Topic 4: Political Economy and Trade Policy

Articles:


Motivation (Grossman and Helpman, 1995)

- When asked “why no free trade?”, most international economists respond “it must be politics”

- In representative democracies, trade policy shaped not only by general electorate, but by special interests that lobby for what may be socially costly policies

- Two key approaches to modeling political process:
  - political competition: parties announce policies they will implement if elected (Magee et al., 1989)
  - political support: incumbent governments set policies to maximize political support (Stigler, 1971)

- Paper adopts latter approach in order to explain structure of trade protection
The Model

- Small economy where all individuals have identical preferences, but different factor endowments; each maximizes utility:

\[ u = x_0 + \sum_{i=1}^{n} u_i(x_i) \] (1)

where \( x_0 \) is consumption of good \( 0 \), and \( x_i \) consumption of goods \( i = 1,2,\ldots,n \)

\( u_i(.) \) are differentiable, increasing, and strictly concave

- Good 0 is *numeraire* with world and domestic price of 1; \( p_i^* \) is world price of good \( i \), and \( p_i \) is domestic price

- Individual spending \( E \) consumes \( x_i = d_i(p_i) \) of \( i \), where demand function is inverse of \( u'_i(x_i) \) and expenditure on *numeraire* good is \( x_0 = E - \sum_i p_i d_i(p_i) \)
The Model

- Indirect utility takes form:

\[ V(p, E) = E + s(p) \]  \hspace{1cm} (2)

where \( p = (p_1, p_2, \ldots, p_n) \) is vector of domestic prices, and consumer surplus is,

\[ s(p) = \sum_i u_i [d_i(p_i)] - \sum_i p_i d_i(p_i) \]

- Good 0 produced from labor alone under constant returns with an input-output coefficient of 1, labor supply being large enough that wage rate equals one

- Production of \( x_i \) uses labor and sector-specific inputs under constant returns, where specific factors are inelastic in supply

- With wage rate fixed, aggregate reward to specific factor in \( i \) depends on domestic price of \( i \), \( \pi_i(p_i) \)
The Model

- Government can implement trade taxes and subsidies, which drive wedge between domestic and world prices; net revenue/capita from all taxes and subsidies is:

\[ r(p) = \sum_i (p_i - p_i^*) \left[ d_i(p_i) - \frac{1}{N} y_i(p_i) \right] \]

(3)

where \( N \) is total voting population, and domestic output of good \( i \) is \( y_i(p_i) = \pi'_i(p_i) \)

- Government redistributes revenue uniformly to all voters, so \( r(p) \) is net transfer to each one

- Typical individual derives income from wages and transfers, plus that from ownership of sector-specific inputs – income tied to production of good \( i \), hence they have direct stake in trade taxes/subsidies
The Model

- In some set of sectors $L$, specific-factor owners organize into lobbies making political contributions; remaining sectors/individuals make no contributions.

- Lobby in sector $i$ makes contribution contingent on trade-policy vector of government; $C_i(p)$ is contribution schedule of $i$, designed to maximize total welfare of members, i.e., income plus surplus less contributions.

- Joint welfare of lobby $i$ is $V_i = W_i - C_i$ where $W_i$ is gross-of-contributions joint welfare:
  \[ W_i(p) = \ell_i + \pi_i(p_i) + \alpha_i N[r(p) + s(p)] \]  
  (4)
  where $\ell_i$ is total labor supply (income) of owners of specific factors used in $i$ and $\alpha_i$ is share of population owning some of that factor.
The Model

- Contributions can be used to finance campaign spending, and voters more likely to re-elect government delivering high standard of living

- Government objective function is:

\[
G = \sum_{i \in L} C_i(p) + aW(p) \quad a \geq 0
\]  

(5)

\(W\) is aggregate, gross-of-contributions welfare, i.e., aggregate income plus trade tax revenues plus consumer surplus:

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

(6)

- Two-stage non-cooperative game where lobbies simultaneously choose contribution schedules in first stage, government sets policy in second stage
Nash Equilibrium

Equilibrium is:

