

Income Distribution, Welfare, and the Patterns of Trade

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Introduction

- ▶ Global trends of inequality (Pinkovskiy et al., 2024):
 - ▶ declining income inequality between countries
 - ▶ constant income inequality within countries
- ▶ Research question: How does income inequality (within and between countries) affect prices and welfare in open economies?
- ▶ Approach: Two-country trade model with non-homothetic preferences, varying income distributions and pricing-to-market behaviour by firms.

Model Overview

- ▶ Consumer demand as extensive-margin consumption choice → trade-off between price and market size
- ▶ Income-dependent consumption baskets & price schedules
- ▶ Key mechanism for PtM: Firms choose how to split their fixed costs across markets
⇒ (Average) willingness-to-pay determines fixed cost splitting

Related Literature

► Pricing-to-Market

[Alessandria and Kaboski (2011); Behrens and Murata (2012); Bertolotti and Etro (2017); Feenstra and Romalis (2014); Fieler and Eaton (2025); Kichko and Picard (2023); Simonovska (2015)]

► Inequality & Trade

[Bekkers et al. (2012); Choi et al. (2009); Dalgin et al. (2008); Hummels and Klenow (2005); Fieler (2011); Kichko and Picard (2023)]

Model – Demand Side

- ▶ Mass $\mathcal{P}$ of consumers
- ▶ Consumers endowed with income $\theta \in [\underline{\theta}, \bar{\theta}]$, with CDF $G(\theta)$
- ▶ Preferences are non-homothetic 0/1 consumption of differentiated goods
[Falkinger (1994); Föllmi and Zweimüller (2006); Matsuyama (2000); Murphy et al. (1989)]
- ▶ Goods are indivisible, only yield utility on first unit
→ pure extensive-margin of consumption

Model – Demand Side II

► Utility

$$U = \int_0^{\infty} c(j) dj, \quad \text{with } c(j) \in \{0, 1\}$$

► Budget constraint:

$$\int_0^N p(j) c(j) \leq \tilde{\theta}$$

► Consumption decision rule: A consumer buys variety j if and only if the price is below their willingness-to-pay:

$$c(j) = 1 \text{ if } p(j) \leq \frac{1}{\lambda(\theta)}, \quad c(j) = 0 \text{ if } p(j) > \frac{1}{\lambda(\theta)},$$

Model – Supply Side

- ▶ Production follows Krugman (1980)
- ▶ Monopolistic competition with homogeneous firms
- ▶ Fixed costs F and marginal costs $1/a$.
Firm's price-setting problem: Due to 0/1 demand, a higher price means fewer buyers
 - ▶ Only fraction $(1 - G(\tilde{\theta}))$ of consumer can afford good at price $p(\tilde{\theta})$
 - ▶ trade-off between price vs. market size
 - ▶ "Marginal consumer" who is indifferent between buying and not buying

Autarky Equilibrium I

- ▶ Free market entry
- ▶ Firms sort along income distribution such that zero profit & no deviation incentives
- ▶ Zero-profit condition:

$$\underbrace{\mathcal{P}(1 - G(\theta))}_{\text{market size}} \underbrace{\left(p(\theta) - \frac{1}{a}\right)}_{\text{contribution margin}} = \underbrace{F}_{\text{fixed costs}}, \quad \forall \theta$$

- ▶ ZPC solves for price schedule:

$$p(\theta) = \frac{1}{a} + \frac{F}{(1 - G(\theta))\mathcal{P}} \quad (1)$$

- ▶ Prices & markups increasing in θ . **Intuition:** market size determines fixed costs per unit sold → small market size implies larger fixed cost share per unit

Autarky Equilibrium II

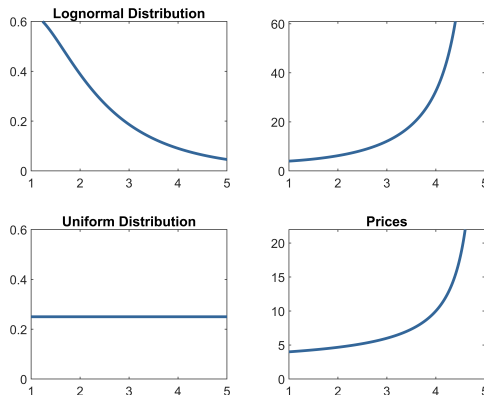


Figure 1: Income Distributions and Prices under Autarky

Notes: The log-normal distribution is a truncated from above. The distribution is determined by $\theta \sim LN(\mu = 0.3, \sigma = 1.2)$, with $1 \leq \theta \leq 5$. The uniform distribution is given by $\theta \sim U(1, 5)$. To calculate prices, we set $\mathcal{P} = 1$, $F = 2$, and $a = 0.5$ for simplicity. Hence, both price schedules start at $p(\theta) = 4$ for the most basic product with market size equal $\mathcal{P}$.

