Inequality, Openness, and Growth through Creative Destruction

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Inequality impacts growth through various channels. The net effect remains unclear and empirical evidence is mixed. We focus on one specific channel: The effect of inequality on the demand for high quality goods. We show that in developing countries this channel may be reversed in an open when compared to a closed economy. Increasing the income of the rich is beneficial for growth in a closed economy because it increases their willingness-to-pay for innovated high-quality goods. In an open economy, an increase in the income of the rich intensifies competition from foreign high-quality providers. Theoretical predictions in line with suggestive evidence from growth regressions using both aggregate data and industry-level data on export quality.
Motivational Fact

Developing countries satisfy their demand for high quality goods via importing.


Model

Households
- Instantaneous utility is $u^h = \int_0^1 (q^h_i(t))^{1-\beta} di (z^h(t))^\beta$
- $i$ is one consumption need, $q_i$ a different quality of that good
- Two types of households that differ in their income $I^H, I^L$
  (endowments with effective labor)

Homogeneous good
- Sector is perfectly competitive and $z = a_z AL_z$

Differentiated good and innovation
- Linear production $q_i = a_q AL_i$
- Blueprints up to $\bar{q}_i(t-1)$ are publicly available $\rightarrow$ competitive fringe
- Convex cost of quality upgrading $h(\bar{q}_i(t)/\bar{q}_i(t-1))$
- One period patent for all qualities $q_i \in (\bar{q}_i(t-1), \bar{q}_i(t)]$
- After one period, varieties spill over to the aggregate economy, such that $A(t + 1) = \frac{\bar{q}(t)}{\bar{q}(t-1)} A(t)$
Firms’ problem

- Revelation principle: Problem of incumbent firm

\[
\max_{q_i^H, p_i^H, q_i^L, p_i^L, \bar{q}_i(t) \forall i} \quad \lambda \left( p_i^H - \frac{1}{a_q A} q_i^H \right) + (1 - \lambda) \left( p_i^L - \frac{1}{a_q A} q_i^L \right) - h \left( \frac{\bar{q}_i(t)}{\bar{q}_i(t-1)} \right)
\]

s.t. \[ \theta^h v(q_i^h) - p_i^h \geq \arg\max_{q \in [0, \bar{q}_i(t-1)]} \left\{ \theta^h v(q) - \frac{1}{a_q A} q \right\}, \quad h \in \{L, H\} \] (IR)

\[ \theta^H v(q_i^H) - p_i^H \geq \theta^H v(q_i^L) - p_i^L \] (ICH)

\[ \theta^L v(q_i^L) - p_i^L \geq \theta^L v(q_i^H) - p_i^H \] (ICL)

\[ q_i^h \leq \bar{q}_i(t), \quad h \in \{L, H\}. \]

Optimal non-linear pricing with (1) endogenous upper bound on quality and (2) GE effects on firms’ behaviour due to endogenous \( \theta \)
Equilibrium

- All households with income $I^h \leq \hat{I} := 1/[a_q(1 - \beta)]$ will find it optimal to consume some quality $q \leq \bar{q}(t-1)$ at marginal cost.

- There is a unique equilibrium that is symmetric:
  - $I^L \leq I^H \leq \hat{I}$: No growth equilibrium
  - $I^L \leq \hat{I} < I^H$: Separating equilibrium
  - $\hat{I} < I^L \leq I^H$: Pooling or separating equilibrium
Growth determined by quality for highest type, \( H \)

\[
\omega^H = 1 + \sigma \sqrt{\frac{1-\lambda}{\lambda}} \quad \text{and} \quad \omega^L = 1 - \sigma \sqrt{\frac{\lambda}{1-\lambda}}
\]

Consider redistribution from the poor to the rich: \( \sigma \uparrow \)

For \( \hat{I} \geq \bar{w} \): \( \sigma \uparrow \) monotonously increases growth

For \( \hat{I} < \bar{w} \): \( \sigma \uparrow \) U-shaped with lowest growth at change from pooling to separating equilibrium
Small Open Economy

- Consider Small Open Economy that is not at frontier and iceberg trade cost $\tau$
- $A^{\text{ROW}} > A^{\text{SOE}} (\bar{q}(t-1)^{\text{ROW}} > \bar{q}(t-1)^{\text{SOE}})$, otherwise perfectly symmetric
- Trade: SOE exports the homogeneous good $z$ and imports high quality goods. Homogeneous good $z$ must be priced competitively in the world market, i.e.

$$p_z^{\text{ROW}} = \tau \frac{w^{\text{SOE}}}{a_z A^{\text{SOE}}} = \frac{\sigma^{\text{ROW}}}{a_z A^{\text{ROW}}}.$$ (1.1)

