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Non-homothetic Preferences, Growth and International Trade

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1. Motivation

- Study demand side effects on growth and trade in an international context
- What are the consequences of changes in global income inequality for growth and international trade?
- Linder (1961) postulates that similarity in per capita incomes is a key determinant of international trade
  - ▸ Hunter (1991) finds empirical evidence for the importance of non-homothetic preferences in trade
- Empirical studies on relationship between income inequality and growth are contradictory
  - ▸ Barro (2000) finds a negative relationship for poor countries and a positive relationship for rich. Perotti (1996) finds an overall negative relationship.

1.1 Motivation

- Inequality in per capita incomes across countries has
    - i) a negative effect on international trade (extensive margin, i.e. the number of product categories which are traded)
    - ii) a positive effect on (world) growth
- Intuition
    - i) high inequality $\rightarrow$ large difference between willingness to pay (and hence prices) $\rightarrow$ threat of parallel imports disciplines price setting of monopolists (arbitrage) $\rightarrow$ some monopolists sell exclusively to the rich $\rightarrow$ not all varieties are traded
    - ii) high inequality $\rightarrow$ not all varieties are traded $\rightarrow$ poor consume only a subset of all varieties $\rightarrow$ more resources available for research and development (R&D) $\rightarrow$ higher growth rate

2. Model - Demographics and Distribution

- 2 countries form the world
- L households populate world
- Fraction β lives in country P (poor) and $1 - \beta$ in country R (rich)
- Each household is endowed with labor (efficiency units) and owns assets (only domestic)
- No inequality within countries

2.1 Model - Markets and Intellectual Property Rights

- No uncertainty
- Factor markets
  - ▶ Labor and capital immobile across countries
  - ▶ Domestic factor markets perfect, i.e. markets clear at equilibrium prices
- Goods markets
  - ▶ Assume goods are indivisible
  - ▶ Goods can be traded internationally but iceberg trade costs $\tau \geq 1$ occur
  - ▶ Domestic goods markets characterized by monopolistic competition
- Intellectual Property Rights
  - ▶ Patents are perpetual and fully enforced
  - ▶ International exhaustion of patents, i.e. parallel imports are allowed

2.2 Model - Households

- Assumption of indivisible goods implies that consumption is binary choice

- Model consumption of good j as indicator function

$$x(j, t) = \begin{cases} 1, & \text{if good } j \text{ is consumed} \\ 0, & \text{else} \end{cases}$$

- Instantaneous utility is given by

$$u\left(x(j, t)\right) = \int_{j=0}^{N(t)} x(j, t) dj = N(t)$$

- Zero-one preferences imply that consumption choice is restricted to extensive margin

- In contrast to CES preferences where consumption is chosen only along the intensive margin

2.2.1 Model - Demand

- Households maximize logarithmic intertemporal utility over an infinite horizon

$$U(0) = \int_{t=0}^{\infty} \exp\left(-\rho t\right) \log\left[u\left(x(j,t)\right)\right] dt$$

  subject to a budget constraint and a no-Ponzi game condition.

- Household's demand for good j at time t is given by

$$x(j,t) = \begin{cases} 1, & \text{if } z(t) \geq p(j,t) \\ 0, & \text{else} \end{cases}$$

  where $z(t) = \frac{u(x(j,t))^{-1}}{\lambda(t)}$ denotes the willingness to pay

- The willingness to pay is different across countries since marginal utility of wealth $\lambda(t)$ depends on wealth level which is different

2.3 Model - Firms

- Monopolistic firms
- Only production factor is labor
- Firms in both countries have access to same technology
- Perfect international knowledge spillovers in R&D and production (Coe & Helpman, 1995)
- Technology
  - Creation of 1 new design (R&D) requires $F(t) = F/N(t)$ units of labor
  - Production of 1 unit of final output requires $b(t) = b/N(t)$ units of labor
- Firms maximize operating profits subject to their market demand

3. Model - Equilibrium

- Autarky: No goods are traded if
  - ▶ Willingness to pay falls short of marginal cost of production times trade cost
- Full Trade: All goods are traded if inequality in per capita incomes across countries is so low that
  - ▶ Willingness to pay of rich falls short of willingness to pay of poor times trade cost, i.e. $z_R(t) \leq \tau z_P(t)$
  - ▶ Firms can perfectly price discriminate
- Partial Trade: Only a fraction of all goods produced in the rich country is traded if inequality is so high that
  - ▶ Willingness to pay of rich exceeds willingness to pay of poor times trade cost, i.e. $z_R(t) > \tau z_P(t)$
  - ▶ Firms cannot perfectly price discriminate due to the threat of parallel imports (arbitrage)

3.1 Model - Effects of Inequality

- Inequality has a negative effect on international trade
  - ▶ Intuition: If inequality across countries is high, differences in the willingness to pay are high. The threat of parallel imports induces some firms in the rich country to sell exclusively to domestic market (forgo larger market but can charge higher price). Hence, not all goods are traded.
- Inequality has a positive effect on growth
  - ▶ Intuition: If inequality across countries is high, the economy is in a partial trade equilibrium. The poor consume only a fraction of all goods that are produced in the rich country. Hence, less resources are needed in the production sector (compared to full trade equilibrium) so that more resources can be allocated to R&D. This allows the economy to grow at a higher rate.

