

Optimal Redistribution in an Open Economy

Oleg Itskhoki
Harvard University

Princeton University
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- My answer: depends on the source of inequality
 - ① Skill (increasing dispersion of ability):
 - ▶ increase redistribution
 - ② Globalization (falling trade costs):
 - ▶ increase less or even reduce

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- **Data**: more productive firms
 - ... hire more productive workers
 - ... are larger and pay higher wages
 - ... are more likely to export

Why this model?

- **Conventional framework:** Stolper-Samuelson (HO model)

Challenges:

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 - Heterogeneous firms and workers
 - Positive assortative matching
 - Rent-sharing

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- **This paper:** stylized version of HIR

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 - ⇒ greater efficiency loss from taxation (**efficiency margin**)
- Redistribution rationalizes export entry subsidies

Related Literature

- Recent work on trade and inequality:
 - Verhoogen (2008), Amiti and Davis (2008)
 - Helpman, Itskhoki and Redding (2008a,b)
- Public Finance models with extensive margin:
 - Diamond (1980), Saez (2002)
- Compensation of losers from trade:
 - Dixit and Norman (1980,1986)
 - Spector (2001), Davidson and Matusz (2006), Egger and Kreickemeier (2008)

Outline

- ① Economic Environment
- ② Closed Economy
- ③ Open Economy
 - Optimal Linear Tax
 - Additional Tax Instruments
- ④ Summary and Discussion

Economic Environment

- Standard Public Finance Setup:
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- Each **worker-entrepreneur** produces distinct variety:

$$Q = \left[\int y_n^\beta dH(n) \right]^{1/\beta}, \quad 0 \leq \beta \leq 1$$

- Real revenue of agent n :

$$r_n = Q^{1-\beta} y_n^\beta$$

Agents and Government

- Agent's problem:

$$U_n \equiv \max_{c, y \geq 0} U \left(c, \frac{y}{n} \right)$$

subject to budget constraint:

$$c = r - T(r), \quad \text{where} \quad r = Q^{1-\beta} y^\beta$$

Agents and Government

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subject to budget constraint:

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- Government maximizes a **Social Welfare Function**:

$$\max_{T(\cdot)} \int G(\mathcal{U}_n) dH(n)$$

subject to individual optimality and GBC:

$$\int T(r_n) dH(n) \geq 0$$

Assumptions

- No income effects in labor supply:

$$U(c, \ell) = c - v(\ell)$$

- Constant labor supply elasticity:

$$v(\ell) = \frac{1}{\gamma} \ell^\gamma \quad \Rightarrow \quad \varepsilon \equiv \frac{v'(\ell)}{\ell \cdot v''(\ell)} = \frac{1}{\gamma - 1}$$

- Constant relative inequality aversion:

$$G(U) = \frac{1}{1 - \rho} U^{1 - \rho}, \quad \rho \geq 0$$

- Restricted set of tax instruments:

— Linear tax rate:

$$T(r) = -\Delta + tr, \quad \Delta = tR$$

— Additional tax instruments

Closed Economy

Proposition

- i. *Income inequality is determined uniquely by the ability distribution*
- ii. *Optimal linear tax rate increases in income inequality*

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Sketch of the Proof:

- **Lemma:** Distribution of relative revenues:

$$r_n \propto n^{\frac{\beta\gamma}{\gamma-\beta}}$$

- **Lemma:**

Efficiency Margin = Intensive Margin of Labor Supply = ε

- **Lemma:** Inequality Margin increases in income inequality (variance of relative revenues)

Open Economy

Setup

- Source of trade: **love-of-variety** ($\beta < 1$)
 - Krugman (1980); Helpman and Krugman (1985)
 - Broda and Weinstein (2006)
- Two symmetric countries
- No tariffs and efficient bargaining about national tax policies
- Variable iceberg trade cost $\tau > 1$
- Fixed costs of trade f_x (Melitz, 2003) \longrightarrow **selection**
 - Evidence: Bernard-Jensen (2004); Das-Roberts-Tybout (2007)
 - Alternatives: BEJK (2003); Melitz-Ottaviano (2008)

