The Political Economy of International Factor Mobility

Giovanni Facchini
Department of Economics
University of Illinois

Gerald Willmann
Department of Economics
Universität zu Kiel

prepared for
Presentation at Konstanz
January 2003

the paper is available for download at
`http://siepr.stanford.edu/papers/pdf/00-20.pdf`

Outline of talk

- Introduction
- Related Literature
- The Factor Protection Game
- Equivalence of Tariffs and Quotas
- Empirical Test
- Conclusions

Motivation

- Free international movement of production factors is efficient
- Countries customarily use their sovereignty to restrict immigration and to influence the flows of foreign direct investment.
- Substantial evidence on the role of pressure groups in shaping policy outcome
- Complementarities in production are important

Examples for labor:

- Chinese Exclusion Act (1882)
- Literacy Test (1917)
- Immigration and Reform and Control Act (1986)
- Silicon Valley executives *trooped* before congress to increase the number of H1B visas (1998)

for capital:

- Restrictions on capital mobility used to be quite common
- Today extensive subsidization of FDI — examples from the US:

Year	Investor	Dollars per Job
1980	Honda	4000
early 1980s	Nissan	17000
1984	Mazda-Ford	14000
mid-1980s	Mitsubishi-Chrysler	35000
mid-1980s	Toyota	50000
mid-1980s	Fuji-Isuzu	51000
1992	BMW	70000
1993	Mercedes-Benz	168000

Table 1: FDI Subsidies (Oman, (2000))

Roadmap

- Propose a theory of the endogenous formation of policy towards the international mobility of production factors.
- Determine equilibrium policy as a result of the interaction of domestic interest groups with incumbent politicians driven by electoral considerations.
- Highlight the role of complementarities among production factors.
- Test the implications of our model.

Related Literature

1. Int'l Factor Mobility
   (a) Labor
      - Benhabib (1996)
      - Razin, Sadka and Swagel (1998)
      - Scholten and Thum (1996)

   (b) Capital
      - Haaparanta (1997)
      - Biglaiser and Mezzetti (1997)

2. Trade in Final Goods
   - Grossman and Helpman (1994/95)
   - Levy (1999)
   - Goldberg and Maggi (1999)
   - Gawande et al. (2000/01)
   - Mc Calman (2000)
   - Eicher and Osang (2001)

3. Theoretical Framework
   - Bernheim and Whinston (1986)
   - Dixit, Grossman and Helpman (1997)

The Model

- Home is small country
- $I = \{1, ..., n\}$ is the set of production factors
- $\Lambda \subseteq I$ (exogenous) subset of organized factors
- One output good, DRTS technology: $Y = F(L_1, ..., L_n)$
- $\pi(\mathbf{w})$ is the profit function
- ℓ_i is domestic factor supply, L_i^D is domestic factor demand, $m_i = L_i^D - \ell_i$ is the amount of factor i imported
- Output price normalized to 1
- w_i, w_i^* are the domestic and foreign *real* prices of factor i
- Government controls international factor flows
- M agents
- $\alpha_i = \frac{M_i}{M}$ share of the population supplying factor i

The Factor Protection Game

Agents play a non-cooperative *menu auction* à la Bernheim and Whinston (1986)

- 1st stage: lobbying factors present government (the auctioneer) with contribution schedules $B_i(\mathbf{w})$
- 2nd stage: Government sets domestic price vector $\mathbf{w} \in \mathbf{W}$ (or equivalently tariff or quota) and collects contributions

Payoffs:

- Factor i's *gross* payoff $g_i(\mathbf{w}) = w_i \ell_i + \alpha_i [\pi + \sum_{k \in I} (w_k - w_k^*)(L_k^D - \ell_k)]$
- Government's objective $S = a \sum_{i \in I} g_i(\mathbf{w}) + \sum_{i \in \Lambda} B_i(\mathbf{w})$

Equilibrium Policy

Proposition 1 $(\{B_i^0(\mathbf{w})\}_{i\in\Lambda}, \mathbf{w^0})$ *is a subgame perfect Nash equilibrium for the factor protection game if and only if:*

i) $B_i^0(\mathbf{w})$ *is feasible* $\forall i \in \Lambda$,

ii) $\mathbf{w}^0 \in \arg\max_{\mathbf{w}\in\mathbf{W}} \quad a\sum_{k\in I} g_k(\mathbf{w}) + \sum_{k\in\Lambda} B_k^0(\mathbf{w})$,

iii) $\mathbf{w}^0 \in \arg\max_{\mathbf{w}\in\mathbf{W}} \quad a\sum_{k\in I} g_k(\mathbf{w}) + \sum_{k\in\Lambda} B_k^0(\mathbf{w}) + g_i(\mathbf{w}) - B_i^0(\mathbf{w}) \;\; \forall i \in \Lambda$,

iv) $\forall i \in \Lambda, \exists \mathbf{w}^i \in \mathbf{W}$ *that maximizes* $a\sum_{k\in I} g_k(\mathbf{w}) + \sum_{k\in\Lambda} B_k^0(\mathbf{w})$ *such that* $B_i^0(\mathbf{w}^i) = 0$.

