Exporters and Trade Policy with Heterogeneous Districts

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* The views expressed herein are those of the author and are not necessarily those of the Federal Reserve Bank of Richmond, or the Federal Reserve System.

OUR CONTRIBUTION

- **Theory:** Political model of trade with districts
  - Trade policy enacted by representatives of districts
    - Heterogenous districts: Manufacturing unevenly distributed
    - Some sectors spatially concentrated others not
  - Specific factors in import-competing and exporting industries
  - Large country case: terms-of-trade effects
- **Method:** Quantify the relative influence of districts and sectors in trade policy-making
  - Estimate structural parameters, **welfare weights** using 2002 tariffs and NTMs
    - 2000 siginificant: China's accession to WTO and MFN status
  - Weights identify winners and losers from trade policy
  - **Exporters** explain low U.S. trade protection despite backslash against "globalization"

MODEL

R **districts** (indexed by $r = 1, \ldots, R$)

J **import-competing** industries (indexed by $j = 1, \ldots, J$)

1 **exporting** industry (indexed by g)

$m = \{L, K\}$: **factors**

n_{jr}^{m} = population of type-m factors in sector j in district r

STAGE2: NATIONAL TARIFFS t_j

-2 Large countries, U.S. and ROW: Terms of trade (TOT) effects
-Only tariffs allowed. No export subsidies.

Sectoral tariffs $t_1, \ldots, t_J$ maximize aggregate (national) welfare:

$$\max \Omega^A(\mathbf{t}) = \sum_r \left(\sum_j \sum_m \Delta_{jr}^m W_{jr}^m \right)$$

- Welfare weights Δ_{jr}^m target of estimation
- National tariffs $t_j = 1, \ldots, J$ result of Nash bargaining
- Our view: Basis for *agenda setting* by the President in Kennedy Round domestic legislative bargain (he has the votes since this brings exporters into his coalition)

National Tariffs (Imports only) - I

Without export sector, **ad-valorem tariff** τ_j $(= t_j/p_j)$ generalizes Grossman-Helpman (1994):

$$\frac{\tau_j}{1+\tau_j} = \sum_r \left[\frac{\Delta_{jr}^K n_{jr}^K}{\Delta} \cdot \frac{n}{n_{jr}^K} \cdot \left(\frac{q_{jr}/M_j}{-\epsilon_j^M} \right) \right] - \frac{q_j/M_j}{-\epsilon_j^M} \tag{1}$$

There are two components:

- Demand-for-protection component: Since $-\epsilon_j^M > 0$, τ_j increases with the (regional) output-to-(national) import ratio q_{jr}/M_j This is reminiscent of Grossman-Helpman model
- Consumption-distortion component: τ_j decreases with the national consumption-to-import ratios D_j^L/M_j and D_j^K/M_j. With homogeneous tastes (for L and K) and $D_j = q_j + M_j$, this simplifies to sector j's national output-to-import ratio.

National Tariffs: US vs. ROW Nash Bargain - I

With export sectors g, import sector j tariff has additional parameters:

- $\theta_{jg} = \frac{d\bar{p}_g/dt_g}{dp_j/dt_j} < 0$ is the TOT effect on US exports of g from ROW's retaliation against US tariff on import j (numerator), relative to change in the domestic price of j (denominator).
- $\mu_j > 0$ is relative bargaining strength of the U.S. in sector j.
- $\delta_j = \epsilon_j^M \left(\frac{1}{\epsilon_j^{X*}} + 1 \right) < 0$ is the "effective" import demand elasticity in the presence of (the TOT impact of) retaliation on sector g.