Open Economy

Agent's Problem

- Revenues:

$$r_n = \begin{cases} Q^{1-\beta} y_n^\beta, & \text{non-exporter,} \\ Y_x^{1-\beta} Q^{1-\beta} y_n^\beta, & \text{exporter} \end{cases} \quad Y_x \equiv 1 + \tau^{-\frac{\beta}{1-\beta}}$$

- Consumption: $c_n = \Delta + (1 - t)r_n - l_n f_x$
- Utility: $\mathcal{U}_n = \max_{c, y, l_n} \{c - v(y/n)\}$
- Selection: n_x is exporting cutoff

Trade and Inequality

- **Result:** Trade increases inequality of revenues and utilities

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- Relative revenues:

$$\frac{r_n}{R} \propto \begin{cases} n^{\frac{\beta\gamma}{\gamma-\beta}}, & n < n_x, \\ Y_x^{\gamma \frac{1-\beta}{\gamma-\beta}} n^{\frac{\beta\gamma}{\gamma-\beta}}, & n \geq n_x, \end{cases} \quad Y_x = 1 + \tau^{\frac{-\beta}{1-\beta}}$$

Trade and Inequality

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- Relative revenues:

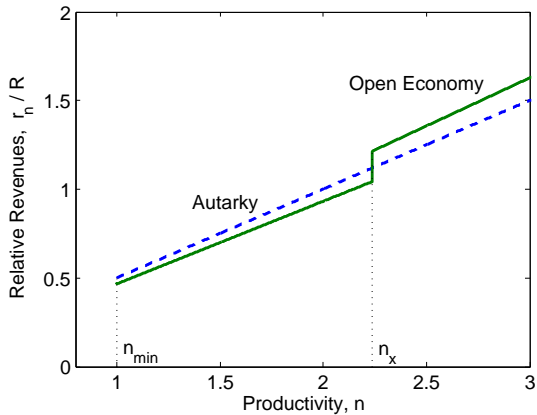
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- **Two limiting cases:**
 - no agent exports ($n_x \rightarrow n_{\max}$)
 - all agents export ($n_x \rightarrow n_{\min}$)

$$\frac{r_n}{R} = \frac{r_n^a}{R^a} \propto n^{\frac{\beta\gamma}{\gamma-\beta}}$$

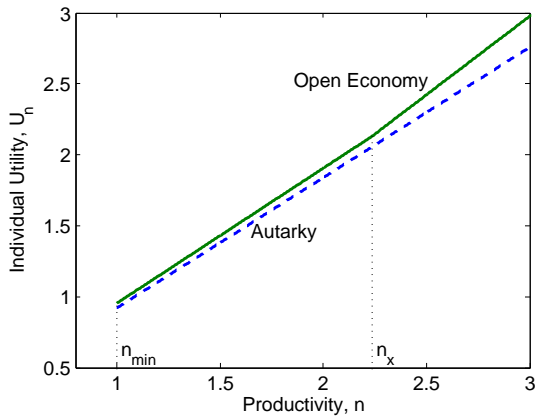
Relative Revenues

Illustration



Utilities

Illustration



Open Economy

Equilibrium Properties

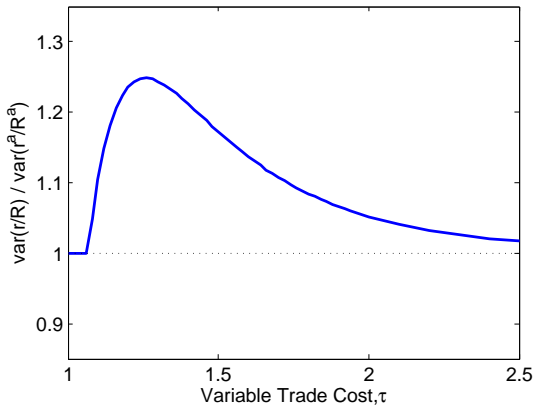
Proposition

Holding the tax rate constant:

