

Optimal Trade Policy, Equilibrium Unemployment and Labor Market Inefficiency

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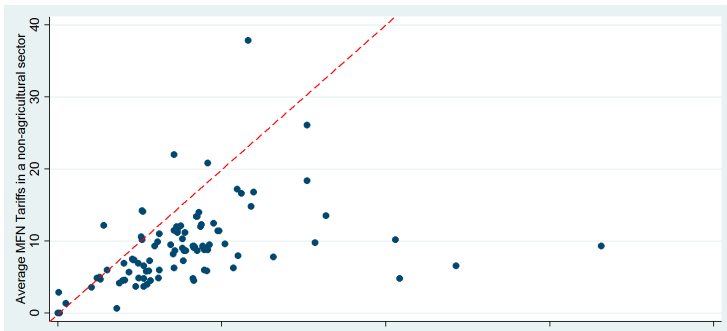
Puzzle: Why do **small open economies** use **trade protections** to **protect domestic jobs** despite the fact that trade protection is **not economically sensible** in neoclassical trade models?

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



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

What I do in this paper

- 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

Preview of Results

- 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
 - Costinot (2009), Suwanprasert (2016), Brecher (1974a, 1974b), Matschke (2006)
- Frictional labor market and international trade
 - Davidson, Martin, Matusz (1988, 1999), Helpman, Itskhoki (2010), Helpman, Itskhoki, Redding (2010)
 - Mitra, Ranjan (2007), Dutt, Mitra, Ranjan (2009)
 - Felbermayr, Prat, Schmerer (2011a, 2011b)

Model

Model

- Standard Heckscher-Ohlin model: $2 \times 2 \times 2$
 - 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

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
 - λ is the elasticity of matching function with respect to vacancy

Model

Rental price

- Perfectly competitive market for capital

Wage determination

- Nash bargaining

$$w_i = \operatorname{argmax} (S_i - w_i)^\beta (w_i)^{1-\beta}$$

- β : Firms' bargaining power
- $1 - \beta$: Workers' bargaining power

Production function

- Output $k_i^{\phi_i}$

Resource Markets

$$\begin{aligned}L_x + L_y &= E \\ k_x L_x + k_y L_y &= K\end{aligned}$$

Representative household

- Preference:

$$U(X^d, Y^d) = \frac{(X^d)^\alpha (Y^d)^{1-\alpha}}{\alpha^\alpha (1-\alpha)^{1-\alpha}}$$

- Budget Constraint:

$$\underbrace{(1+t)pX^d + Y^d}_{\text{Expenditure}} = \underbrace{(1+t)pX^s + Y^s}_{\text{GDP}} - \underbrace{((1+t)p x_V + y_V)V}_{\text{Vacancy cost}} + \underbrace{tp(X^d - [X^s(p, t) - x_V V])}_{\text{Tax Revenue/Subsidy Cost}}$$

Equivalently,

$$pX^d(p, t) + Y^d(p, t) = \underbrace{p[X^s(p, t) - x_V V] + [Y^s(p, t) - y_V V]}_{\text{Net Output}}$$

① Competitive Equilibrium

- Households maximize utility
- Firms maximize profits
- Markets clear

② 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

$$\underbrace{\frac{E}{V}}_{\text{Prob(a vacancy is randomly filled)}} \times \underbrace{\pi}_{\text{Profit}} = \underbrace{((1+t)p)^\alpha f}_{\text{Vacancy Cost}}$$

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

- 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)

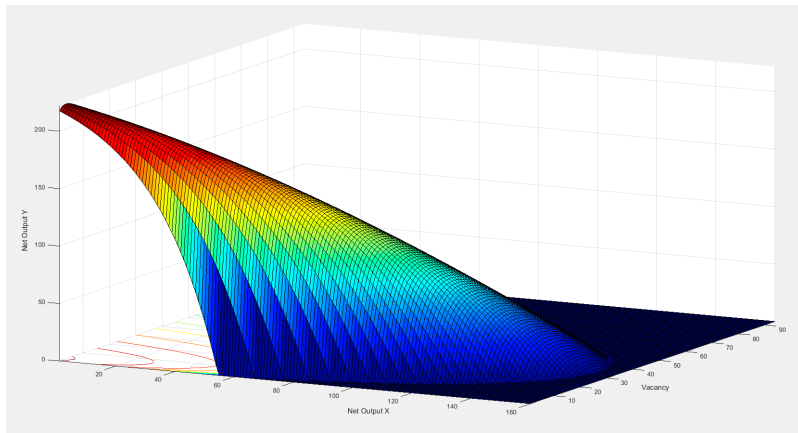
How does aggregate income respond to a price change?