- It follows that quality $q$ ($q < \bar{q}(t-1)^{\text{ROW}}$) can be imported at price

$$\tau \frac{w^{\text{ROW}}}{a_q A^{\text{ROW}}} q = \tau^2 \frac{1}{a_q A^{\text{SOE}}} q$$ (1.2)

- Introduces additional IR constraint into firm’s optimization problem
Firms’ Problem Small Open Economy

\[
\max_{q^H_i, p^H_i, q^L_i, p^L_i, \bar{q}_i(t)} \lambda \left( p^H_i - \frac{1}{a_q A_i} q^H_i \right) + (1 - \lambda) \left( p^L_i - \frac{1}{a_q A_i} q^L_i \right) - h \left( \frac{\bar{q}_i(t)}{\bar{q}_i(t - 1)} \right)
\]

s.t. \[
\theta^h v(q^h_i) - p^h_i \geq \arg\max_{q \in [0, \bar{q}_i(t - 1)]} \left\{ \theta^h v(q) - \frac{1}{a_q A_i} q \right\}, \quad h \in \{L, H\}
\]

\[
\theta^h v(q^h_i) - p^h_i \geq \arg\max_{q > \bar{q}_i(t - 1)} \left\{ \theta^h v(q) - \tau^2 \frac{1}{a_q A_i} q \right\}, \quad h \in \{L, H\}
\]

\[
\theta^H v(q^H_i) - p^H_i \geq \theta^H v(q^L_i) - p^L_i
\]

\[
\theta^L v(q^L_i) - p^L_i \geq \theta^L v(q^H_i) - p^H_i
\]

\[
q^h_i \leq \bar{q}_i(t), \quad h \in \{L, H\}.
\]
Rule out that low types find it attractive to import differentiated goods
We consider the case with $\hat{I} < \bar{\omega}$ and increasing $\sigma$

If $\sigma$ increases further, $(IRf)$ becomes binding
Firm has to improve the value of the contract for the high types (reduce $p^H$) to keep serving the rich
What are the effects of lowering $p^H$?

- Positive demand effect: lower $p^H$ of all firms increases $\theta^H$  
  $\Rightarrow q^H$ higher

- Negative pro-competitive effect: lower mark-ups decrease profits from innovation

- Negative business stealing effect: as inequality increases further, domestic firms will not serve rich consumers any longer and high qualities are imported. The positive price effect from the closed economy is no longer present

Therefore, compared to the closed economy, the effect of inequality on growth is typically smaller in the SOE and may even be negative.
Consequences of inequality

- Developing countries with higher inequality have more high quality imports from the ROW, and hence less domestic innovation.
- We test this prediction using data on sectoral import and export quality.
- For a developing country, higher inequality should have a smaller effect on growth in an open than in a closed economy.
- Hence, we estimate:

\[
\ln \left( \frac{q_{x,c,t}}{q_{x,c,t-j}} \right) = \beta_1 \ln(q_{x,c,t-j}) + \beta_2 Open_{c,t-j}^s + \beta_3 Ineq_{c,t-j} + \beta_4 Dist_{c}^s \\
+ \beta_5 [Open_{c,t-j}^s \times Ineq_{c,t-j}] + \beta_6 [Open_{c,t-j}^s \times Dist_{c}^s] + \beta_7 [Ineq_{c,t-j} \times Dist_{c}^s] \\
+ \beta_8 [Open_{c,t-j}^s \times Ineq_{c,t-j} \times Dist_{c}^s] + \text{controls}
\]

- Our prime interest is in the sum of \( \beta_5 \) and \( \beta_8 \).
### Main results

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<th>Dependent variable in $t$:</th>
<th>Growth $t$ to $t + 1$ in export quality</th>
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### Main results II

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Appendix: Firms’ Problem II

- All households with income $I^h \leq \hat{I} := 1/[a_q(1 - \beta)]$ will find it optimal to consume some quality $q \leq \bar{q}(t - 1)$ at marginal cost.
- Suppose $\hat{I} < I^L \leq I^H$: First order conditions for profit maximization

\begin{align*}
\theta^L \left( v(q^L_i) - v(\bar{q}(t - 1)) \right) + \frac{1}{a_q} &= p^L_i \\
\theta^H \left( v(q^H_i) - v(q^L_i) \right) + p^L_i &= p^H_i \\
\theta^L v'(q^L_i) - \lambda \theta^H v'(q^L_i) - (1 - \lambda) \frac{1}{a_q A} &\leq 0 \\
\lambda \theta^H v'(q^H_i) - \lambda \frac{1}{a_q A} - h' \left( \frac{q^H_i}{\bar{q}(t - 1)} \right) &= 0 ,
\end{align*}

(1.3) (1.4) (1.5) (1.6)