- i. All agents gain from trade, although these gains are not proportionally distributed;*
 - ii. Inequality of relative revenues and utilities is higher in an open economy than in autarky given that some agents do not export;*
 - iii. Falling trade costs first increase and then decrease inequality.*
- Replicates Helpman, Itskhoki and Redding (2008):
 - inequality is higher in open economy
 - inequality is non-monotonic with the fraction of exporting agents

Inequality in Open Economy

Illustration



Optimal Redistribution

Proposition

In response to the same increase in inequality, optimal linear tax rate increases by less (or even falls) in the open economy relative to closed economy.

Optimal Redistribution

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Intuition:

- Inequality Margin still increases in income inequality (variance of relative revenues)
- Efficiency Margin = Intensive Margin + Extensive Margin $> \varepsilon$

Optimal Linear Tax Rate

- General optimality condition:

$$\frac{t}{1-t} = \frac{1}{\tilde{\varepsilon}} \cdot \alpha - (1-\beta)(1-\alpha), \quad 0 \leq \alpha \leq 1$$

$$\underbrace{-\frac{1-\beta}{\beta}}_{\text{efficiency}} \leq t \leq \underbrace{\frac{1}{1+\tilde{\varepsilon}}}_{\text{max revenue}}$$

Optimal Linear Tax Rate

- General optimality condition:

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- Efficiency Margin:

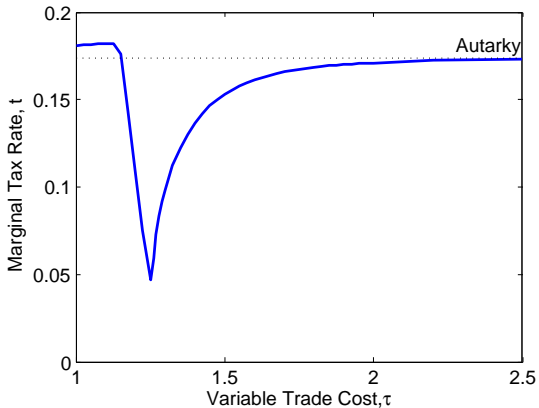
$$\tilde{\varepsilon} \equiv \frac{d \ln Q}{d \ln(1-t)} = \varepsilon \cdot \begin{cases} 1, & \text{no trade/no selection,} \\ 1 + \kappa_x, & \text{trade with selection} \end{cases}$$

- Inequality Margin:

$$\begin{aligned} \alpha &\equiv \int \frac{G'(\mathcal{U}_n)}{\lambda} \frac{r_n - R}{R} dH(n) = -\text{cov} \left(\frac{G'(\mathcal{U})}{\lambda}, \frac{r}{R} \right) \\ &= -\beta_U \cdot \text{var} \left(\frac{r}{R} \right) \end{aligned}$$

