Protection for Sale

Gene Grossman and Elhanan Helpman, *American Economic Review*, 1994

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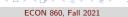ECON 860 – International Trade Theory
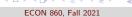Fall 2021

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- This is particularly obvious in international trade policy, where there is a general consensus that free trade will maximize national welfare under most conditions.
- However, the distributional effects of trade will give organized industry groups an incentive to lobby for trade protection.

Outline

- Paper based around a specific-factors model of trade. People in import-competing industries have a specific factor of production that they earn rents from.

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- Some industries successfully organize and lobby the government for trade protection – offer contributions to government officials based on level of protection delivered.
- Government values both contributions from lobbyists and national welfare. Maximizes its own utility function based on offers from lobbying groups.
- Groups that are organized and lobbying get protection from international trade, those that are not get import subsidies.

Existing Literature

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- Second strand, exemplified by Stigler (1971) and Hillman (1982) is to see trade policy as designed to maximize a political support function. Grossman and Helpman (1994) is more in this strand.

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- Lobbies in the model represent different industries. Lobbies offer prospective contributions to the government based on the trade policies that the government delivers. Based on the incentives created by these contributions, the government chooses a vector of tariffs and/or subsidies and implements them.

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- The economy produces $n + 1$ goods. One is a numeraire good made with one unit of labor. The other n goods that the economy produces are made with a combination of labor and a specific factor of production.
- Some of these industries are able to form effective lobby groups (the process in this model is exogenous) which then offer support to the government in return for trade protection.

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- 62% of PAC contributions were made before a Congressional candidate even had a challenger identified.
- It is thus reasonable to assume that PAC contributions are a means to influence incumbents.

Basic Game Form

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- Contribution schedule maps each policy vector that the government might choose into a contribution level.
- Contribution schedules form a Nash Equilibrium in the form of a Bernheim-Whinston (1986) menu-auction game.

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Formal Framework

- Each individual maximizes the utility function:

$$U = x_0 + \sum_{i=1}^{n} u_i(x_i)$$

where $u_i(x_i)$ is differentiable, increasing, and strictly concave, and good 0 is a numeraire good with a world and domestic price equal to 1.

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- $x_i = d_i\left(p_i\right)$ is the demand for each good as a function of the domestic price.
- $x_0 = E - \sum_{i=1}^{n} p_i d_i\left(p_i\right)$ is the demand for the numeraire good as a function of domestic prices.

Indirect Utility

- This setup gives us an indirect utility function of:

$$V(\mathbf{p}, E) = E + s(\mathbf{p})$$

where $s(\mathbf{p}) = \sum_{i=1}^{n} u_i [d_i(p_i)] - p_i d_i(p_i)$.

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- Roy's identity tell us that $y_i(p_i) = \pi_i'(p_i)$.

Tariff Revenue

- The per-capita revenue that the government gets from tariff barriers is:

$$r\left(\mathbf{p}\right) = \sum_{i=1}^{n} \left(p_i - p_i^*\right) \left[d_i\left(p_i\right) - \frac{1}{N}y_i\left(p_i\right)\right]$$

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- As with Mayer (1984), assume that the government returns this revenue as a lump-sum payment to each individual.

Lobbying Groups

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- The welfare of each industry is $V_i = W_i - C_i$, where:

$$W_i(\mathbf{p}) = l_i + \pi_i(p_i) + \alpha_i N [r(\mathbf{p}) + s(\mathbf{p})]$$

and l_i is the total labor supply and income in industry i and α_i is the fraction of the electorate that owns part of the specific factor used in i.

Government

- The government chooses to maximize the objective function:

$$G = \sum_{i=1}^{N} C_i(\mathbf{p}) + aW(\mathbf{p})$$

where $W(\mathbf{p})$ represents gross societal welfare, L is the set of industries with a lobbying group, and a is a non-negative constant representing the trade-off between societal welfare and political contributions.

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- $W(\mathbf{p})$ can be written as:

$$W(\mathbf{p}) = I + \sum_{i=1}^{N} \pi_i(p_i) + N[r(\mathbf{p}) + s(\mathbf{p})]$$

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Equilibrium Characterization

The equilibrium contribution schedule offered by the industry lobbies has the form of a Bernheim and Whinston (1986) menu auction equilibrium.