Assumption: $B_i(\mathbf{w})$ is differentiable for all $i \in \Lambda$.

ii)

$$a \sum_{k \in I} \nabla g_k(\mathbf{w}^0) + \sum_{k \in \Lambda} \nabla B_k^0(\mathbf{w}^0) = 0$$

iii)

$$\begin{aligned} a \sum_{k \in I} \nabla g_k(\mathbf{w}^0) + \sum_{k \in \Lambda} \nabla B_k^0(\mathbf{w}^0) + \\ \nabla g_i(\mathbf{w}^0) - \nabla B_i^0(\mathbf{w}^0) &= 0 \qquad \forall i \in \Lambda \end{aligned}$$

Combining the two we have:

$$\nabla g_i(\mathbf{w}^0) = \nabla B_i^0(\mathbf{w}^0)$$

Summing over $i \in \Lambda$ and substituting into *ii)* gives

$$a \sum_{i \in I} \nabla g_i(\mathbf{w}^0) + \sum_{i \in \Lambda} \nabla g_i(\mathbf{w}^0) = 0$$

Taking a closer look at the gradient:

$$\frac{\partial g_i(\mathbf{w})}{\partial w_j} = \delta_{ij}\ell_j + \alpha_i \left(-\ell_j + \sum_{k \in I} (w_k - w_k^*) \frac{\partial L_k^D}{\partial w_j} \right)$$

$$\text{where} \qquad \delta_{ij} = \begin{cases} 1 & \text{if} \quad i = j \\ 0 & \text{otherwise} \end{cases}$$

2 sums in our final FOC can then be rewritten as

$$\begin{aligned} \sum_{i \in \Lambda} \nabla g_i(\mathbf{w}^0) &= I_j \ell_j + \\ & \alpha_\Lambda \left(-\ell_j + \sum_{i \in I} (w_i - w_i^*) \frac{\partial L_i^D}{\partial w_j} \right) \\ \sum_{i \in I} \nabla g_i(\mathbf{w}^0) &= \sum_{i \in I} (w_i - w_i^*) \frac{\partial L_i^D}{\partial w_j} \end{aligned}$$

$$\text{where} \qquad \alpha_\Lambda = \sum_{i \in \Lambda} \alpha_i \;\; , \quad I_j = \begin{cases} 1 & \text{if j lobbies} \\ 0 & \text{otherwise} \end{cases}$$

Substituting back into the final FOC results in a system of equations that we solve as follows:

Proposition 2 If the equilibrium factor price vector lies in the interior of $\mathbf{W}$, then the government chooses a factor price vector that satisfies

$$\mathbf{w} - \mathbf{w}^* = (\nabla^{\mathbf{2}}_{\mathbf{w}}\pi)^{-1}(\mathbf{z})$$

$$z_j = \frac{(I_j - \alpha_\Lambda)\ell_j}{a + \alpha_\Lambda}$$

$$\text{where} \qquad \alpha_\Lambda = \sum_{i \in \Lambda} \alpha_i \quad , \quad I_j = \begin{cases} 1 & \text{if j lobbies} \\ 0 & \text{otherwise} \end{cases}$$

Since $(\nabla^{\mathbf{2}}_{\mathbf{w}}\pi)^{-1} = -\nabla^2 F$, we have

$$w_j - w_j^* = -\frac{1}{a + \alpha_\Lambda} \sum_i F_{ji}(I_i - \alpha_\Lambda)\ell_i$$

Interpretation

If factor j lobbies, protection

- increases with the amount of factor domestically supplied
- decreases with the share of the population lobbying (α_Λ)
- decreases with the weight attached to social welfare in government's objective function (a)
- complementarities in production matter

Complementarities

Definition: two inputs i, j are
— complements if $F_{ij} > 0$
— substitutes if $F_{ij} < 0$

A lobbying *complement (substitute)* has a *detrimental (positive)* effect on the degree of protection granted to a factor.

