Inequality and Unemployment in a Global Economy

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Motivation
Trade and Inequality

- Two central propositions in trade:
    - Aggregate welfare gains from trade, but. . .
    - Distributional conflict: both winners and losers from trade

- 1980-90s: globalization and growing inequality

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- We propose an alternative framework:
  - Agent heterogeneity and selection into exporting
  - Reallocation within industries
  - Composition of workers across firms

Empirical Motivation

1. **Reallocation** occurs largely within rather than between industries
   - e.g., Levinsohn (1999) for Chile

2. **Wage dispersion** across firms within sectors
   - Linked to productivity dispersion (e.g., Davis and Haltiwanger 1991)
   - Employer-size wage premium (e.g., Oi and Idson 1999)

3. Wage differences between **exporters** & **non-exporters** within sectors
   - Bernard and Jensen (1995, 1997)

4. This exporter wage premium is linked to **workforce composition**
   - Kaplan and Verhoogen (2006), Munch and Skaksen (2008), Schank, Schnabel and Wagner (2007)

5. Labor market frictions and **unemployment**   ▸ More Detail

Our Approach

- New analytical framework
    - consistent with a number of product and labor market facts

- Main ingredients:
    1. Heterogeneity in firm productivity
    2. Heterogeneity in worker ability
        - imperfectly observed match-specific ability
    3. Random search and matching
    4. Screening of workers by firms
    5. Production technology with complementarities

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- Main findings:
  1. Trade increases wage inequality within sectors
     - for general asymmetric countries
     - robust to the specifics of general equilibrium
  2. Direct effect of trade is to increase unemployment
  3. Welfare gains are ensured for risk-neutral agents

Related Theoretical Literature

- Heterogeneous firms and trade:
  - Melitz (2003), BEJK (2003) and Yeaple (2004)
- Search and matching:
  - Labor and Macro: Mortenson (1970, 2003), Pissarides (1974, 2000), Diamond (1982), and Burdett & Mortensen (1998)
  - Trade: Davidson et al. (1998, 1999), Felbermayr et al. (2008, 2009), Helpman & Itskhoki (2007), and Tybout & Guner (2009)
  - Two-sided heterogeneity: Shimer & Smith (2000), Acemoglu (1997), Albrecht & Vroman (2002), Postel-Vinay & Robin (2002), Cahuc et al. (2006), Davidson et al. (2008), and Lentz (2008)
- Trade and efficiency or fair wages:
  - Amiti & Davis (2008), Davis & Harrigan (2007), Egger & Kreickemeier (2007, 2008), Grossman & Helpman (2008)
- Trade and technology-skill complementarities:
  - Bustos (2007), Verhoogen (2008), Costinot & Vogel (2009), Burstein & Vogel (2009), Blanchard & Willmann (2009)
- Firm recruitment policies and worker screening:
  - Barron et al. (1987), Pellizzari (2005), Autor & Scarborough (2005)

Road Map

1. Model Outline

2. Sectoral Equilibrium

3. Trade and Wage Inequality

4. Trade and Unemployment

5. General Equilibrium
   - Economy with an Outside Sector
   - Single-sector Economy
   - Risk Aversion

Model Outline

- Two asymmetric countries
- One heterogeneous factor: labor
- Melitz-type sector
- Static one-shot game

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- Timing:
  1. Workers choose a sector to search for a job
  2. Workers are matched with firms
  3. Firms screen workers
  4. Firm bargain with hired workers

  – Workers that are not sampled or sampled but not hired are unemployed

Sectoral Equilibrium
Market Structure

- CRRA preferences with CES demand across varieties within sectors
  - Firm revenue in the domestic market:
  $$r = Ay^\beta, \qquad 0 < \beta < 1$$

- Monopolistic competition as in Melitz (2003)
  - Fixed entry cost: f_e
  - Productivity draw $\theta \sim \text{Pareto}(z)$
  - Fixed production cost: f_d
  - Trade: variable iceberg cost $\tau > 1$ and fixed cost f_x
  - Revenue of the firm:
  $$r(\theta) = \Upsilon(\theta)^{1-\beta} A y(\theta)^\beta,$$

  $$\Upsilon(\theta) = 1 + I_x(\theta) \cdot \tau^{-\frac{\beta}{1-\beta}} \left(\frac{A^*}{A} \right)^{\frac{1}{1-\beta}}$$