Theorem

$\left(\left\{ C_i^0 \right\}_{i \in L}, \mathbf{p^0} \right)$ *is a subgame perfect Nash equilibrium of the trade-policy game if and only if:*

1. C_i^0 *is feasible for all* $i \in L$.

2. $\mathbf{p^0}$ *maximizes* $\sum_{i \in L} C_i^0 (\mathbf{p}) + aW (\mathbf{p})$ *over the feasible policy space (i.e. government's welfare function is maximized).*

3. $\mathbf{p^0}$ *maximizes* $W_j (\mathbf{p}) - C_j^0 (\mathbf{p}) + \sum_{i \in L} C_i^0 (\mathbf{p}) + aW (\mathbf{p})$ *for each lobby* $j \in L$ *(see note below).*

4. *for every* $j \in L$, *there exists a* $\mathbf{p^j}$ *in the feasible policy set that maximizes* $\sum_{i \in L} C_i^0 (\mathbf{p}) + aW (\mathbf{p})$ *such that* $C_i^0 (\mathbf{p}) = 0$.

Equilibrium Explanation

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- The second states that the government sets trade policy to maximize its welfare given the contribution schedules offered by the lobby groups.
- The third condition states that for each lobby j, the equilibrium price vector must maximize the joint welfare of the lobby and the government, given the contribution schedules of the other lobbies.

Condition 3

- Suppose that Condition 3 were not true. Then lobby j would have an incentive to redesign the contribution schedule and give the government a contribution that would just barely induce it to choose the jointly optimal price vector (i.e., make $\sum_{i \in L} C_i^0(\mathbf{p}) + aW(\mathbf{p})$ slightly bigger), and pocket the rest of the remaining surplus for itself.

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- Condition 3 implies that a first order condition is satisfied at $\mathbf{p^0}$, that is:

$$\nabla W_j\left(\mathbf{p^0}\right) - \nabla C_j^0\left(\mathbf{p^0}\right) + \sum_{i \in L} \nabla C_i^0\left(\mathbf{p^0}\right) + a\nabla W\left(\mathbf{p^0}\right) = \mathbf{0} \qquad (1)$$

for all $j \in L$.

Local Truthfulness

- At the same time, condition 2 implies that:

$$\sum_{i \in L} \nabla C_i^0 \left(\mathbf{p^0} \right) + a \nabla W \left(\mathbf{p^0} \right) = \mathbf{0} \tag{2}$$

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- Combining equations (1) and (2) gives us:

$$\nabla C_i^0 \left(\mathbf{p^0} \right) = \nabla W_i \left(\mathbf{p^0} \right)$$

that is, the contribution schedules are truthfully revealing of the lobbies' preferences in the neighborhood of the equilibrium policy.

Global Truthfulness?

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- If $\mathbf{p}'$ were known beforehand, the other lobbies could adjust and set their contribution schedules such that $\nabla C_i^0\left(\mathbf{p}'\right) = \nabla W_i\left(\mathbf{p}'\right)$ (i.e. local truthfulness around the new equilibrium).

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- However, since the nature of a trembling hand perfect equilibrium is such that $\mathbf{p}'$ cannot be known ahead of time, the only trembling hand perfect equilibrium strategy must be such that $\nabla C_i^0\left(\mathbf{p^0}\right) = \nabla W_i\left(\mathbf{p^0}\right)$ for all feasible $\mathbf{p}$ (i.e. global truthfulness).

- If truthful strategies are used, then we have by definition that $C_j^0(\mathbf{p}) = W_j(\mathbf{p}) - B_j^0$, where B_j^0 is the net (non-negative) benefit that lobby j gets in equilibrium from its lobbying efforts.

Equilibrium Policies

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- Condition 2 implies that $\sum_{i \in L} C_i^0(\mathbf{p^0}) + aW(\mathbf{p^0}) \geq \sum_{i \in L} C_i^0(\mathbf{p}) + aW(\mathbf{p})$ for all feasible $\mathbf{p}$.

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- If $C_i(\mathbf{p}) \geq W_i(\mathbf{p}) - B_i^0$ for all $i \in L$ and all feasible $\mathbf{p}$, then:

$$\sum_{i \in L} \left(W_i\left(\mathbf{p^0}\right) - B_i^0 \right) + aW\left(\mathbf{p^0}\right) \geq \sum_{i \in L} \left(W_i(\mathbf{p}) - B_i^0 \right) + aW(\mathbf{p})$$

which, in turn, implies:

$$\sum_{i \in L} W_i\left(\mathbf{p^0}\right) + aW\left(\mathbf{p^0}\right) \geq \sum_{i \in L} W_i(\mathbf{p}) + aW(\mathbf{p}) \tag{3}$$

Weighted Maximization Problem

- Expression (3) is equivalent to stating that:

$$\mathbf{p^0} = \text{argmax} \left[\sum_{i \in L} W_i(\mathbf{p}) + aW(\mathbf{p}) \right] \tag{4}$$

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- In words, the government is maximizing an objective function in equilibrium that puts a weight of $1 + a$ on the welfare of industries that have lobbying groups and a on the welfare of industries that do not have lobbying groups.