National Tariffs: US vs. ROW Nash Bargain-II

With export sectors g import industry tariffs are:

$$\frac{\tau_j}{1+\tau_j} = \sum_r \left[\frac{\Delta_r^{KM} n_r^{KM}}{\Delta} \left(\frac{n}{n_r^{KM}} \right) \left(\frac{q_{jr}/M_j}{-\delta_j} \right) \right] + \sum_r \left[\frac{\Delta_r^{KX} n_r^{KX}}{\Delta} \left(\frac{n}{n_r^{KX}} \right) \left(\mu_j \sum_g \theta_{jg} \frac{q_{gr}/M_j}{-\delta_j} \right) \right] - \left(\frac{q_j/M_j}{-\delta_j} + \frac{\mu_j \sum_g \theta_{jg} D_g/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}} \right). \quad (2)$$

Comment:

1) GH (1995, eq (16)) have inverse export supply elasticity in the optimal tariff equation. Here its effect is moderated by the amount by which retaliation affects the world price and therefore it is $1/(1+\epsilon_j^{X*})$.

REGRESSION MODEL WITH EXPORT SECTORS g

-**Without export sector**, regression model was:

$$\frac{\tau_j}{1+\tau_j} = \sum_{r=1}^{R}\left[\frac{\Delta_r^K n_r^K}{\Delta}.\left(\frac{n}{n_r^K}\right)\frac{q_{jr}/M_j}{-\epsilon_j}\right] - \frac{q_j/M_j}{-\epsilon_j} + e_j, \tag{3}$$

where (i) $\Delta = \sum_r \left(\Delta_r^K n_r^K + \Delta_r^L n_r^L\right)$, and (ii) $\frac{q_j/M_j}{-\epsilon_j} = \sum_{r=1}^{R} \frac{q_{jr}/M_j}{-\epsilon_j}$.

-**With export sector**, regression model is :

$$\begin{aligned}\frac{\tau_j}{1+\tau_j} &= \sum_r\left[\frac{\Delta_r^{K^M} n_r^{K^M}}{\Delta}\left(\frac{n}{n_r^{K^M}}\right)\left(\frac{q_{jr}/M_j}{-\delta_j}\right)\right] \\ &+ \sum_r\left[\frac{\Delta_r^{K^X} n_r^{K^X}}{\Delta}\left(\frac{n}{n_r^{K^X}}\right)\left(\mu\sum_g \theta_{jg}\frac{q_{gr}/M_j}{-\delta_j}\right)\right] \\ &- \left(\frac{q_j/M_j}{-\delta_j} + \frac{\mu\sum_g \theta_{jg} D_g/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}}\right) + e_j. \end{aligned} \tag{4}$$

Comment: Bargaining strength defined here at national, not sector, level $\mu_j = \mu$ (Santi, we'll write the μ_j version in the appendix, so please don't erase it)

Different specific factor weights in M and X sectors

- Import sector j has weight $\Delta_r^{K^M}$ (regional variation, not within-region)
- Export sector j has weight $\Delta_r^{K^X} = \Delta^{K^X}$ (regional variation, not within-region)
  - In any case we can only the aggregate weight of specific factors in region r relative to total welfare weight of specific factors and labor
  - That is, cannot separate Δ_r^K from N_r^K, we identify their product as a share of the aggregate.

Grossman-Helpman type specification with variables $Z_{jr} = q_{jr}/M_{jr}$ [with M_{jr} approx. by $M_j \times (n_r/n)$].

- **Without export sectors** (only $\Delta_r^{K^M}$ weights) the GH model is

$$\frac{\tau_j}{1+\tau_j} = \sum_{r=1}^{R} \frac{\Delta_r^{K^M} n_r^{K^M}}{\sum_r \left(\Delta_r^{K^M} n_r^{K^M} + \Delta_r^L n_r^L\right)} \cdot \left(\frac{n_r}{n_r^{K^M}}\right) \left[\frac{q_{jr}/M_{jr}}{-\epsilon_j}\right] - \frac{q_j/M_j}{-\epsilon_j} + e_j$$

