Measuring Fiscal Impoverishment

Sean Higgins Nora Lustig

Department of Economics
Tulane University

17th World Congress
International Economic Association
Amman, Jordan
June 9, 2014

Motivation: Debate about taxing the poor

- Governments criticized for heavily taxing the poor

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)

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*)

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"

Motivation: Debate about taxing the poor

- High taxes on the poor are acceptable if accompanied by sufficiently large transfers to the poor

Motivation: Debate about taxing the poor

- 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)

Motivation: Debate about taxing the poor

- 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)

Motivation: Debate about taxing the poor

- 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)
- Current measures of tax and transfer system inadequate

Brazil

Pre-tax and transfer income groups	Post-tax and transfer income groups: < $2.50	$2.50 –4.00	$4.00 –10.00	> $10.00	% of Pop.
< $2.50	85%	10%	4%	1%	15%
$2.50 –4.00	14%	75%	10%	1%	11%
$4.00 –10.00	0%	13%	84%	3%	33%
> $10.00	0%	0%	16%	84%	40%
% of Pop.	14%	14%	36%	36%	100%

Outline

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

   do not tell us whether some of the poor are made poorer by the tax and transfer system ("fiscal impoverishment")

Outline

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

   do not tell us whether some of the poor are made poorer by the tax and transfer system ("fiscal impoverishment")

2. Illustrate that this phenomenon is occurring in Brazil

Outline

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

   do not tell us whether some of the poor are made poorer by the tax and transfer system ("fiscal impoverishment")

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

Review of Stochastic Dominance

- Let F and G be the cumulative distribution functions for two income distributions.
- F (weakly) first order stochastic dominates G

$$\text{if } F(y) \leq G(y) \; \forall \, y$$

Review of Stochastic Dominance

- Let F and G be the cumulative distribution functions for two income distributions.
- F (weakly) first order stochastic dominates G among the poor

$$\text{if } F(y) \leq G(y) \ \forall \, y \in [0, z]$$

Review of Stochastic Dominance

- Let F and G be the cumulative distribution functions for two income distributions.
- F (weakly) first order stochastic dominates G among the poor

$$\text{if } F(y) \leq G(y) \ \forall \, y \in [0, z]$$

- F first order stochastically dominates G on $[0, z]$
  - $\Leftrightarrow$ 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

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
- 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

- F_1 does weakly FOSD F_0 among the poor

Propositions: FI and FOSD

- F_1 does not weakly FOSD F_0 among the poor

Proposition

F_1 does not weakly FOSD F_0 among the poor
$\Rightarrow$ FI has occurred

- F_1 does weakly FOSD F_0 among the poor

Propositions: FI and FOSD

- F_1 does not weakly FOSD F_0 among the poor

Proposition

F_1 does not weakly FOSD F_0 among the poor
$\Rightarrow$ FI has occurred

- F_1 does weakly FOSD F_0 among the poor
  - and there was no reranking among the poor

  - and there is reranking among the poor

Propositions: FI and FOSD

- F_1 does not weakly FOSD F_0 among the poor

Proposition

F_1 does not weakly FOSD F_0 among the poor
$\Rightarrow$ FI has occurred

- F_1 does weakly FOSD F_0 among the poor
  - and there was no reranking among the poor

Proposition

If there is no reranking among the poor,
F_1 FOSD F_0 on $[0, z] \Leftrightarrow$ no FI

