j^K = \Gamma_j^K n_j^K/(\gamma^K + \gamma^L)$, 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 $(\tilde{\gamma}_j^K - \alpha_j^K)/\alpha_j^K$ – 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 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.
  - $\mathbf{n}_r^L = (n_{0r}^L, n_{1r}^L, n_{2r}^L, \ldots, n_{Jr}^L)$: vector of mobile factors across sectors in district r.
  - $n^L = \sum_r n_r^L$: 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:[1] Domestic prices are denoted by $p_0 = 1$, $\mathbf{p} = (p_1, ..., p_J)$, and world prices by $\overline{\mathbf{p}} = (\overline{p}_1, ..., \overline{p}_J)$.

[1]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.

- 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 $m = L, K$.[2]

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-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 $p_j f_{jr}^{\prime}(n_{jr}^L) = w_{jr}$, 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.

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

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.[3]

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

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

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

[3] 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.

the solution obtained when tariffs are set at τ_j, the difference between τ_{jr} and τ_j can be written as:

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

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^K_{jr} and Γ^K_{jr}, (ii) the spatial distribution of n^K_{jr}, and (iii) the production levels of good q_{jr} across all locations r.[4] 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 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.[5]

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

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

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

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

[4] 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^K_{jr} becomes relevant in determining tariffs and explaining the difference between τ_{jr} and τ_j.

[5] 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.

where $A \equiv a\gamma/(a\gamma + n_j^K)$. 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 $t_j^{\mathcal{O}}$. Specifically,

$$t_j^{\mathcal{O}} - t_j \quad = \quad \frac{n_j^K}{\left(a\gamma + n_j^K\right)} \left[\frac{n}{M_j'} \left(\frac{D_j^K}{n^K} - \frac{Q_j}{n_j^K} - \frac{M_j}{n} \right) - t_j \right].$$

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 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.[6] 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.

[6]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

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

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[7]

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

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 $\gamma^K = \sum_r \Gamma_r^K n_r^K$.

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

$$N = \left(\Omega^{US} - \overline{\Omega}^{US}\right)^{\sigma} \left(\Omega^{RoW} - \overline{\Omega}^{RoW}\right)^{(1-\sigma)},$$

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

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:[8]

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

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

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.[9]

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 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):

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

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

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

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 τ_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 $\mathbf{t}^{X*}$.[10] This increase ultimately affects producers and consumers of the exportable goods in country US (because τ_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.

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:

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

[10] Note that this is a simultaneous decision.

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

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

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.[11]

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 can implement its preferred tariff. We next obtain the tariff that region r would choose conditional on attracting region r' and form a majority coalition.

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.[12] 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 $m \in \{L, K\}$.[13] 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.

[11] See Celik et al (2013). To simplify the exposition, we consider only importing sectors and no terms-of-trade effects.

[12] 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.

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

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

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

where $\tau_{jr}/(1+\tau_{jr}) = t_{jr}/p_j$, since $p_j = \overline{p}_j + t_{jr}$, 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 $\mathbf{t}_r = \{t_{1r}, \dots, t_{jr}, \dots, t_{Jr}\}$ that maximizes district r's welfare $\Omega_r(\mathbf{t}_r)$ subject to $\Omega_{r'}(\mathbf{t})_r \geq \Omega_{r'}(\overline{\mathbf{t}})$ for all $r' \neq r$ (the two other districts), where $\overline{\mathbf{t}}$ is the vector of existing (status-quo) tariffs.