Production Technology

- Production function:

$$y = \theta h^\gamma \bar{a} = \theta \left(\frac{1}{h}\right)^{1-\gamma} \int_0^h a_i \mathrm{d}i, \qquad 0 < \gamma < 1$$

  – human capital complementarity (team production)
  – managerial time as fixed factor (Rosen, 1982)

- Unobserved match-specific ability: $a \sim \text{Pareto}(k)$

- Search cost: $b \cdot n$ (Diamond-Mortensen-Pissarides)

- Screening cost: $\frac{c}{\delta}(a_c)^\delta$

- Output:

$$y = \kappa_y \theta n^\gamma a_c^{1-\gamma k}, \qquad \gamma k < 1$$

Firm's Problem

- Wage bargaining (Stole and Zwiebel, 1996):

$$w(\theta) = \frac{\beta\gamma}{1 + \beta\gamma} \frac{r(\theta)}{h(\theta)}$$

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$$\pi(\theta) = \max_{\substack{n \geq 0, \\ a_c \geq a_{\min}, \\ I_x \in \{0,1\}}} \left\{ \frac{1}{1 + \beta\gamma} Y^{1-\beta} A \left[\kappa_y \theta n^\gamma a_c^{1-\gamma} k \right]^\beta - bn - \frac{c}{\delta} a_c^\delta - I_x f_x - f_d \right\}$$

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- $\theta < \theta_d$ exit and $\theta > \theta_x$ export
- More productive firms:
    - sample more workers and are more selective
    - hire more workers (provided $\delta > k$)
    - pay higher wages
- Wage inequality across firms within sectors:
    - Employer-size wage premium (e.g. Oi and Idson 1999)
    - Rent-sharing (e.g. Van Reenen 1996)

Exporter Wage Premium

- Market access variable:

$$\Upsilon(\theta) = \left\{ \begin{array}{ll} 1, & \theta < \theta_x, \\ \Upsilon_x > 1, & \theta \geq \theta_x \end{array} \right. , \qquad \Upsilon_x = 1 + \tau^{\frac{-\beta}{1-\beta}} \left(\frac{A^*}{A} \right)^{\frac{1}{1-\beta}}$$

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- Revenue across firms:

$$r(\theta) = r_d \Upsilon(\theta)^{\frac{1-\beta}{\Gamma}} \left(\frac{\theta}{\theta_d} \right)^{\beta/\Gamma}$$

Intuition: profit is smooth, revenue jumps for exporters to cover f_x

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- Exporters pay higher wages (Bernard and Jensen 1995, 1997)

$$w(\theta) = \frac{b}{h(\theta)/n(\theta)} = b \left(\frac{a_c(\theta)}{a_{\min}} \right)^k = w_d \Upsilon(\theta)^{\frac{(1-\beta)k}{\delta\Gamma}} \left(\frac{\theta}{\theta_d} \right)^{\frac{\beta k}{\delta\Gamma}}$$

- Exporters differ in workforce composition (Schank et al. 2007)

Wage Profiles
## Open Economy vs. Autarky
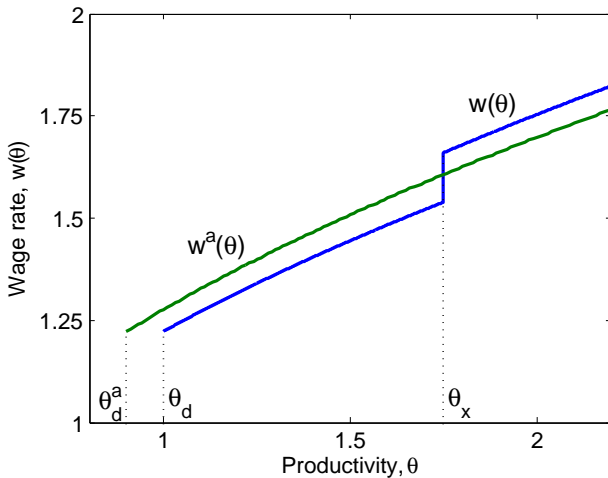
Wage Distribution

