Optimal Trade Policy, Equilibrium Unemployment and Labor Market Inefficiency

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Motivation

**Puzzle:** Why do small open economies use trade protections to protect domestic jobs despite the fact that trade protection is not economically sensible in neoclassical trade models?
Motivation

Why trade policy to protect jobs?

1) Reality:

- “Jobs are lost!” has always been a political criticism of trade liberalization.
- Only two countries have no trade protection

![Graph showing relationship between average MFN tariffs and unemployment](image)
Motivation

Why trade policy to protect jobs?

2) Theory of trade policy formation:

- In traditional trade models with fixed total employment, conventional wisdom is that trade protection of a small open economy generates distortions and reduces social welfare.
  - Only large countries that can manipulate world prices will use a trade policy \( \Rightarrow \) Too little trade
- One possible explanation for a small open country is a political-economy argument (Grossman & Helpman, 1994)
  - Lobbyists pay a government to protect some specific sectors
Introduce a *frictional labor market* into an otherwise standard *Heckscher-Ohlin* model of international trade

- Main ingredient: firms post costly vacancies that are randomly filled
- Key features:
  - Endogenous unemployment
  - Redistribution effects between capital income and labor income

Analyze (i) the impact of trade on unemployment, (ii) efficiency, and (iii) welfare gains from trade

Provide a *welfare-based* argument for optimal trade policy in a small open economy
1. The impact of trade on employment
   - When the relative price of labor-intensive good increases (decreases), employment increases (decreases)

2. The labor market may generate an inefficient level of unemployment compared to a first-best outcome
   - Hold-up problem vs Congestion externality

3. Welfare gains from trade
   - Capital-abundant countries with inefficiently high unemployment may have welfare losses from trade

4. Welfare-based argument for optimal trade policy
   - Provided that labor market inefficiency exists and no non-distortive instrument is available, protecting jobs makes sense
Why Trade Policy?

Why do countries use trade policies to solve an issue in a labor market?

- Bhagwati (1971): a trade policy is normally a second-best policy and a first-best policy is a domestic policy aiming directly at the inefficiency

Direct labor market policies are impractical

1. A first-best policy is a direct tax-cum-subsidy on the vacancy postings
   - Potentially has asymmetric information problems and commitment problems

2. The strongest case of my results is developing countries where their informal sectors are large and their labor market has not yet been fully developed

3. Tariffs generate income for the government
Optimal trade policy and equilibrium unemployment

Frictional labor market and international trade
- Felbermayr, Prat, Schmerer (2011a, 2011b)
Model
Model

- Standard Heckscher-Ohlin model: 2x2x2
  - A small open economy with population $L$ and capital stock $K$
  - Two goods: labor-intensive $X$ and capital-intensive $Y$
  - Normalize $p_y = 1$.
  - Terms-of-trade $p = p_x/p_y$ is given from the world market
- Gov uses a trade policy to change the domestic price of good $X$ from $p$ to $(1 + t)p$.
  - $t > 0$: import tariff or export subsidy
  - $-1 < t < 0$: import subsidy or export tax
Model

Production (Brief Timeline)

1. Single-worker firms create a costly vacancy
   - The vacancies are randomly matched with unemployed workers
2. If the vacancy is filled, the firm and the worker bargain on wage via Nash bargaining
3. The firm rents capital $k_i$ for the worker
   - Capital moves freely across sectors
4. Output is produced and sold
Vacancy cost

- Firms must use a combination of $x_V$ units of goods $X$ and $y_V$ units of goods $Y$ as intermediate inputs to produce one new vacancy.
- The input requirement for delivering one vacancy is

$$x_V^\alpha y_V^{1-\alpha} \geq \alpha^\alpha (1 - \alpha)^{1-\alpha} f$$

Matching function

- Let $V$ be the total economy-wide vacancy.
- In this one-period model, all $L$ workers are initially unemployed.
- Employment $E = M(V, L) = \min \left\{ V^\lambda L^{1-\lambda}, L \right\}$
  - Prob (a vacancy is filled) = $E/V$
  - $\lambda$ is the elasticity of matching function with respect to vacancy.
Model

Rental price
- Perfectly competitive market for capital

Wage determination
- Nash bargaining

\[ w_i = \text{argmax} \ (S_i - w_i)^\beta (w_i)^{1-\beta} \]