GH-TYPE SPEC- I

- **With many export sectors** g subject to retaliation GH is

$$\frac{\tau_j}{1+\tau_j} = \sum_r \left[\frac{\Delta_r^{K^M} n_r^{K^M}}{\Delta} \left(\frac{n_r}{n_r^{K^M}} \right) \left(\frac{q_{jr}/M_{jr}}{-\delta_j} \right) \right] + \sum_r \left[\frac{\Delta_r^{K^X} n_r^{K^X}}{\Delta} \left(\frac{n}{n_r^{K^X}} \right) \left(\mu \sum_g \theta_{jg} \frac{q_{gr}/M_j}{-\delta_j} \right) \right] - \left(\frac{q_j/M_j}{-\delta_j} + \frac{\mu \sum_g \theta_{jg} D_g/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}} \right) + e_j. \quad (5)$$

(i) Negative sign in the second expression on rhs is clear - specific factors g in all regions producing g demand lower tariffs.

(ii) τ_j increases as $\frac{\mu\theta_{jg} D_g/M_j}{-\delta_j}$ becomes more negative, and only $\theta_{jg} = (d\bar{p}_g/dt_g^*)/(dp_j/dt_j)$ is negative in the expression. Why? Consider denominator $(dp_j/dt_j) > 0$. The lower the TOT externality of t_j, the closer this is to 1 (small country). Then the tariff is determined by the numerator, and the TOT effect of retaliation by ROW actually benefits US consumers of g. So while consumers of j dislike tariffs on j (via q_j/M_j), consumers of g like τ_j!
-Now consider numerator $(d\bar{p}_g/dt_g^*) < 0$. The smaller the TOT externality ROW can impose, the closer it is to zero - ROW is small country and retaliation not such a threat. If it is large, then it can dominate as above.

GH-TYPE SPEC. - II: SINGLE EXPORT SECTOR g

- With $g = 1$, one variable in the second term: $\left(\theta_{jg}.q_{gr}/M_j\right)/(-\delta_j)$.
- Can we estimate the r export weight shares $\Delta_r^{K^X} n_r^{K^X}/\Delta$ in (14)?
- Yes, assume sector g's specific factor gets weight $\Delta_r^{K^X} = \Delta^{K^X}$.

$$\frac{\tau_j}{1+\tau_j} = \sum_r \left[\frac{\Delta_r^{K^M} n_r^{K^M}}{\Delta}\left(\frac{n_r}{n_r^{K^M}}\right)\left(\frac{q_{jr}/M_{jr}}{-\delta_j}\right)\right] + \frac{\Delta^{K^X} n}{\Delta}\left[\frac{\mu.\theta_{jg}.Q_g/M_j}{-\delta_j}\right] - \left(\frac{q_j/M_j}{-\delta_j} + \frac{\mu.\theta_{jg}.D_g/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}}\right) + e_j. \quad (6)$$

(i) $Q_g = \sum_r q_{gr}$ is aggregate output of export sector g.

(ii) Note that now $n = n^{K^M} + n^{K^X} + n^L$. So be careful how to recover weights from coefficients. The small country had only n^{K^m} so $n^{K^m}/n = 0.30$ or so.Now it will be 0.25 or so (rest in X).

(iii) From (15) $\frac{\Delta^{K^X}}{\Delta}$ can be estimated. .

(iv) Note: M_j in second term (not M_{jr} since no r only aggregate).

(v) Other than $\frac{\bar{p}_j}{p_j}$ in θ_{jg} in (13) we measure all variables. Show robustness to

DATA

- We collected:
  1. Tariffs and imports (M_j) (USITC Dataweb; Feenstra's site)
  2. Output (q_{jr}), and consumption (D_j^L and D_j^K) (County Business Patterns: 2002)
  3. Employment by type of economic agent, sector and region (n_{jr}^K and n_{jr}^L) (County Business Patterns: 2002; NBER manufacturing database)
  4. Import demand elasticities ($\epsilon_j^M, \epsilon_g^{M^*}$) (Kee, Nicita and Olarreaga (2008)
  5. Export supply elasticities ($\epsilon_g^X, \epsilon_j^{X^*}$) (Nicita, Olarreaga and Silva (2018))
- Data were available from different sources and at different levels of geographical and industry aggregation
- Convert the data from to NAICS 3-digit level, and map from Metropolitan Statistical Areas and Counties onto the 435 Congressional Districts for the 107th Congress (2002)
- We account for over 10 mn. manufacturing workers in 2002.