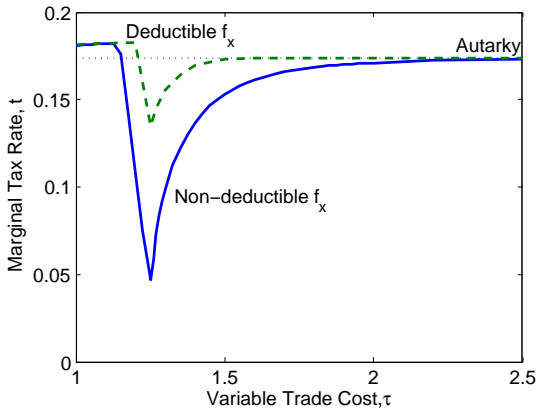
Policy Response to Inequality

Open Economy



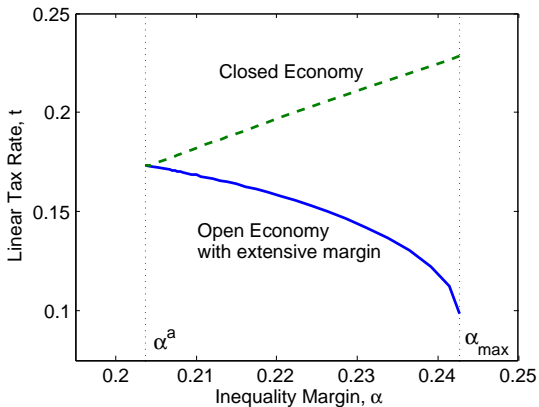
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Policy Response to Inequality

Open versus Closed Economy



Additional Tax Instruments

- ① Can government target **entry** directly?
- ② **Marginal** vs **Average** tax rates

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 - Natural candidates for additional tax instruments:
 - export market entry subsidy (s)
 - differential tax rates on exporters and non-exporters (t_d, t_x)
 - A type of a two-bracket tax system

Additional Tax Instruments

- ① Can government target **entry** directly?
- ② **Marginal** vs **Average** tax rates
 - Natural candidates for additional tax instruments:
 - export market entry subsidy (s)
 - differential tax rates on exporters and non-exporters (t_d, t_x)
 - A type of a two-bracket tax system
 - Analytical characterization of optimal entry
 - Numerical analysis of optimal tax schedules

Optimal Entry

- Utilitarian Welfare ($\rho = 0$):

$$W^{\circ} = Q - \pi_x f_x - \int v\left(\frac{y_n}{n}\right) dH(n)$$

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Proposition

- Entry is efficient when intensive margin is undistorted:*

$$t = -\frac{1-\beta}{\beta} \quad \Rightarrow \quad s^\circ = 0$$

- There is too little entry when intensive margin is distorted:*

$$t > -\frac{1-\beta}{\beta} \quad \Rightarrow \quad 0 < s^\circ / f_x < 1$$

- $ds^\circ / t_d < 0$ and $ds^\circ / t_x > 0$*

- Optimal entry subsidy for $\rho > 0$, $s^* < s^\circ$*

Numerical Analysis

Parameter Calibration

- Pareto ability distribution with shape parameter 2.2
 - upper end of the empirical ability distribution in Saez (2001)
- Elasticity of substitution = 4 ($\beta = 3/4$)
 - BEJK (2003) and Broda and Weinstein (2006)
- Labor supply elasticity $\varepsilon = 1/2$
 - Tuomala (1990) and Saez (2002)
- Inequality aversion $\rho = 2$
 - Saez (2002)
- Fixed trade cost f_x such that 35% of output is produced by exporting agents and exports accounts for 18% of consumption
 - Bernard and Jensen (1999)

Average and Marginal Tax Rates

Three Instruments

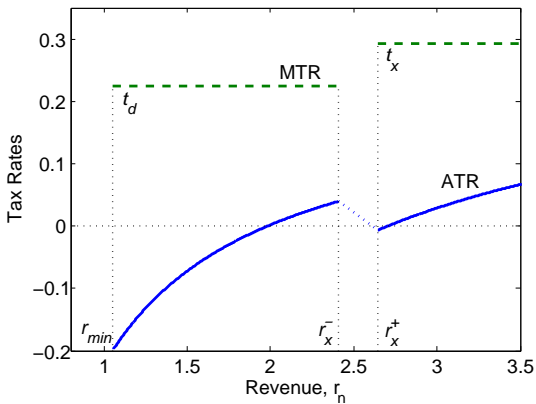


Figure: Average and Marginal Tax Rates for Different Skill Levels ($\tau = 1.3$)

