Measuring Fiscal Impoverishment

Sean Higgins   Nora Lustig

Department of Economics
Tulane University

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Motivation: Debate about taxing the poor

- Governments criticized for heavily taxing the poor

  - Example: Brazil
    - Poor face higher proportional tax burdens than the rich (Goñi et al., 2011)
    - Poorest 10% spends about a quarter of its income on consumption taxes (Baer and Galvão, 2008)
    - Criticized by:
      - Politicians (e.g., Rodrigues, 2011)
      - Academics (Siqueira and Nogueira, 2013)
      - Multilateral organizations (Afonso et al., 2013)
      - National and international media (O Globo, Le Monde, Washington Post)

- World Bank recommendation to developing countries: “avoid taxing the poor”
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- High taxes on the poor are acceptable if accompanied by sufficiently large transfers to the poor

- "A regressive tax might conceivably be the best way to finance pro-poor expenditures, with the net effect being to relieve poverty" (Ebrill et al., 2001)

- "It is quite obvious that the disadvantages of a proportional tax are moderated by adequate targeting" of transfers, since "what the poor individual pays in taxes is returned to her" (Engel et al., 1999)
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- Current measures of tax and transfer system inadequate
Brazil

<table>
<thead>
<tr>
<th>Pre-tax and transfer income groups</th>
<th>Post-tax and transfer income groups</th>
<th>% of Pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; $2.50</td>
<td>$2.50–4.00</td>
</tr>
<tr>
<td>&lt; $2.50</td>
<td>85%</td>
<td>10%</td>
</tr>
<tr>
<td>$2.50–4.00</td>
<td>14%</td>
<td>75%</td>
</tr>
<tr>
<td>$4.00–10.00</td>
<td>0%</td>
<td>13%</td>
</tr>
<tr>
<td>&gt; $10.00</td>
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</tr>
</tbody>
</table>

Higgins and Lustig Measuring Fiscal Impoverishment 3/15
1. Show that standard measures of the effect of taxes and benefits on the poor
   - Poverty indicators (including squared poverty gap)
   - Stochastic dominance tests
   - Measures of horizontal inequity and progressivity
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2. Illustrate that this phenomenon is occurring in Brazil

3. Axiomatically derive a measure that does capture FI
Defining Fiscal Impoverishment

- Income space $\Omega \subset \mathbb{R}_+$ and $\sup \Omega < \infty$
- Income before taxes and transfers $y_i^0 \in \Omega$ and after taxes and transfers $y_i^1 \in \Omega$ for $i = 1, \ldots, n$
- Cumulative distribution functions $F_0 : \Omega \to [0, 1]$ and $F_1 : \Omega \to [0, 1]$
- Poverty line $z \in \Omega$
- There is fiscal impoverishment if $y_i^1 < y_i^0$ and $y_i^1 < z$ for some $i$
• Let $F$ and $G$ be the cumulative distribution functions for two income distributions.

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- $F$ first order stochastically dominates $G$ on $[0, z] \iff$ Lower poverty under distribution $F$ for broad class of poverty measures, any poverty line (Atkinson 1987; Foster and Shorroks 1988)
Review of Horizontal Inequity and Progressivity

- **Horizontal inequity** occurs when pre-tax and transfer equals are treated *unequally* by the fiscal system
  - or individuals are reranked by the fiscal system

- There is **classical horizontal inequity** if $y_i^0 = y_j^0$ and $y_i^1 \neq y_j^1$ for some $(i, j)$ pair

- There is **reranking** if $y_i^0 > y_j^0$ and $y_i^1 < y_j^1$ for some $(i, j)$ pair
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• The tax and transfer system is **progressive** if net taxes—i.e., taxes minus benefits—as a proportion of income increase with income
Propositions: FI and FOSD

- $F_1$ does not weakly FOSD $F_0$ among the poor
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If there is no reranking among the poor, $F_1$ FOSD $F_0$ on $[0, z] \iff$ no FI

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Proposition:

If there is reranking among the poor, $F_1$ FOSD $F_0$ on $[0, z]$ is not a sufficient condition for no FI.

Proof.

$y^0 = (5, 8, 20)$, $y^1 = (9, 6, 18)$, $z = 10$. $F_1$ FOSD $F_0$ among the poor and there is FI.
Proposition

\textit{Horizontal inequity is \textbf{neither a necessary nor sufficient condition} for FI.}

Proof.

\[ y_0 = (5,5,6,20), \quad y_1 = (5,7,6,18), \quad z = 10. \]

Horizontal inequity (classical and reranking) has occurred but FI has not.

\[ y_0 = (5,8,20), \quad y_1 = (6,7,20), \quad z = 10. \]

FI has occurred but horizontal inequity (classical or reranking) has not.
Proposition

Horizontal inequity is *neither a necessary nor sufficient condition* for FI.

Proof.

Not sufficient: $y^0 = (5, 5, 6, 20), y^1 = (5, 7, 6, 18), z = 10$. Horizontal inequity (classical and reranking) has occurred but FI has not.
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Not necessary: \( y^0 = (5, 8, 20), y^1 = (6, 7, 20), z = 10 \). FI has occurred but horizontal inequity (classical or reranking) has not.
A globally progressive tax and transfer system is *neither a necessary nor sufficient condition* for no FI.
Proposition

A globally progressive tax and transfer system is *neither a necessary nor sufficient condition* for no FI.

Not necessary:
An Illustration: Brazil

Before taxes and transfers
After taxes and transfers
Propose a set of axioms

1. Monotonicity
2. Focus
3. Normalization
4. Continuity
5. Permutability
6. Translation invariance
7. Linear homogeneity
8. Subgroup consistency

Measure of FI satisfying 1–8 is uniquely determined up to a proportional transformation
Axiomatic Measure of FI

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  2. Focus
  3. Normalization
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- Measure of FI satisfying 1–8 is uniquely determined up to a proportional transformation

\[ f(y^0, y^1; z) = k \sum_{i \in S} (\min\{y^0_i, z\} - \min\{y^0_i, y^1_i, z\}) \]
FI in Brazil

- 36.8% of post-fisc poor are fiscally impoverished
- Total FI, $f(y^0, y^1; z)$ with $k = 1$, equals over $700$ million
- Per capita FI, $f(y^0, y^1; z)$ with $k = 1/n$, equals $0.01$ per person per day
  - This divides by total population, not just those who are impoverished
- The impoverished pay $0.19$ per person per day in net taxes
  - 10% of their pre-fisc incomes on average
Dominance Criteria

**Proposition**

*FI is unambiguously lower in \((y^0, y^1)\) than \((x^0, x^1)\) for any measure of FI satisfying Axioms 1–8 and any poverty line in \([0, z^+]\) if and only if*

\[
f(y^0, y^1; z) \leq f(x^0, x^1; z) \quad \forall \ z \in [0, z^+]\]

_with strict inequality for some \(z \in [0, z^+]\)._*

- In other words, compare FI curves