DESCRIPTIVE STATS

Descriptive statistics for the individual terms in the constraint are in Appendix Table Axx.

- $\frac{q_j/M_j}{-\delta_j}$ has mean 0.81 and ranges between 0.02 (Leather goods) and 2.22 (Food products).
- $\frac{\mu.\theta_{jg}.D_g/M_j}{-\delta_j}$ has mean $-.10$ and ranges between -0.64 (Petroleum Refining) and -0.01 (Transport goods).
- $\frac{1}{1+\epsilon_j^{X*}}$ has mean 0.38 and ranges between 0.16 (Textiles) and 0.71 (Furniture).
- Overall, $\frac{q_j/M_j}{-\delta_j} + \frac{\mu.\theta_{jg}.D_g/M_j}{-\delta_j} - \frac{1}{1+\epsilon_j^{X*}}$ has mean 0.33 and range -1.08 (Petroleum Refining), 1.84 (Food products)

Results: Table 1

- Highlights - I: Labor weights
  1. We can estimate the weight given to labor-as-consumers relative to total weight. This differs across models, since each model defines different *regions*. In the "4region-2000 Dem/Rep" nodel we aggregate districts into 8 regions (4×2), we find that capital gets 36% weights and labor 64%. It is the major reason why US tariffs are low on average.
- Highlights - II: Capital weights:
  1. We obtain precise estimates of regions that win and the implied welfare weights for specific capital in those regions.
  2. Some regions have specific capital weights $\Delta_r^K = 0$.
     - Is it because those regions belong to losing coalitions? Or they vote with the winning coalition to pass a bill that may even go against their trade interest, but buys them a winning coalition on votes that matter more to them?
     - We will attempt to see which is true in the voting data. [Note to us: not sure if that belongs to this paper or anotehr one – we might suggest coalitions]

Legislative Coalitions: Regional Aggregations

- Estimate weights for two different regional groupings

Case 1: Geography-based coalitions

- 9 geographic subdivisions from U.S. Census

Case 2: Competitiveness of State and CDs

- Coalitions based on electoral dynamics: 9 regions based on battleground state in 2000 Presidential election and competitiveness of Congressional seat

CASE 1: GEOGRAPHY I

2SLS estimates. DV: *Applied Tariff, 2002*

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

Weights on Specific Factors

CASE 1: GEOGRAPHY II

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

CASE 1: GEOGRAPHY III

- **Small country case**
  - Legislative bargain favors mobile factor owners (68.4% of aggregate welfare); owners of sector-specific capital get remainder (31.6%)
  - Winners: Pacific (7.3), E N Central: (6.3%), Mid-Atlantic (5.1)
- **Large country case**
  - Legislative bargain favors mobile (64.2%) and X-specific factors (20.4%); M-specific factors M get 15.4%
  - Winners: W N Central (7.5%), S Atlantic (6.3), W S Central (1.6); regions with a higher share of specific factors in X-sector (New England, Mountain, Pacific)

CONCLUDING REMARKS

1. Develop a general version of a political economy of trade model which includes fixed factors from importing and exporting sectors
2. Advance empirical contributions of the PE of trade
   - Assess how far actual tariffs are from tariff preferences of districts
   - Help understand the political fallout from the China shock
3. Estimate the implied weights on districts and industries retrieved from the observed pattern of protection
4. Interests of fixed factors still play an important role in determining US trade policy
   - The structure of trade tariffs reveals an aggregate weight on special interests that is approximately 35% of the aggregate welfare weight
   - Interests of specific factors in exporting sectors obtain about 60% of the total weight on fixed factors (20% of the aggregate welfare weight)
5. Results show U.S. exporters to be highly effective in countervailing the demand for protection by domestic