Autarky Equilibrium III

► Welfare:

$$\begin{aligned}\bar{\theta} &= \int_{\underline{\theta}}^{\bar{\theta}} p(\theta) dN(\theta) + p(\underline{\theta}) N(\underline{\theta}) \\ \Leftrightarrow N(\bar{\theta}) &= \int_{\underline{\theta}}^{\bar{\theta}} \underbrace{\frac{a\mathcal{P}(1-G(\theta))}{aF + (1-G(\theta))\mathcal{P}}}_{=1/p(\theta)} d\theta + \underbrace{\frac{a\mathcal{P}}{aF + \mathcal{P}}}_{=N(\underline{\theta})} \bar{\theta}\end{aligned}\quad (2)$$

► Following mean-preserving spread (MPS) in income:

- Total product variety $N(\bar{\theta})$ increases
 $\Rightarrow$ average price level falls (because $\bar{\theta}$ constant)
- Prices of luxuries fall, prices of basic goods rise $\Rightarrow$ rising welfare inequality

Trade – Overview

- ▶ Two Countries "Home" and "Foreign"
- ▶ All variables of "Foreign" denoted with asterisk
- ▶ Income distributions $G(\cdot)$ and $G^*(\cdot)$, with same support $[\underline{\theta}, \bar{\theta}]$
- ▶ Zero trade costs, i.e. $\tau = 1$
 - ⇒ Firms of Home and Foreign will choose same price within same market (conditional on same marginal consumer)
 - ⇒ Factor Price Equalisation holds
- ▶ Markets are segmented → firms may pursue pricing-to-market

Trade – Pricing I

- ▶ Due to free entry, firms must earn same profits within each market
- ▶ A firm from Home can set a price $p(\theta)$ for its good in Home (marginal consumer θ) and price $p^*(\theta^*)$ in Foreign (marginal consumer θ^*)
- ▶ Profits may be unevenly distributed between Home and Foreign
- ▶ Total profits must equal fixed costs:

$$\Pi_H + \Pi_F = F \quad (3)$$

where Π_i is profit share earned in market i .

- ▶ Prices in Home and Foreign are then given by:

$$p(\theta) = \frac{1}{a} + \frac{\Pi_H}{\mathcal{P}(1 - G(\theta))} \quad p^*(\theta^*) = \frac{1}{a} + \frac{\Pi_F}{\mathcal{P}^*(1 - G^*(\theta^*))}$$

Trade – Pricing II

- ▶ How to determine Π_H and Π_F ?
- ▶ Because all firms export, zero trade costs & identical bound on income distributions
 $\Rightarrow$ the richest consumers $\bar{\theta}$ consume the same in both countries
 $\Rightarrow$ welfare is identical

$$\int_{\underline{\theta}}^{\bar{\theta}} \frac{a\mathcal{P}(1 - G(\theta))}{a\Pi_H + (1 - G(\theta))\mathcal{P}} d\theta + \frac{a\mathcal{P}}{a\Pi_H + \mathcal{P}} \underline{\theta} = \int_{\underline{\theta}}^{\bar{\theta}} \frac{a\mathcal{P}^*(1 - G^*(\theta^*))}{a\Pi_F + (1 - G^*(\theta^*))\mathcal{P}^*} d\theta^* + \frac{a\mathcal{P}^*}{a\Pi_F + \mathcal{P}^*} \underline{\theta} \quad (4)$$

- ▶ Profit split (3) and (4) solve for price schedules as functions of income distributions and parameters
- ▶ Why not income-dependent profit shares $\Pi_i(\theta)$? Firms wouldn't earn same profits within each market $\rightarrow$ deviation incentives

Trade Case 1: Identical Countries

- ▶ Suppose Home and Foreign have identical income distributions $G(\cdot) = G^*(\cdot)$ and equal population $\mathcal{P} = \mathcal{P}^*$
- ▶ Symmetry implies $\Pi_H = \Pi_F = F/2$, fixed costs shared equally across countries
- ▶ With each market covering half the fixed cost, the price schedule in each country becomes:

$$p(\theta) = \frac{1}{a} + \frac{F/2}{(1 - G(\theta)) P},$$

which is analogous to doubling market size in autarky

Trade Case 1: Identical Countries II

- ▶ Trade liberalisation lowers all prices due to market size effect: fixed costs are spread across more consumers. However, the price drop is not uniform:
 - ▶ Necessities (low θ goods) already had many buyers; doubling market further reduces their price modestly.
 - ▶ Luxuries (high θ goods) had few buyers; doubling market size significantly reduces their markup.
- ▶ **Pro-rich gains from trade:** Rich consumers benefit more, in both absolute and relative terms, because of larger price changes
[Adao et al. (2022); Borusyak and Jaravel (2021); Galle et al. (2023); Helpman et al. (2010)]