- set of contribution functions \( \{C_i^0(p)\} \), one for each lobby group, where each maximizes joint welfare given other contribution schedules and expected political optimization by government

- domestic price vector \( p^0 \) maximizing government’s objective taking contribution schedules as given

Game has structure of menu-auction problem (Bernheim and Whinston, 1986) – in this case allow government (auctioneer) choice set of domestic price vectors to be continuous
Nash Equilibrium

- \( \bar{\mathcal{P}} \) is set of price vectors, each domestic price lying between minimum \( p_i \) and maximum \( \bar{p}_i \)

- Drawing on Lemma 2 of Bernheim and Whinston, equilibrium of trade policy game is:

\[
(\{C_i^0\}_{i \in L}, p^0) \text{ is a subgame - perfect equilibrium of trade - policy game iff:}
\]

(a) \( C_i^0 \) is feasible

(b) \( p^0 \) maximizes \( \sum_{i \in L} C_i^0(p) + aW(p) \) on \( \bar{\mathcal{P}} \)

(c) \( p^0 \) maximizes \( W_j(p) - C_j^0(p) + \sum_{i \in L} C_i^0(p) + aW(p) \) on \( \bar{\mathcal{P}} \) for every \( j \in L \)

(d) for every \( j \in L \) there exists a \( p^j \in \bar{\mathcal{P}} \) that maximizes \( \sum_{i \in L} C_i^0(p) + aW(p) \) on \( \bar{\mathcal{P}} \) such that \( C_j^0(p^j) = 0 \)
Nash Equilibrium

(a) Restricts each lobby’s contribution schedule to be feasible, i.e., non-negative and no greater than aggregate income of lobby members

(b) Given contribution schedules offered by lobbies, government sets trade policy to maximize its welfare

(c) For every lobby $j$, equilibrium price vector must maximize joint welfare of lobby and government, given contribution schedules of other lobbies, i.e., no unexploited profit opportunities can exist for any lobby

If not the case, lobby $j$ could reformulate policy bids to induce government to choose jointly optimal price vector and thereby appropriate much of surplus from switch in policy
Nash Equilibrium

Assume lobbies’ contribution functions are differentiable around equilibrium \( p^0 \), implies that if \( p^0 \) maximizes \( V_j + G \), then first-order condition is satisfied:

\[
\nabla W_j^0(p^0) - \nabla C_j^0(p^0)
\]

\[
+ \sum_{i \in L} \nabla C_j^0(p^0) + a \nabla W(p^0) = 0 \quad \text{for all } j \in L
\]

Government maximization of \( G \) requires:

\[
\sum_{i \in L} \nabla C_i^0(p^0) + a \nabla W(p^0) = 0
\]

Taken together, (7) and (8) imply:

\[
\nabla C_i^0(p^0) = \nabla W_i(p^0) \quad \text{for all } i \in L
\]

(9) establishes contribution schedules are locally truthful around \( p^0 \), i.e., each lobby sets schedule so that marginal change in contribution for small change in policy matches effect on lobby’s gross welfare.
Local Truthfulness

$C_i$ \hspace{1cm} $p_i$

Lobby indifference curve

Government indifference curve

Contribution schedule

$G$ $L$ $E$ $E'$ $C$
Truthful Nash Equilibrium

- Equilibrium price vector of truthful Nash equilibrium (TNE) satisfies:

\[
p^0 = \arg\max_{p \in \bar{p}} \left( \sum_{j \in L} W_j(p) + aW(p) \right)
\]

(10) States that in equilibrium, truthful contribution schedules induce government to behave as if it were maximizing a social-welfare function that weights different members of society differently.