DATA

- Data available from different sources, and levels of aggregation (geography, industry) for 2002 (107^{th} Congress)
- Tariffs and imports, M_j: USITC Dataweb; R. Feenstra's site
- NTMs: ad-valorem equivalents of core NTMs at the 6-digit HS level; Kee, Nicita & Olarreaga (2009)
- Import demand elasticities, ϵ_j: Kee, Nicita and Olarreaga (2008)
- Output, q_{jr}, and consumption, D_j^m: County Business Patterns (2002)
  - Data from CBP converted to NAICS 3-digit level and mapped from MSAs and Counties onto the Congressional districts (CDs) for the 107th Congress (2002) for which data is available (433 CDs)
- Employment by type of economic agent, sector, region, n_{jr}^m: County Business Patterns (2002); NBER manufacturing database
- For n_r^K / n_r: compensation of white collar (non-production)

CASE 2: WEIGHTS BY ELECTORAL OUTCOMES

Distribution of CD seats, employment, and export output

State-wide vote in Presidential election	**House election in CD**			**Total**
	Competitive	Safe Dem	Safe Rep	
Competitive	17 [0.03] (0.09)	72 [0.16] (0.09)	83 [0.22] (0.09)	172
Safe Dem	8 [0.02] (0.12)	75 [0.16] (0.27)	42 [0.09] (0.15)	125
Safe Rep	5 [0.02] (0.05)	51 [0.11] (0.12)	80 [0.20] (0.06)	136
	30	198	205	433 [1.00] (0.11)

Notes: (1) Each cell in the 3 $\times$ 3 represents "coalition" r. Each cell shows (i) the number of districts in the coalition; (ii) the proportion of manufacturing workforce in brackets; (iii) the proportion of export industry (NAICS-334 Computers) output in parentheses.

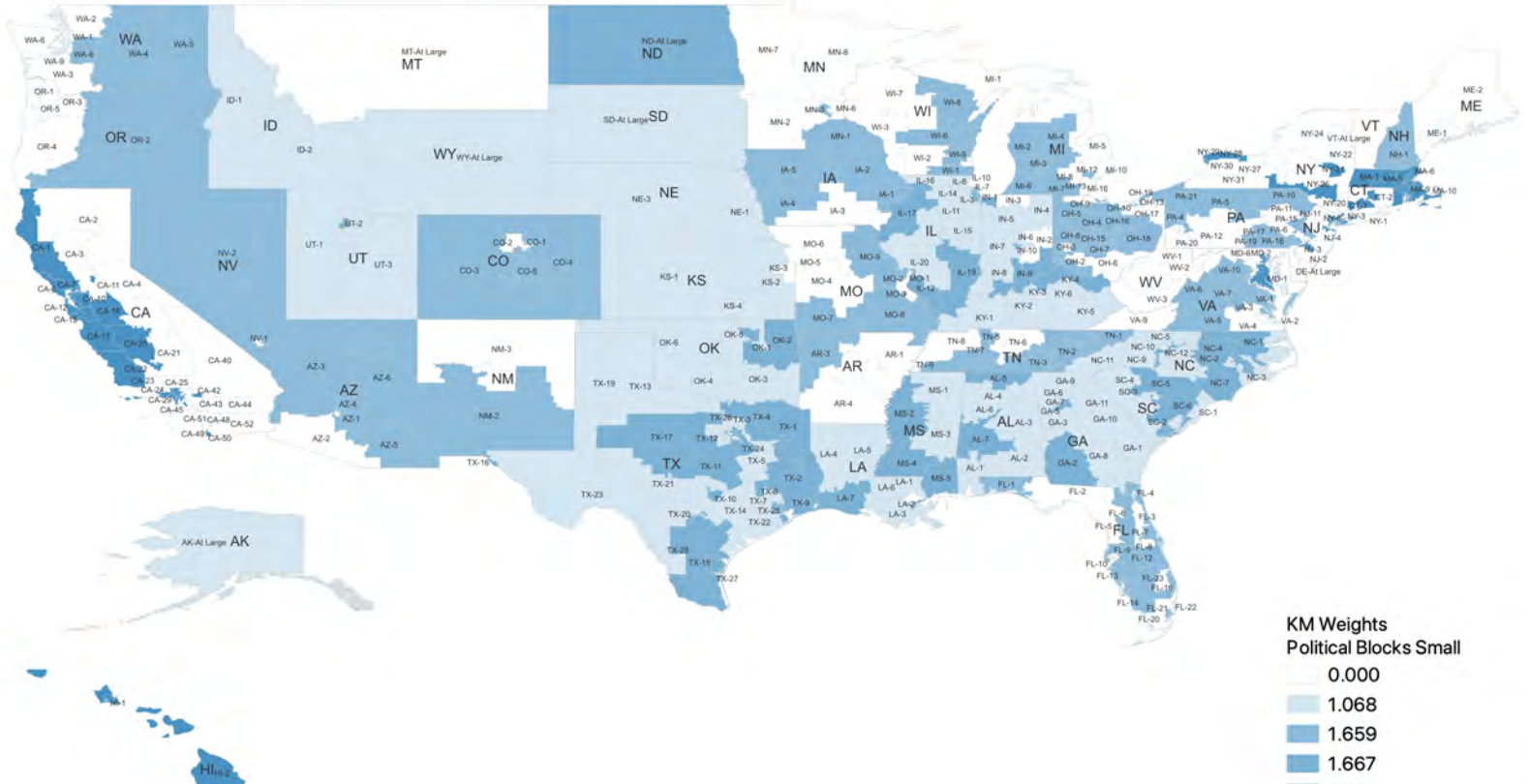
Case 2: Weights by Electoral Outcomes – Small Country