4. Conclusion

- Argued that inequality across countries has
  - a negative effect on international trade
  - a positive effect on growth

- Extensions, future research
  - Relax assumption on capital mobility
  - North-South framework: effect of inequality on product cycle

5. Related Literature

- Difference to standard theory?
- Suppose we have constant-elasticity-of-substitution (CES) preferences (homothetic)
- Since marginal utility of consuming first unit of a variety is infinity, all varieties are traded (always)
- No effect of inequality in per capita incomes on international trade and growth, since only aggregate income matters
- Related work
  - ▶ static: Foellmi et al. (2010), Markusen (2010) or Mitra and Trindade (2005)
  - ▶ dynamic: Foellmi and Zweimüller (2006)

6. Transitional Dynamics

- Suppose rich country inherits a large knowledge stock and the poor country a very low one (off balanced growth path)

- Economy starts in an equilibrium where not all varieties are traded, and might end up in one where all varieties are traded (if inequality on bgp is below a certain threshold)

- During the transition the poor country grows at a higher rate than the rich, i.e. the poor country catches up until the economy is on the bgp (however, not complete convergence since on final bgp there is still inequality)

- Interest rates in the poor country are high at the beginning, so that there is a lot of R&D which allows the poor country to grow at a high rate (during the transition, the poor save more than the rich)

- Lower international knowledge spillovers lead to a longer transition period (simulations)

6.1 Transitional Dynamics

- Phase diagram
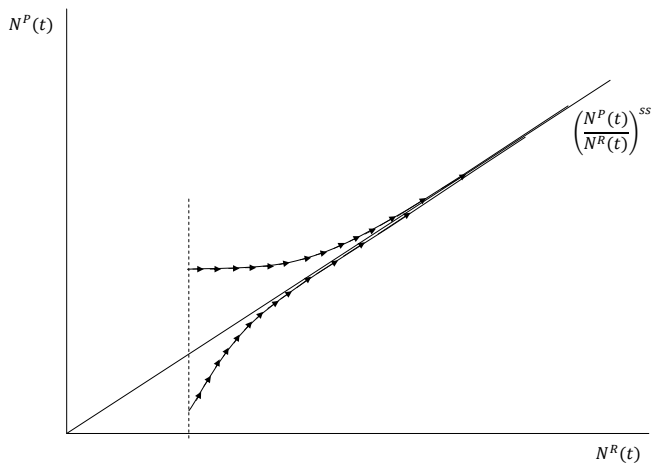
7. Policy

- Trade liberalization has a positive effect on growth
  - ▶ Intuition: A decline in trade costs liberates resources from the production sector that can be allocated to R&D (it reduces inefficiency in general)
- Design of intellectual property rights: National exhaustion of patents
  - ▶ If patents are nationally exhausted, parallel imports are not allowed by law
  - ▶ In that case the economy is always in a full trade equilibrium since firms can always perfectly price discriminate, and therefore all firms will always sell to all households
  - ▶ Hence, this change in policy has a negative effect on growth and a positive effect on international trade

8. Within-country Inequality

- Assume there is no inequality across countries
- Suppose there inequality within the rich country and no inequality within the poor country
- Furthermore, wealth is distributed such that $z_{RR}(t) > z_P(t) > z_{RP}(t)$
- Since there are no trade cost within the rich country, there will always be some monopolists which sell exclusively to the rich
- Effect of within-country inequality
  - low within-country inequality such that $z_{RR}(t) < \tau z_P(t)$ and $z_P(t) < \tau z_{RP}(t)$: no firm has an incentive to sell exclusively to the rich in the rich country $\rightarrow$ all goods traded
  - high within-country inequality such that $z_P(t) < \tau z_{RP}(t)$ and $z_{RR}(t) > \tau z_P(t)$: some firms in the rich country have an incentive to sell exclusively to the rich $\rightarrow$ only subset of all goods traded

9. Learning-by-importing

- Knowledge only transfers in goods imported
- Suppose technology is
  - $F^i(t) = F/N_i(t)$
  - $b^i(t) = b/N_i(t)$
- Full Trade $N_i(t) = N(t)$: no difference
- Partial Trade $N_R(t) = N(t)$ and $N_P(t) < N(t)$: growth rate given by

$$g = \frac{\left(I^P - b\right) L \left[\beta + \tau(1 - \beta)\right]}{F}$$

consumption of households in poor country determines extent of learning-by-doing (since rich consume all goods)

  - inequality has negative effect on growth
  - inequality has negative effect on trade
  - trade cost has positive effect on growth (since the set of goods exported to the poor country is a positive function of τ)

10. Literature

Linder, Staffan B., An Essay on Trade and Transformation, Almqvist and Wiksells, Uppsala, 1961.