Effect of Policy Changes on Industry Welfare

- If the equilibrium contribution schedule is differentiable and locally truthful, then the equilibrium policy will be $\mathbf{p^0}$ such that:

$$\sum_{i \in L} \nabla W_i \left(\mathbf{p^0} \right) + a \nabla W \left(\mathbf{p^0} \right) = \mathbf{0}$$

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- Look first at an industry i where i has an organized lobbying group:

$$\frac{\partial W_i (\mathbf{p})}{\partial p_j} = (\delta_{i,j} - \alpha_i) \, y_j (p_j) + \alpha_i \left(p_j - p_j^* \right) m_j' (p_j) \qquad (5)$$

where $\delta_{i,j} = 1$ if $i = j$ and zero otherwise, and $m_j (p_j) = N d_j (p_j) - y_j (p_j)$.

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where $\delta_{i,j} = 1$ if $i = j$ and zero otherwise, and $m_j (p_j) = N d_j (p_j) - y_j (p_j)$.

- The first term is an decrease in net surplus from the price increase (or an increase in surplus if $i = j$), The second term is a change in the amount of tariff revenue collected due to fluctuations in imports.

Effect of Policy Changes on Welfare for Organized Industries

- If we sum equation (5) across all $i \in L$ we get:

$$\sum_{i \in L} \frac{\partial W_i(\mathbf{p})}{\partial p_j} = (I_j - \alpha_L) y_j(p_j) + \alpha_L (p_j - p_j^*) m_j'(p_j) \tag{6}$$

where I_j is an indicator variable indicating whether or not industry j has an organized lobby, and $\alpha_L = \sum_{i \in L} \alpha_i$ is the fraction of the population who belongs to an industry represented by an organized lobby.

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- Equation (6) tells us that, starting from free-trade prices, industries with a lobby benefit from a small increase in prices due to a tariff on their own good, and get harmed by an increase in the prices of other goods.

Effect of Policy Changes on Aggregate Welfare

- If we take the derivative of national welfare with respect to a tariff-induced price change, we get:

$$\frac{\partial W}{\partial p_j} = \left(p_j - p_j^*\right) m_j'\left(p_j\right) \tag{7}$$

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- It is clear in equation (7) that national welfare is maximized at free trade (i.e. when $p_j = p_j^*$).

- Combining equations (6) and (7), we can find the equilibrium price for p_j by setting:

$$\left(I_j - \alpha_L\right) y_j\left(p_j\right) + \alpha_L \left(p_j - p_j^*\right) m_j'\left(p_j\right) + a \left(p_j - p_j^*\right) m_j'\left(p_j\right) = 0 \tag{8}$$

Equilibrium Tariffs

- With a little bit of algebra, we can derive the following from equation (8):

$$\frac{p_j - p_j^*}{p_j} = \frac{(I_j - \alpha_L)}{(a + \alpha_L)} \frac{y_j(p_j) / m_j(p_j)}{-m_j'(p_j) p_j / m_j(p_j)}$$

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- If we then define $z_j(p_j) = \frac{y_i(p_i)}{m_i(p_i)}$ as the inverse of the import penetration ratio,

$e_j(p_j) = -\frac{m_j'(p_j)p_j}{m_j(p_j)}$ as the elasticity of demand for imports, and $\tau_j = \frac{p_j - p_j^*}{p_j^*}$ as the ad-valorem tariff, we can rewrite this equation as:

$$\frac{\tau_j}{1 + \tau_j} = \frac{(I_j - \alpha_L) z_j}{(a + \alpha_L) e_j} \qquad (9)$$

Equilibrium Tariffs

- With a little bit of algebra, we can derive the following from equation (8):

$$\frac{p_j - p_j^*}{p_j} = \frac{(l_j - \alpha_L)}{(a + \alpha_L)} \frac{y_j(p_j)/m_j(p_j)}{-m_j'(p_j) p_j/m_j(p_j)}$$

- If we then define $z_j(p_j) = \frac{y_i(p_i)}{m_i(p_i)}$ as the inverse of the import penetration ratio,

  $e_j(p_j) = -\frac{m_j'(p_j)p_j}{m_j(p_j)}$ as the elasticity of demand for imports, and $\tau_j = \frac{p_j - p_j^*}{p_j^*}$ as the ad-valorem tariff, we can rewrite this equation as:

$$\frac{\tau_j}{1 + \tau_j} = \frac{(l_j - \alpha_L)}{(a + \alpha_L)} \frac{z_j}{e_j} \tag{9}$$

- Note that $z_j(p_j)$ and $e_j(p_j)$ are endogenous variables, potentially affected by the initial price level.