- In autarky, the wage distribution is Pareto$(1 + 1/\mu)$:

$$G_w^a = 1 - \left(\frac{w_d}{w}\right)^{1+1/\mu}, \qquad \mu = \frac{\beta k/\delta}{z\Gamma - \beta}$$

- Consistent with evidence linking wage and productivity dispersion
  - Davis and Haltiwanger (1991)
  - Faggio, Salvanes and Van Reenen (2007)

- In the closed economy, μ is a sufficient statistic for inequality
  - Coef. of Variation, Lorenz Curve (Gini Coef.), Theil Index

- In the open economy, the wage distribution is a mix of:
  - Truncated Pareto$(1 + 1/\mu)$ (non-exporting firms)
  - Pareto$(1 + 1/\mu)$ (exporting firms)

▸ Open Economy Wage Distribution

Wage Density
Open Economy
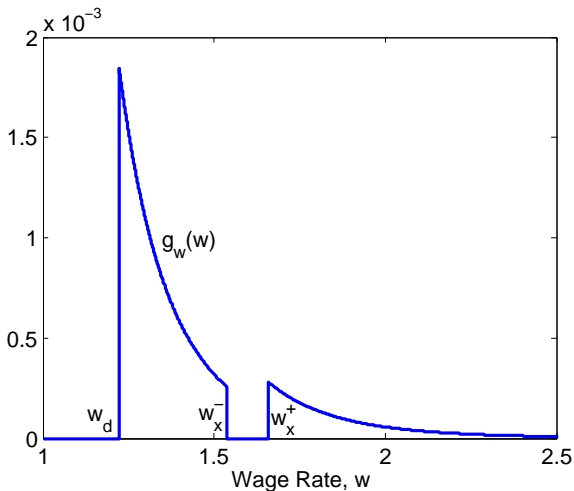
- Autarky: $w_x^- \to \infty$
- All firms export: $w_x^+ \to w_d$

Wage Inequality

Lemma

In a trade equilibrium where all firms export, wage inequality in the differentiated sector is the same as in autarky

Proof: In both cases the wage distribution is $\text{Pareto}(1 + 1/\mu)$

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Proposition
In a trade equilibrium where some but not all firms export, wage inequality in the differentiated sector is strictly greater than in autarky

Proof:

  i. Consider a counterfactual *autarkic* wage distribution $G_w^c(w)$ with shape param. $1 + 1/\mu$ and the same mean as in the open economy
  ii. $G_w^c(w)$ second-order stochastically dominates $G_w(w)$

▶ Theil Index

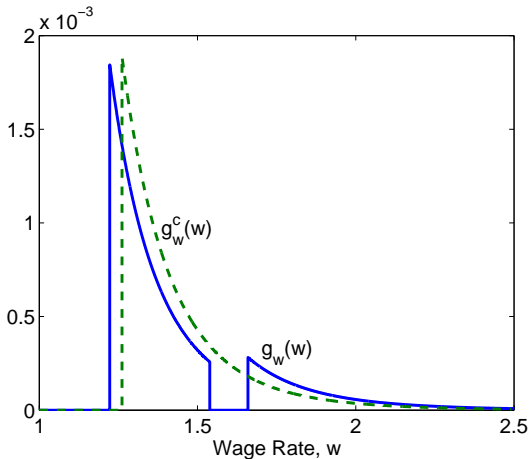# Actual vs. Counterfactual Wage Distributions