Optimal Entry

Additional Tax Instruments

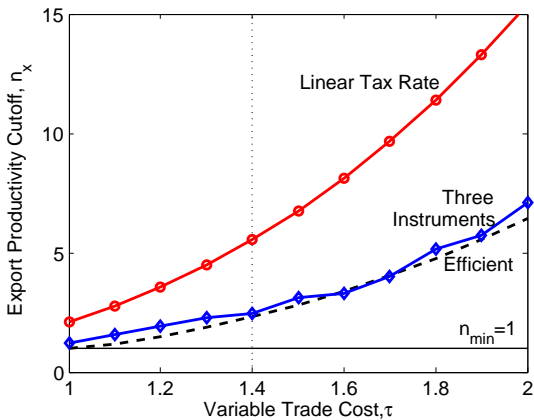


Figure: Optimal Entry, n_x

Marginal Tax Rates

Additional Tax Instruments

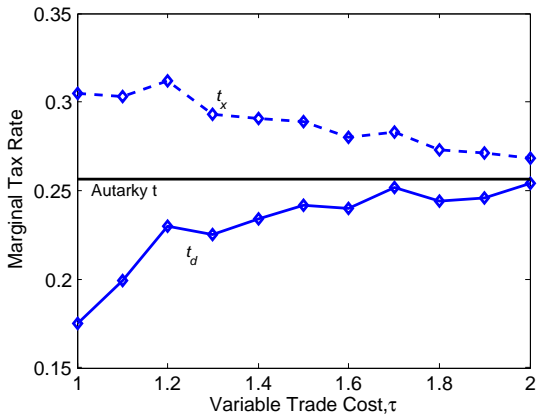


Figure: Optimal Marginal Tax Rates, t_d and t_x

Marginal Tax Rates

Additional Tax Instruments

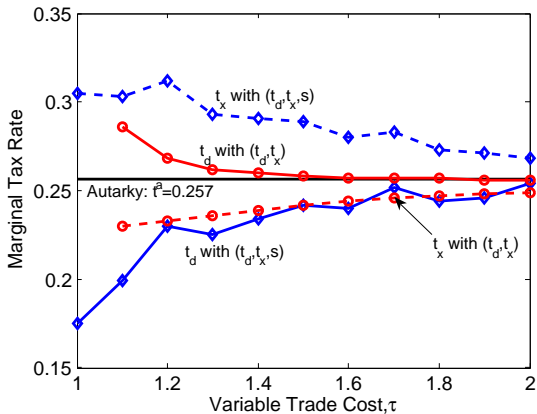


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Inequality Outcome

Additional Tax Instruments

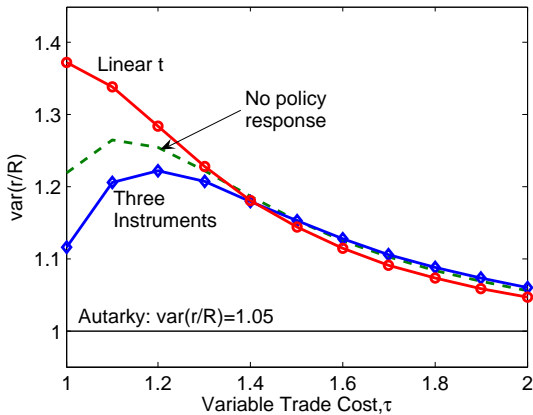


Figure: Inequality of Relative Revenues, $\text{var}(r/R)$

Summary

- Trade intensifies both inequality and efficiency margins through selection into exporting (extensive margin of trade)
- An optimal tax system should balance equity, efficiency and, in particular, entry decisions
- Negative marginal tax rates for agents at the threshold
- Greater inequality may be a necessary outcome to reap the most gains from trade

Discussion

- Second dimension of heterogeneity: fixed costs
- General non-linear taxes in the open economy

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- General non-linear taxes in the open economy
- Other activities with extensive margin: technology adoption
- The role of free entry condition
- Losers from trade
- Optimal unemployment insurance