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11. Full Trade Equilibrium

$$\dot{N}^R(t) = \left\{ \frac{(1-\beta)LI^R(1-\phi+\phi^2) - b^R L[(1-\beta)+\tau\beta]}{F^R} \right\} N^R(t) + \left\{ \frac{(1-\beta)LI^R(1-\phi)}{F^R} \right\} N^P(t)$$

$$\dot{N}^P(t) = \left\{ \frac{\beta LI^P(1-\psi+\psi^2) - b^P L[\beta+\tau(1-\beta)]}{F^P} \right\} N^P(t) + \left\{ \frac{\beta LI^P(1-\psi)}{F^P} \right\} N^R(t)$$

$$\dot{z}_P(t) = \left\{ \frac{\beta L b^P N(t)}{F^P N^P(t)} \right\} z_P(t)^2 - \left\{ \frac{L b^P[\beta+\tau(1-\beta)]}{F^P} + \rho + \frac{\dot{N}(t)}{N(t)} \right\} z_P(t)$$

$$z_R(t) = \frac{\beta}{1-\beta} \frac{N^R(t)}{N^P(t)} z_P(t)$$

$$\dot{w}^R(t) = \left\{ \frac{\dot{N}(t)}{N(t)} + \rho + \frac{\dot{z}_R(t)}{z_R(t)} + \frac{(1-\phi+\phi^2)\dot{N}^R(t) + (1-\phi)\dot{N}^P(t)}{(1-\phi+\phi^2)N^R(t) + (1-\phi)N^P(t)} \right\} w^R(t)$$

$$\qquad - \left\{ \frac{\left[(1-\phi+\phi^2)N^R(t) + (1-\phi)N^P(t) \right] N(t)\beta L z_P(t)}{F^R N^P(t)} \right\}$$

where $w^P(t)b^P(t) = 1$ is the numeraire. Case with perfect knowledge spillovers $\phi = \psi = 0$.

12. Partial Trade Equilibrium

$$\dot{N}^R(t) = \left\{ \frac{(1-\beta)LI^R(1-\phi+\phi^2) - b^R L(1-\beta)}{F^R} \right\} N^R(t) + \left\{ \frac{(1-\beta)L\left[I^R(1-\phi) - b^R\tau^2\right]}{F^R} \right\} N^P(t)$$

$$\dot{N}^P(t) = \left\{ \frac{\beta LI^P(1-\psi+\psi^2) - b^P L[\beta + \tau(1-\beta)]}{F^P} \right\} N^P(t) + \left\{ \frac{\beta LI^P(1-\psi)}{F^P} \right\} N^R(t)$$

$$\dot{z}_P(t) = \left\{ \frac{Lb^P[\beta + \tau(1-\beta)]}{F^P} \right\} z_P(t)^2 - \left\{ \frac{Lb^P[\beta + \tau(1-\beta)]}{F^P} + \rho + \frac{\dot{N}^P(t)}{N^P(t)} \right\} z_P(t)$$

$$z_R(t) = \left\{ \frac{\beta + \tau(1-\beta)}{1-\beta} \right\} z_P(t) - \tau\left(\frac{\beta}{1-\beta}\right) \frac{b^R w^R(t)}{(1-\phi+\phi^2)N^R(t) + (1-\phi)N^P(t)}$$

$$\dot{w}^R(t) = \left\{ \frac{\dot{N}(t)}{N(t)} + \rho + \frac{\dot{z}_R(t)}{z_R(t)} + \frac{(1-\phi+\phi^2)\dot{N}^R(t) + (1-\phi)\dot{N}^P(t)}{(1-\phi+\phi^2)N^R(t) + (1-\phi)N^P(t)} + \frac{[(1-\beta)+\tau\beta]Lb^R}{F^R} \right\} w^R(t)$$
$$\quad - \left\{ \frac{\left[(1-\phi+\phi^2)N^R(t) + (1-\phi)N^P(t)\right][\beta + \tau(1-\beta)]Lz_P(t)}{F^R} \right\}$$

$$N^{RM}(t) = \tau\left(\frac{1-\beta}{\beta}\right) N^P(t)$$

where $w^P(t)b^P(t) = 1$ is the numeraire. Case with perfect knowledge spillovers $\phi = \psi = 0$.