Individuals in lobby group get weight of \(1+a\), others not represented getting smaller weight of \(a\) – rationalizes reduced-form political support functions used in literature.
Structure of Protection

- Sum (9) over $i$ and substitute into (8):

$$\sum_{i \in L} \nabla_i W_i(p^0) + a \nabla W(p^0) = 0 \quad (11)$$

(11) Characterizes equilibrium domestic prices supported by differentiable contribution functions

- Now calculate how marginal policy changes affect welfare of various groups in society; looking at members of lobby $i$, find from (3) and (4) that:

$$\frac{\partial W_i}{\partial p_j} = (\delta_{ij} - \alpha_i) y_j(p_j) + \alpha_i (p_j - p_j^*) m'_j(p_j) \quad (12)$$

where $m_j(p_j) \equiv N_{d_j}(p_j) - y_j(p_j)$ denotes the net import demand function and $\delta_{ij}$ is an indicator variable that equals 1 if $i=j$, and 0 otherwise
Structure of Protection

- (12) states that lobby $i$ gains from an increase in price of $i$ above its free trade level, and gains from a decrease in price of any other ($m_j'<0$)

- Specific-factor owners benefit more from an increase in the price of their industry’s output the larger is free-trade supply of good

- Benefit to lobby $i$ of decline in price of good $j$ falls as number of members in that lobby falls, and vanishes in the limit when $\alpha_i=0$

- Summing (12) over $i \in L$:

\[
\sum_{i \in L} \frac{\partial W_i}{\partial p_j} = (I_j - \alpha_L) y_j(p_j) + \alpha_L (p_j - p_j^*) m_j'(p_j)
\]

where $I_j \equiv \sum_{i \in L} \delta_{ij}$ equals 1 if industry $i$ is organized, and $\alpha_L \equiv \sum_{i \in L} \alpha_i$ denotes fraction of voters in a lobby
Structure of Protection

- (13) shows that starting from free-trade prices, lobby members as a whole benefit from small increase in domestic price of any good produced by an organized industry and from small decline in price of any good produced by an unorganized industry ($\alpha_L > 0$)

- Effect of marginal price change on welfare is, using definition of $W$ in (6):

$$\frac{\partial W}{\partial p_j} = (p_j - p_j^*)m'_j(p_j)$$

(14)

Showing that marginal deadweight loss grows as economy deviates farther from free trade

- Substituting (13) and (14 into (11) allows solution for domestic prices in political equilibrium
Structure of Protection

- Result expressed in terms of *ad valorem* taxes/subsidies, i.e., \( t_i^0 \equiv (p_i^0 - p_i^*) / p_i^* \)

If lobbies use contribution schedules that are differentiable around equilibrium, and if equilibrium is in interior of \( \bar{\mathcal{P}} \), government chooses taxes and subsidies satisfying:

\[
\frac{t_i^0}{1 + t_i^0} = \frac{l_i - \alpha_L (z_i^0 / e_i^0)}{a + \alpha_L (z_i^0 / e_i^0)} \quad \text{for } i = 1, 2, \ldots, n
\]

where \( z_i^0 = y_i(p_i^0) / m_i(p_i^0) \) is the equilibrium ratio of domestic output to imports (negative for exports), and elasticity of import demand or export supply (former positive, latter negative) is \( e_i^0 = -m_i'(p_i^0)p_i^0 / m_i(p_i^0) \)
Structure of Protection

- Result is a modified Ramsey rule: *ceteris paribus*, industries with high import demand or high export supply elasticities (in absolute value), have smaller *ad valorem* deviations from free trade.

- This result follows for two reasons:
  - government bears political cost from creating deadweight loss (if \( a > 0 \)); hence, it will prefer to raise contributions from sectors where cost is low.
  - even if \( a = 0 \), if \( \alpha_L > 0 \), members of lobbies as a group bear deadweight loss from trade policy; owners of specific factors in industries other than \( i \) bid to avoid protection in \( i \), the greater the social cost.
Structure of Protection

Deadweight loss issues modified by political variables in determination of equilibrium structure of protection:

- all sectors with lobbies protected by import tariffs/export subsidies, and sectors without representation face import subsidies and export taxes; i.e., organized lobbies raise prices where they get profit income, and lower prices of goods they consume

- political power of organized lobbies reflected in ratio of domestic output to imports – with large domestic output, specific-factor owners gain from price increase; but, for a given import demand elasticity, economy has little to lose from protection when volume of imports is low
Structure of Protection