Comparative Statics

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  2. There are no organized lobbies so that $\alpha_L = 0$ and $I_j = 0$ for all j.
  3. All industries have organized lobbies, so that $\alpha_L = 1$ and $I_j = 1$ for all j.

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  3. All industries have organized lobbies, so that $\alpha_L = 1$ and $I_j = 1$ for all j.
- A particular industry will have zero tariffs if e_j approaches infinity or $z_j = 0$.

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Empirical Tests

- Goldberg and Maggi (1999) perform an empirical test of the Grossman-Helpman model. Starting with equation (9), they derive the following regression equation:

$$\frac{\tau_j}{1 + \tau_j} = \frac{(I_j - \alpha_L)}{(a + \alpha_L)} \frac{z_j}{e_j}$$

$$\frac{\tau_j}{1 + \tau_j} e_j = \frac{(I_j - \alpha_L)}{(a + \alpha_L)} z_j$$

$$\frac{\tau_j}{1 + \tau_j} e_j = \frac{I_j}{(a + \alpha_L)} z_j - \frac{\alpha_L}{(a + \alpha_L)} z_j$$

$$\frac{\tau_j}{1 + \tau_j} e_j = \beta_0 + \beta_1 \frac{y_j}{m_j} + \beta_2 I_j \frac{y_j}{m_j} + \varepsilon_j$$

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- The testable hypotheses generated by this regression specification are:

$$\beta_1 < 0, \ \beta_2 > 0, \ \beta_1 + \beta_2 > 0$$

Goldberg-Maggi Results

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- Since tariffs are not a major component of protection in the U.S., what they use as a proxy for tariff protection is the coverage ratios of NTBs in the sector in question.
- From here, they run the regression and estimate the following coefficients:

$$\beta_1 = -0.0083 \text{ s.e.} \quad (0.0040)$$

$$\beta_2 = 0.0106 \text{ s.e.} \quad (0.0053)$$

- From the estimated coefficients above, it appears that all three hypotheses are satisfied, though the third one only weakly.

Goldberg-Maggi Hypothesis Testing

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- Both of these parameters seem rather high.

Gawande and Bandyopadhyay (2000) Extension

- Gawande and Bandyopadhyay (2000) extend the analysis by adding an intermediate good and estimating the following equation:

$$\frac{\tau_j}{1 + \tau_j} e_j = \frac{l_j}{(a + \alpha_L + \alpha_X)} \frac{z_j}{e_j} - \frac{\alpha_L}{(a + \alpha_L + \alpha_X)} \frac{z_j}{e_j} + \frac{p_X}{e_j m_j} \frac{\partial m_X}{\partial p_j} \tau_X$$

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- In addition to the three hypotheses from Goldberg and Maggi, they also predict that protection in industry j will be increasing in tariffs on intermediate goods X.
- They also add some control variables for industry concentration and instrument for the endogenous variables.

- Their implied value of a from their analysis is even larger than Goldberg and Maggi: $a = 3175$.

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- Eicher and Osang (2002) also estimate the GH model, but dispense with the Truthful Nash Equilibrium assumption, and measure lobbying contributions directly. They find much smaller estimates of a and α_L depending on their specification.

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Summary and Extensions

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- Lobbies make offers of political contributions as functions of a vector of trade policies, using a Bernheim-Whinston menu auction game to derive a Nash Equilibrium.

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- First suggestion is modeling imported intermediate inputs, so that lobby groups have a stronger opinion about tariffs on certain goods. Gawande and Bandyopadhyay do this to some extent.
- Second extension is to incorporate policy interdependence among large trading economies. Trade protection may have relevant terms of trade effects that can be resolved through negotiations. Bagwell and Staiger (2002) moves in this direction.
- One could also speculate on what could happen if there is more than one government agent to lobby. Hauk (2011) [*cough*... shameless job market paper plug... *cough*] does this.