Protection for Sale: An Empirical Investigation

Pinelopi Koujianou Goldberg, Giovanni Maggi (1999, AER)

October 29, 2024

INTRO

Research Questions:

- Is the Grossman-Helpman "Protection for Sale" model consistent with real-world data?
- What are the key structural parameters of the G-H model

Data:

-

Consumers

The representative individual's preference:

$$U = c_0 + \sum_{i=1}^{n} u_i\left(c_i\right) \tag{1}$$

The first order conditions of the utility max problem imply the inverse demand function:

$$p_i = u_i(c_i) \tag{2}$$

Let $d_i = \left[u_i'(c_i)\right]^{-1}$, then $c_i = d_i(p_i)$.

Plug back into the utility, derive the indirect utility function:

$$\begin{aligned} V &= y_i - \sum_{i=1}^{n} p_i d_i\left(p_i\right) + \sum_{i=1}^{n} u_i\left(c_i\right) \\ V &= y_i + \sum_{i=1}^{n} s_i\left(p_i\right) \text{ ,where } S_i\left(p_i\right) = u_i\left(d_i\left(p_i\right)\right) - p_i d_i\left(p_i\right) \end{aligned} \tag{3}$$

Production

- There are $n + 1$ inputs: labor and one sector specific input for each sector.
- Each of the other goods is produced from labor and the sector specific input.
- $y_i(p_i)$ is the supply function of good i.
- $\pi_i(p_i)$: The returns to specific factor i.
- By Hotelling's lemma: $\pi_i'(p_i) = y_i(p_i)$.

Aggregate consumer welfare

Aggregate the indirect utility, we obtain the aggregate consumer welfare:

$$W = \underbrace{1 + \sum_{i=1}^{n} \pi_i + \sum_{i=1}^{n} t_i^s \overbrace{M_i}^{M_i = d_i - y_i}}_{\text{Sum of aggregate income}} + \underbrace{\sum_{i=1}^{n} s_i}_{\text{Sum of utility}} \tag{4}$$

- $M_i = d_i - y_i$ is the net import.

Political structure

In some sectors $L \subset \{1, 2, \cdots n\}$ the owners of specific factors are able to form a lobby.

Let α_i denote the fraction of people that are able to form a lobby, they contribute C_i to the government.

Lobby i's aggregate welfare:

$$W_i = \pi_i + \alpha_i \left(1 + \sum_{j=1}^{n} t_j^s M_j + \sum_{j=1}^{n} s_j \right). \tag{5}$$

Then $W_i - C_i$ is the objective function of lobby i.

Government

Objective function:

$$U^G = \beta W + (1-\beta) \sum_{i \in L}^{n} C_i \tag{6}$$

where $\beta \in [0,1]$ captures the weight of welfare in the government's objective.

JOINT SURPLUS

The combination of consumer welfare and lobby's welfare:

$$\Omega = \beta W + (1 - \beta) \sum_{j \in L}^{n} W_j. \tag{7}$$

The equilibrium trade policy has the tariffs t_i^s for each sector and maximize Ω.

Equilibrium trade policy

$$\Omega = \beta W + (1-\beta)\sum_{j\in L}^{n} W_j.$$

$$= \beta\left(1+\sum_{i=1}^{n}\pi_i + \sum_{i=1}^{n}\tau_i^s M_i + \sum_{i=1}^{n} s_i\right) + (1-\beta)\left[\sum_{i=1}^{n} I_i\pi_i + \alpha_i\left(1+\sum_{j=1}^{n}\tau_j^s M_j + \sum_{j=1}^{n} s_j\right)\right]$$

$$= \beta + (1-\beta)\alpha_L + \sum_{i=1}^{n}\left[\beta + (1-\beta)I_i\right]\pi_i + \sum_{i=1}^{n}\left[\beta + (1-\beta)\alpha_L\right](t_i^s M_i + s_i) \tag{8}$$

- $\alpha_L \equiv \sum_{i\in L}\alpha_i$ represents the share of population that owns some specific factor
- I_i is a dummy that takes value one if $i \in L$.