- the less weight attached to aggregate welfare compared to campaign financing, the larger are trade taxes/subsidies; however, even if $a=0$, interest groups will not want distortions to grow too large

- as share of voters that are members of a lobby increases, rates of protection for organized industries decline; in limit if all voters are in lobby ($\alpha_L=1$) and all lobbies are represented ($I_i=1$ for all $i$), free trade prevails in all markets – groups neutralize each other

- if all interest-group members are small fraction of voting population, ($\alpha_L=0$) no trade taxes/subsidies applied to goods not represented by a lobby ($I_i=0$) – when political contributors are few, stand little to gain from intervention in sectors other than their own
Motivation (Freund and Özden, 2008)

- Evidence suggest industries experiencing losses more likely to get protection, e.g., Trefler (1993) finds it is higher where import penetration has increased.

- Not consistent with models predicting protection should be applied to expanding sectors.

- Freund and Özden (2008) construct political support model where preferences display behavioral characteristics such as loss aversion and reference dependence.

- Changes dynamics of protection: standard effect – protection is increasing in output of domestic industry; behavioral effect – protection increases after negative shock.
Model

- Specific-factors model with lobbying for protection and incorporate behavioral assumptions

- Key insight is that welfare is dependent on both current state and change in states; following Kahneman and Tversky (1991):
  - reference dependence: gains and losses relative to reference point matter
  - loss aversion: losses have larger effect on welfare than gains
  - diminishing sensitivity: marginal value of gains and losses decrease with their size

- Introduce elements into Grossman and Helpman (1994)
The Model

- $n+1$ consumption goods, where good 0 is *numeraire*, produced with labor alone under constant returns, $y_0 = L_0$
- Enough labor to ensure positive supply of good 0, price and wage rate set at one; goods 1, ..., $n$ require labor and sector-specific input fixed in supply, produced under constant returns
- Rewards to owners of specific inputs determined by domestic price $p_i$, denoted by $\pi_i(p_i)$, and supply of $i$ is denoted by $y_i = \pi_i'(p_i)$
- Economy comprises individuals with identical preferences deriving utility from consuming $n+1$ goods and from deviations from reference-dependent utility
The Model

- Each individual maximizes:

$$U = x_0 + \sum_{i=1}^{n} u_i(x_i) - lh\left( \bar{U} - x_0 - \sum_{i=1}^{n} u_i(x_i) \right), \quad h' > 0, \quad h'' < 0, \quad h(0) = 0$$

$x_0$ is consumption of good 0, and $x_i$ consumption of good $i$; $u_i(.)$ are differentiable, increasing, and strictly concave.

Individual demand is $x_i = d_i(p_i)$ of $i$, where demand function is inverse of $u'_i(x_i)$, and $x_0 = E - \sum_i p_i d_i(p_i)$, where $E$ is income.

- Each person owns only one type of sector-specific input, and assume ownership levels are identical across individuals.
The Model

- Behavioral features introduced through $h(.)$, which is increasing in difference between reference utility $\bar{U}$ and actual utility ($h'(.)>0$), marginal increase declining in size of loss ($h''(.)<0$)

- $l$ is an indicator variable, where $l=1$ if utility falls below reference level

- Indirect utility of individual owning specific-factor $i$ is:

$$V_{p_i}(p) = E + s(p) - l_i h \left( \frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N} \right), \quad h' > 0, \ h'' < 0, \ h(0) = 0 \quad (1)$$

where $p$ is domestic price vector, $E$ is constant labor income, $\alpha_i$ is fraction of population $N$ owning specific-factor $i$, and $s(p)$ is consumer surplus
The Model

- Income from specific factor determines extent of loss aversion, and as reward level $\pi_i(p_i)$ strictly increasing in $p_i$, reference reward level corresponds to unique reference price $\bar{p}_i$.