K_r^M Weight Shares (from 2SLS estimates): Small Country model. DV: *Applied Tariffs + NTMs, 2002*

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

Notes: (1) $N = 8210$. (2) Each cell (coalition r) reports: (i) K_r-share of total welfare weights; (ii) individual Γ_r^K / Γ_r^L ratio in square brackets.

Geographical distribution of Γ_r^K / Γ_r^L weights



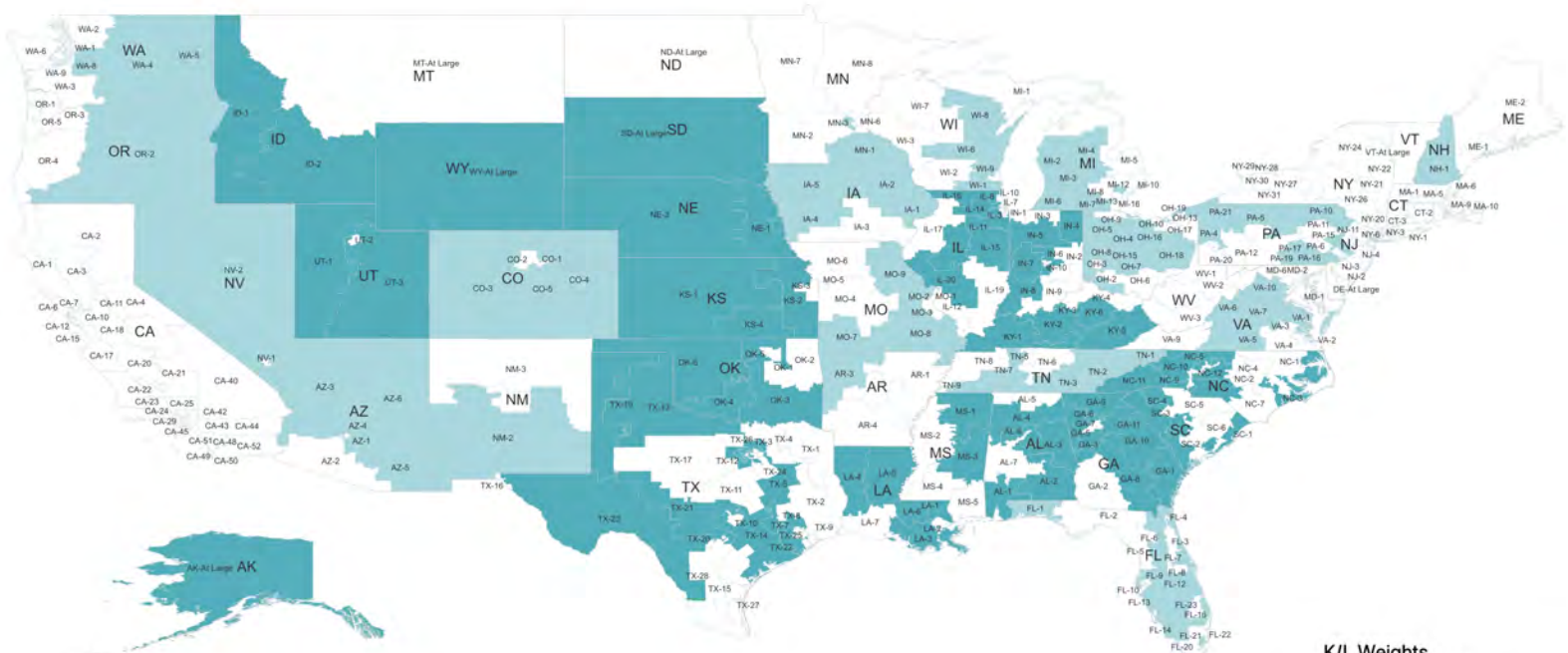
Case 2: Weights by Electoral Outcomes – Large Country

K_r^M and K^X weight shares (from 2SLS estimates). DV: *Applied Tariffs + NTMs, 2002*

State-wide Vote in Presid. Election	Districts in House elections: Competitive	Safe Dem	Safe Rep	Total
Competitive	0 [0]	0 [0]	0.081 [1.537]	0.081
Safe Dem	0 [0]	0 [0]	0 [0]	0
Safe Rep	0 [0]	0 [0]	0.113 [2.252]	0.113
Total K_r^M share	0	0	0.194	0.194
Total K^X share				0.166 [2.906]

Notes: (1) $N = 7675$. (2) Cells in **black**: (i) share of welfare weights on import-competing interests K_r^M; (ii) individual $\Gamma_r^{K^M}/\Gamma_r^L$ ratio in brackets. (3) Total K^X share: (i) aggregate share of welfare weights on export sector interests; (ii) individual Γ^{K^X}/Γ^L ratio in brackets.