These effects are reversed if the other factor does not lobby.

Example : Separability (G-H, 1994)

Assume $\frac{\partial^2 \pi}{\partial w_i \partial w_j} = 0$ if $i \neq j$. Then

$$\frac{t_i}{1+t_i} = \frac{(I_i - \alpha_\Lambda)}{a + \alpha_\Lambda} \frac{1}{\epsilon_{m_i,w_i}} \frac{\ell_i}{m_i}$$

Provided the country imports factor i :

1. If factor i lobbies, it will be granted protection ($t_i > 0$), if it does not imports of that factor are going to be subsidized;

2. If factor i lobbies, protection is decreasing in the share of the population lobbying (the parameter α_Λ).

3. Protection is decreasing with the elasticity of import demand and is increasing with the inverse of the import penetration ratio.

Equivalence of Tariffs and Quotas

The quota game

- Define $\phi(\mathbf{w}) \equiv -\nabla\pi : \mathbf{W} \to \mathbf{L}$
- Lobbys' contribution schedules $\tilde{B}_i(\mathbf{L})$
- Government chooses domestic employment levels $\mathbf{L}$ and collects the contributions from the lobbies

Payoffs:

- Factor i's *gross* payoff

$$\tilde{g}_i(\mathbf{L}) = \phi_i^{-1}(\mathbf{L})\ell_i + \alpha_i[\pi(\phi^{-1}(\mathbf{L})) + \sum_{k\in I}(\phi_k^{-1}(\mathbf{L}) - w_k^*)(L_k^D - \ell_k)]$$

- Government's objective

$$\tilde{S} = a\sum_{i\in I}\tilde{g}_i(\mathbf{L}) + \sum_{i\in\Lambda}\tilde{B}_i(\mathbf{L})$$

Proposition 3 The tariff game and the quota game are strategically equivalent.

Proof

1. Use lemma 1: for all $\mathbf{W}_J \subseteq \mathbf{W}$, $\phi_J(\mathbf{w}) : \mathbf{W}_J \to \mathbf{L}_J$ is one to one, since π is strictly convex.
2. let $\tilde{B}_i(\mathbf{L}) = B_i(\phi^{-1}(\mathbf{L}))$ (no restriction on functional spaces) and then it's a matter of relabelling

Remark

The result can be extended to a mixed case, where the government chooses any combination of tariffs and quotas.

Empirical Part

Use modified version of the tariff equation

$$t_j = \psi \left(\sum_i \frac{F_{ij}}{w_j} I_i \ell_i \right) + \gamma \left(\sum_i \frac{F_{ij}}{w_j} \ell_i \right) + \epsilon_j$$

where $t_j = \frac{w_j - w_j^*}{w_j}$, $\psi = -\frac{1}{a+\alpha_\Lambda}$, $\gamma = \frac{\alpha_\Lambda}{a+\alpha_\Lambda}$ and $\gamma - \psi = \frac{\alpha_\Lambda + 1}{a+\alpha_\Lambda}$.

The testable implications are:

$$\psi < 0$$
$$\gamma > 0$$
$$\psi + \gamma < 0$$

Data

One digit sectoral data for 20 OECD countries, 1995

- Domestic wages: average hourly earnings
- Rate of return on assets from *Compustat Global Vantage*
- International prices: weighted index of foreign prices
- Domestic demand and supply of factors: OECD
- Lobbying:
  1. labor: gross union density
  2. capital: capital per employee (Gawande, 1997)
- $F_{ij}s$: first stage estimation of a CD aggregate production function accross countries

Results

Coefficient	Tariff (USD)	Tariff (PPP)
γ	0.001403	0.001407
	(0.000085)	(0.000085)
ψ	-0.01063	-0.01064
	(0.00063)	(0.00064)
$H_0 : \psi + \gamma = 0$	-21.15	-21.15
α_Λ	0.1316	0.1319
	(0.00072)	(0.00072)
a	93.8	93.9
	(5.624)	(5.607)
Adj R^2	0.751	0.752
Observations	93	93
standard errors in parentheses		

Table 2: Estimation Results

Conclusions

- General theory of endogenous formation of policy towards factor movements
- Complementarities in production are important
- Lobbying matters in explaining migration and FDI policies, but government is welfare-minded
- strong empirical support

Extensions

- Multiple outputs
- Multiple countries, i.e. to model bidding wars for FDI
- Richer political interaction: endogenize government's objective function through political competition