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

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 $j = 1, \dots, J$, the solution tariff, denoted by $t^{r'}_{jr}$, is given by

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

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 (25) can be rewritten in terms of ad-valorem tariffs $\tau_{jr}^{r'}/(1+\tau_{jr}^{r'}) = t_{jr}^{r'}/p_j$ as follows:

$$\frac{\tau_{jr}^{r'}}{1+\tau_{jr}^{r'}} = \frac{n}{-\epsilon_j(t_{jr}^{r'})M_j(t_{jr}^{r'})}\left[\alpha_r \frac{\lambda_{jr}^K}{\lambda_r}\frac{q_{jr}(t_{jr}^{r'})}{n_{jr}^K} + (1-\alpha_r)\frac{\lambda_{jr'}^K}{\lambda_{r'}}\frac{q_{jr'}(t_{jr}^{r'})}{n_{jr'}^K} - \frac{Q_j(t_{jr}^{r'})}{n}\right]. \tag{26}$$

3.2 An Example

Suppose the utility of a representative consumer in region r is given by $u = c_0 + \sum_i(\psi_i c_i - c_i^2/2)$, with $\psi_i > p_i$ (for all p_i considered here).[14] 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 $q_{ri} = \sigma_{ri}n_{ri}^K$, 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 $\Omega_r = \Omega_r^L + \Omega_r^K = \sum_i \Lambda_{ri}^L n_{ri}^L \omega_{ri}^L + \sum_i \Lambda_{ri}^K n_{ri}^K \omega_{ri}^K$, where

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

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

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

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

Note that (27) can therefore be expressed as

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

[14] We adopt some of the same assumptions as in Celik et al (2013).

Equivalently, the ad-valorem tariff $\tau_{jr}^{r'} = t_{jr}/\bar{p}_j$ can also be written as $\tau_{jr}^{r'} = \alpha_r\tau_{jr} + (1-\alpha_r)\tau_{jr'}$, since in this case $\bar{p}_j$ is given. Alternatively,

$$\frac{\tau_{jr}^{r'}}{1+\tau_{jr}^{r'}} = \alpha_r \left(\frac{1+\tau_{jr}}{1+\tau_{jr}^{r'}}\right)\frac{\tau_{jr}}{1+\tau_{jr}} + (1-\alpha_r)\left(\frac{1+\tau_{jr'}}{1+\tau_{jr}^{r'}}\right)\frac{\tau_{jr'}}{1+\tau_{jr'}}. \tag{29}$$

Note that

$$\underbrace{\alpha_r \left(\frac{1+\tau_{jr}}{1+\tau_{jr}^{r'}}\right)}_{\widetilde{\alpha}_r} + \underbrace{(1-\alpha_r)\left(\frac{1+\tau_{jr'}}{1+\tau_{jr}^{r'}}\right)}_{(1-\widetilde{\alpha}_r)} = 1, \tag{30}$$

which means that

$$\frac{\tau_{jr}^{r'}}{1+\tau_{jr}^{r'}} = \widetilde{\alpha}_r\frac{\tau_{jr}}{1+\tau_{jr}} + (1-\widetilde{\alpha}_r)\frac{\tau_{jr'}}{1+\tau_{jr'}}. \tag{31}$$

3.3 Extension: More than three regions

The form of the solution in equation (26) generalizes to the case where $r > 3$. 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.[15]

In the first step, for each coalition $C_r \in \mathscr{C}_r$, the agenda setter r computes the vector of tariffs $\boldsymbol{t}_r^{C_r}$ that would satisfy districts in the coalition. In other words, the tariff vector $\boldsymbol{t}_r^{C_r}$ 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 an extension of (26).

Specifically, under the assumptions considered in Section 3.2, it follows that $\boldsymbol{t}_r^{C_r}$ and also $\boldsymbol{\tau}_r^{C_r}$ can be expressed as a convex combination of the preferred tariffs of the districts in the coalition:

$$\tau_{jr}^{C_r} = \sum_{\iota \in C_r} \alpha_\iota \tau_{j\iota}, \quad \text{for each}\, C_r \in \mathscr{C}_r, \tag{32}$$

where $\tau_{j\iota}$ is the preferred tariff of region ι for good j, $0 \le \alpha_\iota \le 1$ 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 than 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

[15] 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 $\Gamma[x] = (x-1)!$.

look like (32).

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: $A_i = n\frac{\bar{A}_{ind}}{\sum_{ind \in I} \bar{A}_{ind}}$.

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}.