- \( \beta \): Firms’ bargaining power
- \( 1 - \beta \): Workers’ bargaining power

Production function
- Output \( k_i^{\phi_i} \)

Resource Markets

\[ L_x + L_y = E \]
\[ k_x L_x + k_y L_y = K \]
Model

Representative household

- Preference:
  \[
  U(X^d, Y^d) = \left( \frac{X^d}{\alpha^\alpha} \right)^\alpha \left( \frac{Y^d}{1-\alpha} \right)^{1-\alpha}
  \]

- Budget Constraint:
  \[
  (1 + t) p X^d + Y^d = (1 + t) p X^s + Y^s - (1 + t) p x V + y V)
  \]

Equivalently,
\[
p X^d (p, t) + Y^d (p, t) = p [X^s (p, t) - x V] + [Y^s (p, t) - y V]
\]
Competitive Equilibrium
- Households maximize utility
- Firms maximize profits
- Markets clear

Constrained Efficient Equilibrium
- Social planner directly controls productions and consumptions subject to search frictions
Competitive Equilibrium
Competitive Equilibrium

Useful equilibrium conditions

- The minimum vacancy cost is \((1 + t)p^\alpha f\)
- Wages and profits are identical across sectors
- Free entry condition \(\Rightarrow\) Expected profit = 0

\[
\frac{E}{V} \times \frac{\pi}{\text{Profit}} = \frac{((1 + t)p)^\alpha f}{\text{Vacancy Cost}}
\]

\[
\beta SE = ((1 + t)p)^\alpha fV
\]

- Equilibrium employment

\[
E = \left[ \frac{\beta \Phi_2}{f} ((1 + t)p)^{\frac{\phi_y}{\phi_y - \phi_x} - \alpha} \right]^{\frac{\lambda}{1 - \lambda}} L
\]
Result 1:

- When the relative price of labor-intensive good increases (decreases),
  - (Stolper–Samuelson theorem): Real wages increase (decrease) and real returns to capital decrease (increase)
  - Employment increases (decreases)
How does aggregate income respond to a price change?

$$\frac{\Delta l}{l} = \left( \frac{rK}{rK + wE} \right) \frac{\Delta r}{r} + \left( \frac{wE}{rK + wE} \right) \left( \frac{\Delta w}{w} + \frac{\Delta E}{E} \right)$$

- Conclusion: Labor income in this model is more volatile than it is in a traditional Heckscher-Ohlin model
- Other variations
  - $\frac{\Delta E}{E} = 0$ in models without unemployment
  - $\frac{\Delta w}{w} = 0$ in Brecher (1974a, 1974b)
  - $\frac{\Delta w}{w} + \frac{\Delta E}{E} = 0$, $K = 0$ in Helpman and Itskhoki (2010)
3-D Consumption Possibility Frontier
Useful equilibrium conditions

- Vacancy cost is $p^\alpha f$
- Optimal Vacancy

\[
\frac{\partial E}{\partial V} \times S = p^\alpha f
\]

Marginal Social Benefit = Vacancy Cost

- Recall that $\lambda$ is the elasticity of matching function with respect to vacancy

\[
\lambda = \frac{dE/E}{dV/V}
\]

- Conclusion

\[
\lambda SE = p^\alpha fV
\]
Efficiency

Efficiency of labor market:

- Competitive equilibrium under free trade:

\[
\frac{E}{V} \times \beta S = p^\alpha f
\]

Prob(a vacancy is randomly filled)

- Constrained Efficient Equilibrium:

\[
\frac{\partial E}{\partial V} \times S = p^\alpha f
\]

Marginal Social Benefit

Vacancy Cost

**Lemma**: A competitive equilibrium coincides with a constrained efficient equilibrium if and only if \( \beta = \lambda \) and \( t = 0 \).
Main underlying mechanism: A labor market may generate an inefficient level of unemployment

- Two sources of inefficiency
  - Hold-up problem: Firms underinvest when they get only a fraction of output
    - Inefficiently high unemployment
  - Congestion externality: Posting an additional vacancy reduces other firms’ profit through a lower chance of getting a vacancy filled
    - Inefficiently low unemployment
- The Hosios efficiency condition: Efficiency requires two sources of inefficiency are offset perfectly
- I focus on labor market inefficiency when the Hosios condition is violated
Efficiency of Competitive Equilibrium