Figure: Wage Densities
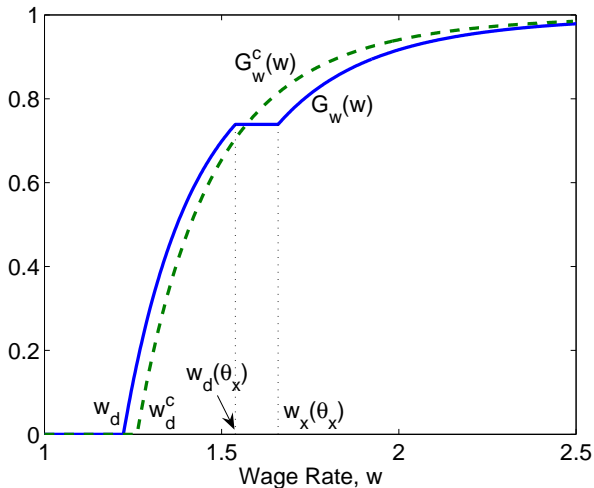
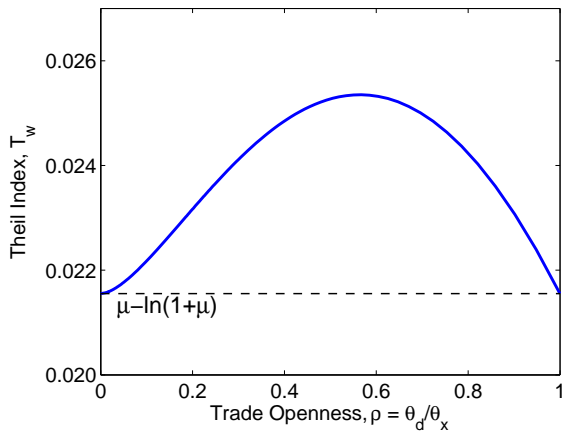# Actual vs. Counterfactual Wage Distributions

Figure: Wage CDFs

Wage Inequality
Additional Results

- Define a measure of trade openness: $\rho \equiv \theta_d/\theta_x \in [0, 1]$
  - where ρ^z equals the fraction of exporting firms
- Inequality: lowest in autarky ($\rho = 0$) or if all firms export ($\rho = 1$)
- Inequality: strictly greater when only some firms export ($0 < \rho < 1$)
  - Intuition: some but not all workers are employed by exporters who pay higher wages than non-exporters
- Inequality is increasing (decreasing) in trade openness when the fraction of exporting firms ρ^z is low (high)

- Average wages conditional on being employed are higher in the open economy than in autarky

- In the open economy, wages in terms of the numeraire are higher at exporters and lower at non-exporters than in autarky

Unemployment

- Sectoral unemployment rate:

$$u = \frac{L - H}{L} = 1 - \frac{H}{N}\frac{N}{L} = 1 - \sigma x$$

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$$\left.\begin{array}{l} bx = \omega \\ b = \alpha_0 x^{\alpha_1} \end{array}\right\} \quad \Rightarrow \quad x = \left(\frac{\omega}{\alpha_0}\right)^{\frac{1}{1+\alpha_1}},$$

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- Hiring rate:

$$\sigma = H/N = \varphi(\rho) \cdot \sigma^a, \qquad \sigma^a = (1 + \mu)^{-1} \cdot h_d/n_d$$

  – Property: $\varphi(\rho) < \varphi(0) = 1$ for all $\rho > 0$

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Proposition

Holding ω constant, the unemployment rate is higher in a trade equilibrium than in autarky

  – Intuition: Reallocation towards more productive and selective firms

Income Inequality

- Income inequality takes into account both wage inequality and unemployment

- Theil Index and Gini Coefficient:

$$\mathcal{T}_\iota = \mathcal{T}_w - \ln(1 - u)$$

$$\mathcal{G}_\iota = u + (1 - u)\mathcal{G}_w$$

Proposition

The distribution of income is more unequal in a trade equilibrium than in autarky

- Both wage inequality and unemployment are higher in a trade equilibrium than in autarky

General Equilibrium

1. Economy with an Outside Sector
   - Constant expected income: $\omega = 1$
   - Constant labor market tightness: x
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❸ Risk Aversion (with an Outside Sector)
- Uncertainty affects sectoral composition (risk premium: $\omega > 1$)
- Trade increases income risk: ω increases
- Additional risk effect for unemployment: x increases
- Two counteracting effects on expected welfare

Summary

- New theoretical framework to examine the relationship between trade and inequality:
    - composition of workers across firms
    - reallocation within industries

- Trade: expected welfare gains but greater social disparity

- Further trade liberalization has non-monotonic effects on inequality

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- Current and future research:
  - HIR (work in progress): Risk and Uncertainty in a Global Economy
  - Helpman-Itskhoki-Muendler-Redding (work in progress): Empirical Evidence using Brazilian data
  - Itskhoki (2008): Optimal Redistribution in an Open Economy

Thank You