EQUILIBRIUM TRADE POLICY

Partial derivative w.r.t. τ_i^s:

$$\begin{aligned}\frac{\partial\Omega}{\partial t_i^s} = \frac{\partial\Omega}{\partial p_i} &= (\beta+(1-\beta)\alpha_L)\cdot M_i + (\beta+1-\beta)\,\alpha_l\tau_i^s\frac{\partial M_i}{\partial p_i} + (\beta+(1-\beta)\alpha_l)\,\frac{\partial s_i\,(p_i)}{\partial p_i} \\ &\quad + (\beta+(1-\beta)I_i)\cdot\frac{\partial\pi_i}{\partial p_i} = 0 \\ &= (\beta+(1-\beta)\alpha_L)\left[M_i+\tau_i M_i'\,(p_i) - d_i\,(p_i)\right] + (\beta+(1-\beta)I_i)\cdot X_i = 0\end{aligned} \tag{9}$$

We can solve for τ_i^s:

$$t_i^s = \frac{I_i-\alpha_L}{\frac{\beta}{1-\beta}+\alpha_L}\cdot\frac{X_i}{-M_i'} \tag{10}$$

In terms of import elasticity $e_i = \frac{\partial p_i M_i}{\partial M_i p_i}$ and import-penetration ratio $z_i = \frac{M_i}{X_i}$:

$$\frac{t_i}{1+t_i} = \frac{I_i-\alpha_L}{\frac{\beta}{1-\beta}+\alpha_L}\cdot\frac{z_i}{e_i} \tag{11}$$

Econometric model

From (11),

$$\frac{t_i}{1+t_i}e_i = \frac{I_i - \alpha_L}{\frac{\beta}{1-\beta} + \alpha_L}\frac{X_i}{M_i} + \epsilon_i \\ = \gamma\frac{X_i}{M_i} + \delta I_i \frac{X_i}{M_i} + \epsilon_i \tag{12}$$

The theory predicts $\gamma = \frac{-\alpha_L}{\beta/(1-\beta)+\alpha_L} < 0$, $\delta = \frac{1}{\beta/(1-\beta)+\alpha_L} > 0$, and $\gamma + \delta > 0$.

With the estimates, we can recover the government's objective β and the fraction of population represented by a lobby α_L.

Econometric model in use

$$y_i^* = \frac{t_i^* e_i}{1 + t_i^*} = \gamma \frac{X_i}{M_i} + \delta I_i \frac{X_i}{M_i} + \boldsymbol{\epsilon}_i \tag{13}$$

$$t_i = \begin{cases} \frac{1}{\mu} t_i^* & \text{if } 0 < t_i^* < \mu \\ 0 & \text{if } t_i^* \leq 0 \\ 1 & \text{if } t_i^* \geq \mu \end{cases} \tag{14}$$

$$\frac{X_i}{M_i} = \zeta_1' \mathbf{Z}_{1i} + u_{1i} \tag{15}$$

$$I_i^* = \zeta_2' \mathbf{Z}_{2i} + u_{2i} \tag{16}$$

$$I_i = \begin{cases} 1 & \text{if } I_i^* > 0 \\ 0 & \text{if } I_i^* \leq 0 \end{cases} . \tag{17}$$

Results

Table: Results From the Basic Specification (G-H Model)

Variable	$\mu = 1$	$\mu = 2$	$\mu = 3$
X_i/M_i	-0.0093	-0.0133	-0.0155
	(0.0040)	(0.0059)	(0.0070)
$(X_i/M_i) * I_i$	0.0106	0.0155	0.0186
	(0.0053)	(0.0077)	(0.0093)
Implied β	0.986	0.984	0.981
	(0.005)	(0.007)	(0.009)
Implied α_L	0.883	0.858	0.840
	(0.223)	(0.217)	(0.214)

VARIABLES SHOULD NOT INFLUENCE PREDICTION

TABLE 2—ALTERNATIVE SPECIFICATIONS ($\mu = 1$)

Variable	Specification 1 Log-likelihood: −134.9	Specification 2 Log-likelihood: −132.06	Specification 3 Log-likelihood: −132.04	Specification 4 Log-likelihood: −130.61
X_i/M_i	—	−0.0093	−0.0096	−0.0109
		(0.0040)	(0.0043)	(0.0045)
$(X_i/M_i) * I_i$	—	0.0106	0.0105	0.0123
		(0.0053)	(0.0053)	(0.0055)
Constant	−0.0640	—	−0.0287	−0.2619
	(0.1104)		(0.1375)	(0.2559)
Unemployment	—	—	—	1.5722
				(1.5884)
Employment size	—	—	—	1.1836
				(0.8235)

Note: Dependent variable: $(t_i^* e_i/1 + t_i^*)$.

DIFFERENT THRESHOLD OF CONTRIBUTION

Table: Results from Using Alternative Thresholds to Define the Political-Organization Dummy

	Thresholds		
	$\$50,000,000$	0.1 percent of total contributions	0.1 percent of value added
Variable	Percent of organized sectors: 74	Percent of organized sectors: 84	Percent of organized sectors: 85
X_i/M_i	-0.0090	-0.1475	-0.0045
	(0.0039)	(0.0664)	(0.0025)
$(X_i/M_i) * I_i$	0.0099	0.1286	0.0075
	(0.0054)	(0.0697)	(0.0074)