2-D Consumption Possibility Frontier

\[ Y^c \]

\[ X^c \]

\( CPF_1(\beta = \lambda) \)

\( CPF_2(\beta < \lambda) \)

\( CPF_3(\beta > \lambda) \)

\[ p_w \]

\[ p_w \]
Result 2: Welfare gains from trade

- Inefficiently high unemployment makes employment more volatile
- Interesting empirically relevant cases:
  1. Developing countries with inefficiently high unemployment are likely to have extra welfare gains from trade
  2. Developed countries with inefficiently high unemployment are likely to have small welfare gains from trade and may have welfare losses from trade

\[
\frac{\Delta l}{l} = \left( \frac{rK}{rK + wE} \right) \frac{\Delta r}{r} + \left( \frac{wE}{rK + wE} \right) \left( \frac{\Delta w}{w} + \frac{\Delta E}{E} \right)
\]
Result 3: Optimal trade policy for a small-open economy

- Only when the labor market is generating the efficient level of employment, free trade is optimal.
- When a labor market is generating inefficiently high/low employment, trade policy can improve welfare by reducing labor market inefficiency.
- To the best of my knowledge, this is the first paper that links optimal trade policy and labor market inefficiency.
Graphical explanation: inefficiently low employment, $\lambda > \beta$
Policy Implications:

1. Rationale: to reduce labor market inefficiency
2. If employment is inefficiently low, the government of that small open economy uses trade policy to raise the domestic relative price of labor-intensive goods
   - Regardless of a country’s comparative advantage

Summary

<table>
<thead>
<tr>
<th>Sector</th>
<th>Total Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Too Low</td>
</tr>
<tr>
<td>Labor intensive</td>
<td>Increases</td>
</tr>
<tr>
<td>Capital intensive</td>
<td>Decreases</td>
</tr>
</tbody>
</table>
Y-axis: $\bar{t}_{\text{Agriculture}} - \bar{t}_{\text{Non-Agriculture}}$

X-axis: $\log (K/L)$

(Source: World Tariff Profiles 2012 by WTO)
Results from Variations of the Model

I explore optimal trade policy in possible variations:

1. **Two-country model**
   - Terms-of-trade manipulation & Labor market inefficiency
   
   **Corollary**: World free trade is not efficient if labor market inefficiency exists (in one of countries).

2. **Ricardian model**
   - One factor of production: Labor
   
   **Corollary**: In the Ricardian model, a small open economy that has inefficiently high unemployment should use either an export subsidy or an import subsidy.

3. **Fully available instrument**
   - Should use a direct instrument in the labor market

4. **Dynamic model**
   - Results from the static model hold
This paper studies an optimal trade policy in an economy with a frictional labor market.

I develop a general equilibrium model that adds a frictional labor market into a standard Heckscher-Ohlin model.

I show that labor market inefficiency changes “textbook” knowledge in international trade:

- Welfare loss from trade is possible.
- Trade policy improves welfare, not because of search frictions, but because of inefficiency.
- Free trade is the optimal trade policy for a SOE, only when a labor market is efficient.

Provided that labor market inefficiency exists and no non-distortive instrument is available, protecting jobs makes sense.
Competitive Equilibrium

Definition:

A competitive equilibrium is the vector of factor prices, consumptions, final outputs, an allocation of endowments, intermediate inputs, and vacancy level \( \{ w, r, X^d, Y^d, X^s, Y^s, k_x, k_y, L_x, L_y, x_V, y_V, V \} \), given the world price ratio, a trade policy, and initial endowments \( \{ p, t, K, L \} \), that satisfies the following conditions:

1. The production cost of vacancy is minimized
2. Firms maximize their profit
3. Wage divides surplus according to Nash bargaining
4. Rental price is given by a perfectly competitive market
5. Firms enter and exit freely
6. Factor markets are cleared
7. The representative consumer maximizes his utility.
Definition: A constrained efficient equilibrium is the vector of consumptions, final outputs, allocations of endowments, intermediate inputs, and vacancy level $\{X^d, Y^d, X^s, Y^s, K_x, K_y, L_x, L_y, x_V, y_V, V\}$, that maximizes social welfare given the world price ratio and initial endowments $\{p, K, L\}$, and that satisfies the (i) production technologies, (ii) matching technology, and (iii) endowment constraints.