Trade Case 1: Identical Countries III

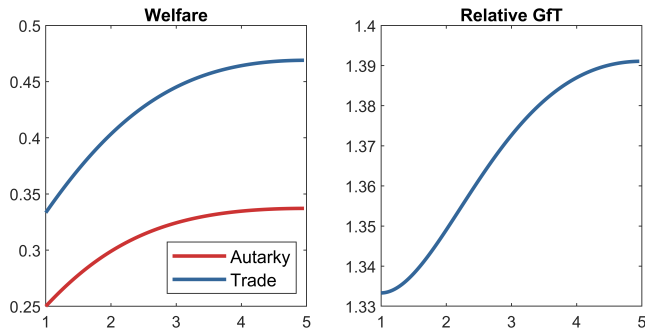


Figure 2: Gains from Trade with Identical Countries

Notes: The log-normal distribution is truncated from above. The distribution is determined by $\theta \sim LN(\mu = 0.3, \sigma = 0.7)$, with $1 \leq \theta \leq 5$. To calculate prices, we set $\mathcal{P} = 1$, $F = 2$, and $a = 0.5$ for simplicity. Welfare is then given by integrating the inverse of prices. Due to the assumption of $G = G^*$, profit shares are identical and opening up to trade is equivalent to half the fixed costs, so trade uses $F = 1$. The gains from trade are calculated as the ratio of welfare under trade to welfare under autarky.

Trade Case 2: Mean-Preserving Redistribution

- ▶ Suppose that Foreign becomes more unequal country. Specifically, Foreign's income distribution is a mean-preserving spread of Home's
- ▶ From autarky: MPS lowers average price level $\rightarrow \text{RHS} > \text{LHS}$. Hence, we require that $\Pi_F > \Pi_H$ for equality

$$\int_{\underline{\theta}}^{\bar{\theta}} \frac{a\mathcal{P}(1 - G(\theta))}{a\Pi_H + (1 - G(\theta))\mathcal{P}} d\theta + \frac{a\mathcal{P}}{a\Pi_H + \mathcal{P}} \underline{\theta} = \int_{\underline{\theta}}^{\bar{\theta}} \frac{a\mathcal{P}^*(1 - G^*(\theta^*))}{a\Pi_F + (1 - G^*(\theta^*))\mathcal{P}^*} d\theta^* + \frac{a\mathcal{P}^*}{a\Pi_F + \mathcal{P}^*} \underline{\theta}$$

Trade Case 2: Mean-Preserving Redistribution II

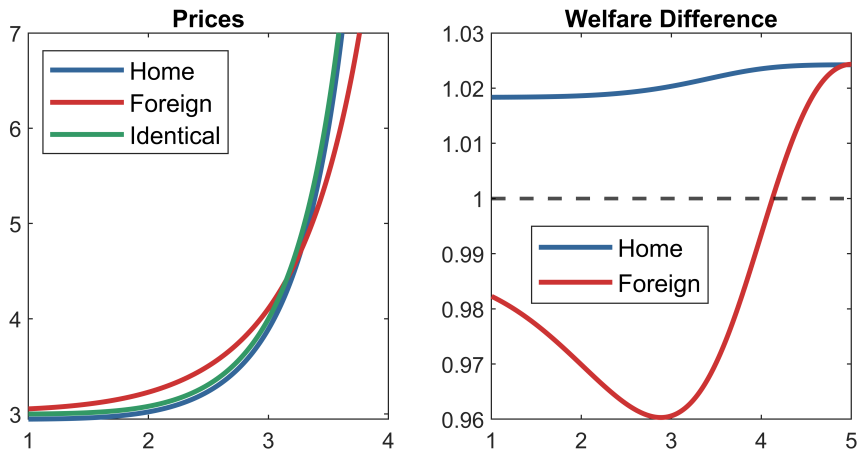


Figure 3: Prices and Welfare in Unequal Countries

Trade Case 2: Mean-Preserving Redistribution III

- ▶ Home: Price schedule shifts downwards, because lower fixed cost share & income distribution $G(\cdot)$ unchanged
⇒ every consumer benefits
- ▶ Foreign: price schedule rotates
 - ▶ **Pricing-to-market effect** shifts price schedule upwards (larger fixed cost share Π_F)
 - ▶ **Market size effect:** fewer middle income consumers & more rich consumers
 - ▶ At upper end of income distribution, market size effect dominates pricing-to-market effect and prices fall
 - ▶ At lower end, negative market size effect (fewer consumers) + pricing-to-market effect (higher fixed cost share)
⇒ large price increases & most consumers lose out
 - ▶ Compared to autarky: even more consumers lose, because additional pricing-to-market effect of increased inequality

Conclusion

- ▶ We develop a two-country trade model with non-homothetic preferences and study effects of income inequality scenarios on prices and welfare
- ▶ Firms pursue pricing-to-market by shifting fixed costs across markets
- ▶ Extensive margin consumption generates price schedules and varying consumption bundles
- ▶ Increased income inequality hurts poor consumers and benefit the rich
⇒ even more people lose in open economy setting due to pricing-to-market effect

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