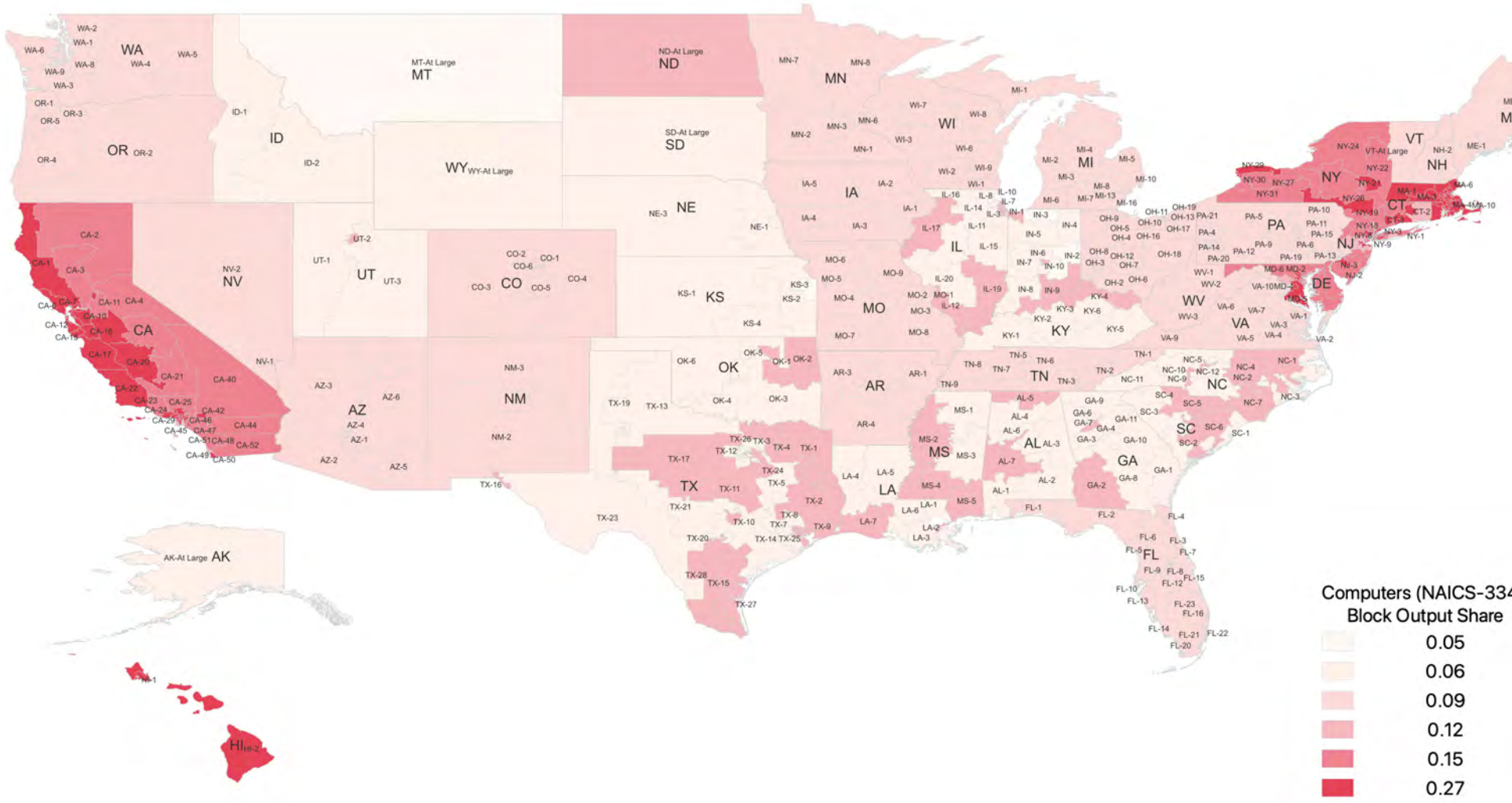
Geographical distribution of Γ_r^K/Γ_r^L weights



Case 2: Weights by Electoral Outcomes – Takeaways

- **Small country case**
  - Suppose Representative Cliff Stearns is the agenda setter (Chairman of the Commerce, Trade, and Consumer Protection Subcommittee of the powerful Ways and Means Committee, 107th Congress); Stearns represents 6th CD in Florida, a Safe Rep District in the most competitive State for the Presidency in the 2000 election
  - Agenda setter proposes an overall level of protection (tariffs + NTMs) that would be approved by: *Safe Rep States + Safe Rep District (80); Safe Dem State + Safe Dem District (75); Safe Rep State + Safe Dem District (51); Competitive State + Safe Rep District (83) (Stearns' own group)*
  - For these groupings of CDs, $(\Gamma_r^{K^M}/\Gamma_r^L) > 1$: enough support of a super-majority in Congress (289 districts), making it Presidential veto-proof
- **Large country case**
  - Same agenda setter: *Competitive State + Safe Rep District (83) (Stearns' own group); and Safe Rep State + Safe Rep*

CASE 2: COMPUTERS (NAICS 334) OUTPUT SHARE BY POLITICAL COALITIONS



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