- Net per capita tariff revenue is:

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

(2)

- Joint welfare of lobby $i$, excluding loss aversion is:

$$W_i(p) \equiv \ell_i + \pi_i(p_i) + \alpha_i N[r(p) + s(p)]$$  

(3)

- Loss aversion of lobby $i$ is:

$$H_i(p) = -l_i \alpha_i Nh \left( \frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N} \right), \quad h' > 0, \quad h'' < 0$$  

(4)
The Model

- With loss aversion, welfare of lobby $i$ is:
  \[ G_i(p) = W_i(p) + H_i(p) \] (4)
  Interests of lobby $i$ are aligned, but opposed to other lobbies; if profits fall below reference level, $l_i = 1$, lobby experiences loss through $h(.)$, in addition to direct loss from decline in $\pi_i(p_i)$

- Social welfare for economy given by:
  \[ W(p) = \ell + \sum_{i=1}^{n} \pi_i(p_i) + N[r(p) + s(p)] \] (5)
  where loss aversion for whole economy is:
  \[ H(p) = -\sum_{i \in L} \alpha_i Nh \left( \frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N} \right) \] (6)
  $L$ is set of sectors with prices below reference level
The Model

- Modified social welfare function is:
  \[ G(p) = W(p) + H(p) \]  \( (7) \)

- As country is small, has no influence over \( p^* \), domestic prices being determined by trade policy vector; government cares about social welfare and values political contributions from organized lobbies \( O \):
  \[ \Omega = \sum_{i \in O} C_i(p) + aG(p) \quad a \geq 0 \]  \( (8) \)

- Nash game is same as in Grossman and Helpman (1994), equilibrium price vector being:
  \[ p^0 = \underset{i \in O}{\text{argmax}} \sum_{i \in O} G_i(p) + aG(p) \]  \( (9) \)

\( G_i(p) \) and \( G(p) \) being defined in (4) and (7)
Trade Policy

- Discontinuity in welfare function at reference price due to loss aversion; to solve for trade policy divide into three cases:

- CASE 1: Equilibrium price above reference price $p_i^0 > \bar{p}_i$

Here $H(p)=0$, and standard Grossman and Helpman (GH) result on structure of protection holds:

$$\frac{t_i^0}{1+t_i^0} = \frac{l_{oi} - \alpha_o}{a + \alpha_o} \left( \frac{z_i^0}{e_i^0} \right)$$

(10)

$l_{oi}$ is an indicator variable equal to one if sector $i$ is organized, and zero otherwise, $\alpha_o$ is fraction of population that is organized, $z_i^0$ is ratio of domestic output to imports, and $e_i^0$ is elasticity of import demand/export supply
Trade Policy

- There is range of world prices that lie below reference price, but equilibrium prices end up above reference prices due to lobbying and resulting protection.

- Equilibrium price below reference price $p_i^0 \leq \bar{p}_i$.

Optimal domestic price can be written as:

$$\arg\max \sum_{i \in O} [W_i(p) + H_i(p)] + a[W(p) + H(p)]$$

In Figures 1 and 2, domestic price is on horizontal axis for industry $i$, welfare on vertical axis, with $aW(p) + W_i(p)$ and $aH(p) + H_i(p)$ drawn as functions of $p_i$, given $p_i^*$. $aW(p) + W_i(p)$ has maximum at GH equilibrium, $p_i^{GH}$. 
Trade Policy

- Loss aversion function $aH(p)+H_i(p)$, is convex and takes negative value when domestic price is below reference price.

- Welfare $\Omega_i(p)$ cannot be at maximum if either $p_i \leq p_i^{GH}$ or $p_i \geq \overline{p}_i$ (see paper for proof); alternatives are either an interior solution $p_i^{GH} < p_i \leq \overline{p}_i$ or corner solution $p_i = \overline{p}_i$.