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

- 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)

Constrained Efficient Equilibrium

3-D Consumption Possibility Frontier



Constrained Efficient Equilibrium

Useful equilibrium conditions

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

$$\underbrace{\frac{\partial E}{\partial V} \times S}_{\text{Marginal Social Benefit}} = \underbrace{p^\alpha f}_{\text{Vacancy Cost}}$$

- Recall that λ is the elasticity of matching function with respect to vacancy

$$\lambda = \frac{dE/E}{dV/V}$$

- Conclusion

$$\lambda SE = p^\alpha fV$$

Efficiency of labor market:

- Competitive equilibrium under free trade:

$$\underbrace{\frac{E}{V}}_{\text{Prob(a vacancy is randomly filled)}} \times \underbrace{\beta S}_{\text{Profit}} = \underbrace{p^\alpha f}_{\text{Vacancy Cost}}$$

- Constrained Efficient Equilibrium:

$$\underbrace{\frac{\partial E}{\partial V} \times S}_{\text{Marginal Social Benefit}} = \underbrace{p^\alpha f}_{\text{Vacancy Cost}}$$

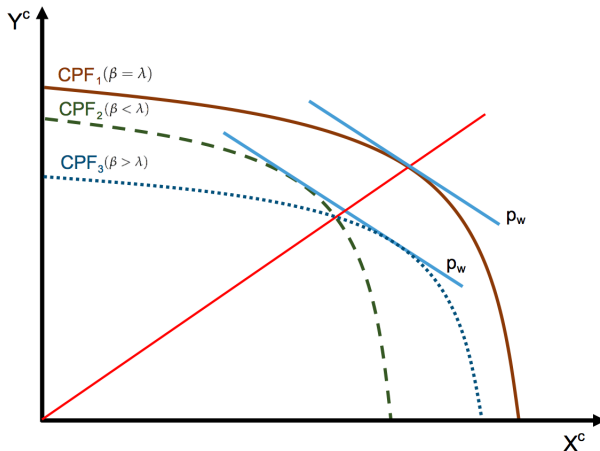
Lemma: A competitive equilibrium coincides with a constrained efficient equilibrium if and only if $\beta = \lambda$ and $t = 0$.

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



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

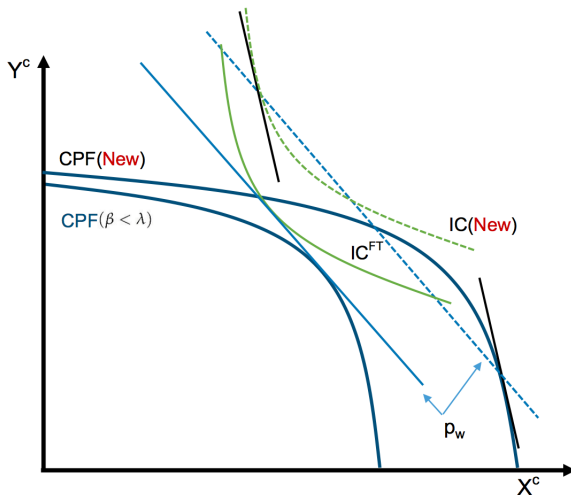
$$\frac{\Delta I}{I} = \left(\frac{rK}{rK + wE} \right) \frac{\Delta r}{r} + \left(\frac{wE}{rK + wE} \right) \left(\frac{\Delta w}{w} + \frac{\Delta E}{E} \right)$$

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**.

Optimal Trade Policy: Small Open Economy

Graphical explanation: inefficiently low employment, $\lambda > \beta$



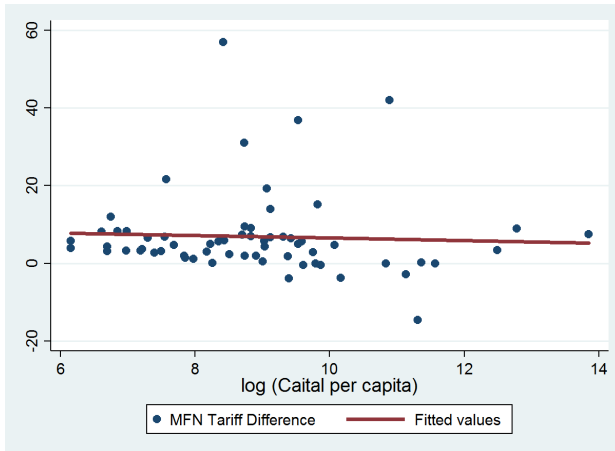
Policy Implications:

- 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

Sector	Total Employment		
	Too Low	Efficient	Too High
Labor intensive	Increases	-	Decreases
Capital intensive	Decreases	-	Increases

Empirical Fact



- 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

Conclusion

- 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**

Appendix

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.

Constrained Efficient Equilibrium

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.