- CASE 2: Loss aversion present and FOC satisfied:

As $\Omega'(p_i^{GH}) > 0$, $p_i^0$ is a unique maximum (Figure 1); government chooses tariff level such that domestic price is $p_i^0$. First-order condition is:

$$(l_{oi} - \alpha_o)y_i(p_i) + (a + \alpha_o)(p_i - p_i^*)m_i'(p_i)$$

$$+(a + l_{oi})y_i(p_i)h_i'\left(\frac{\pi(\overline{p}_i) - \pi(p_i)}{\alpha_iN}\right) = 0$$
Figure 1: Welfare Function and Loss Aversion – Interior Solution

- $aW + W_i$
- $\Omega$
- $p_i^*$
- $p_i^{GH}$
- $p_i$
- $aH + H_i$
Trade Policy

Optimal trade tax is:

\[
\frac{t_i^0}{1+t_i^0} = \frac{(l_{oi} - \alpha_o) + (a + l_{oi})h' \left( \frac{\Pi(p_i) - \Pi(p_i)}{\alpha_i N} \right)}{a + \alpha_o} \left( \begin{array}{c} z_i^0 \\ e_i^0 \end{array} \right)
\]  \hspace{1cm} (11)

Behavioral term [...] has important implications – compared to GH if all sectors are organized \((l_{oi}=1)\) and everyone is in lobby group \(\alpha_o=1\), trade is still distorted if some experience loss aversion at free trade i.e.:

\[
\frac{t_i^0}{1+t_i^0} = h'(.) \left( \begin{array}{c} z_i^0 \\ e_i^0 \end{array} \right)
\]  \hspace{1cm} (12)

(12) is equilibrium tariff in loss-making industry if all sectors are organized, i.e., tariffs compensate for loss aversion
Trade Policy

CASE 3: Loss aversion present and FOC not satisfied in region $p_i^{GH} < p_i \leq \bar{p}_i$

First, $\Omega'(p_i^{GH}) > 0$ - implies $aH(p)+H_i(p) > aW(p)+W_i(p)$ in absolute value in entire range; therefore, $\Omega(p_i^0)$ is increasing and reaches maximum at $\bar{p}_i$ (Figure 2)

Loss aversion below is $\bar{p}_i$, so large that marginal gain from reduction in loss aversion is always greater than marginal loss in weighted social welfare from protection, i.e., $aH'(p)+H'_i(p) > aW'(p)+W'_i(p)$

Government chooses trade policy so that domestic price is $\bar{p}_i$, but once reference price is reached, loss aversion disappears, any further increase in tariff lowering government welfare
Figure 2: Welfare Function and Loss Aversion – Corner Solution

- $aW + W_i$
- $p_i^*$
- $p_i^{GH}$
- $\bar{p}_i$
- $aH + H_i$

Welfare vs. Domestic price
World Prices and Protection

- How does equilibrium level of protection and domestic prices respond to changes in world prices? CASE 2 vs. CASE 3

- Starting with CASE 1, no loss aversion, and GH result holds, and recalling that for range of world prices less than reference price $\bar{p}_i$, equilibrium domestic price may still exceed reference price due to lobbying

Let $p_i^A$ be world price for which domestic price in GH equilibrium is exactly equal to $\bar{p}_i$ (Figure 3)

Suppose world price falls by $\epsilon$, such that $p_i^* = p_i^A - \epsilon$, loss aversion matters – we know $W'(p_i^A) + aW_i'(p_i^A) = 0$, and $H'(p_i^*) + aH_i'(p_i^*) > 0$ implying that $G'(p_i^*) + aG_i'(p_i^*) > 0$ if $\epsilon$ is small enough, i.e., CASE 3
World Prices and Protection

- As $\varepsilon$ increases, world price falls farther, and eventually switch from corner to interior solution (CASE 2); any additional decline in world price $p_i^*$ translates into decline in domestic price $p_i^0$; i.e., distortion from tariff increases and weakening of loss aversion effect.

- Figure 4 shows equilibrium protection level and world price – intermediate section of world prices where trade policy is used to shelter domestic sector.

- In this region, domestic price set exactly equal to reference level, tariff level adjusting exactly to keep domestic price constant as world price falls.

- Below $p_i^B$, there is protection, but does not raise domestic price to reference level.
World Prices and Protection

- Traditional political economy models predict positive monotonic relationship between protection and world prices.
- As in GH model, firms still receive increasing protection when world price is high, i.e., competitive export sectors.
- Region of compensating protection show that declines in world price trigger demands for increased protection.
- Protectionism implemented in sectors that still have significant output and employment, but are starting to lose relative competitiveness.