  - and there is reranking among the poor

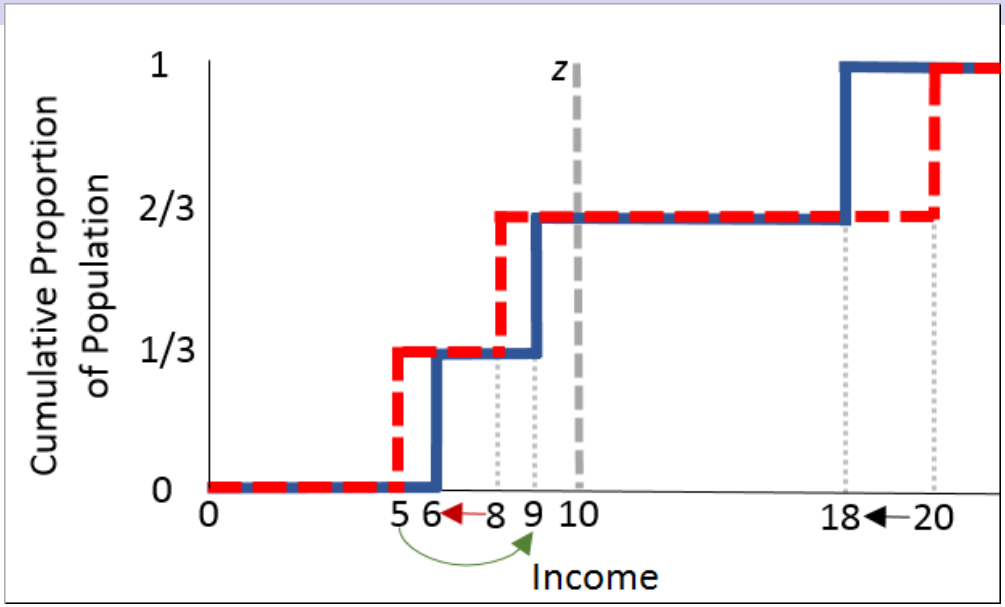
Propositions: FI and FOSD

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.

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



FI and Horizontal Inequity

Proposition

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

Proof.

□

FI and Horizontal Inequity

Proposition

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

Proof.

Not sufficient: $\boldsymbol{y^0} = (5, 5, 6, 20), \boldsymbol{y^1} = (5, 7, 6, 18), z = 10$.
Horizontal inequity (classical and reranking) has occurred but FI has not.

□

FI and Horizontal Inequity

Proposition

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

Proof.

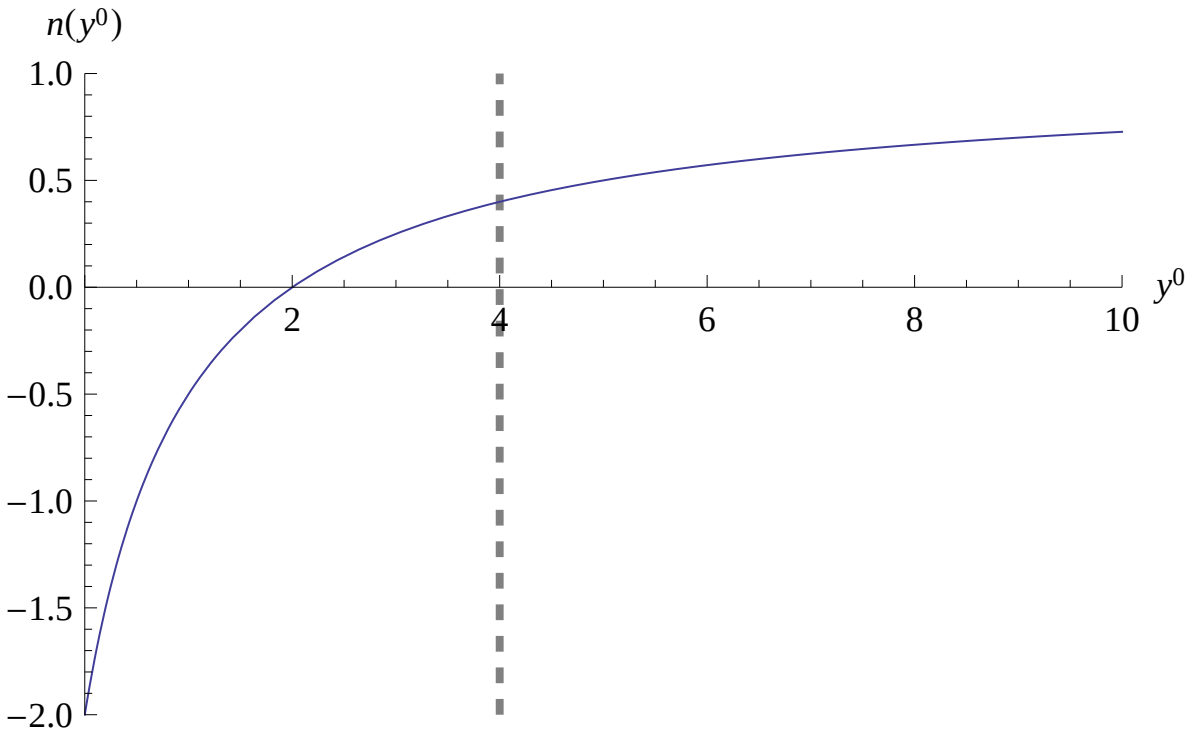
Not sufficient: $\boldsymbol{y^0} = (5, 5, 6, 20), \boldsymbol{y^1} = (5, 7, 6, 18), z = 10$. Horizontal inequity (classical and reranking) has occurred but FI has not.
Not necessary: $\boldsymbol{y^0} = (5, 8, 20), \boldsymbol{y^1} = (6, 7, 20), z = 10$. FI has occurred but horizontal inequity (classical or reranking) has not. □

FI and Progressivity

Proposition

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

Not sufficient:

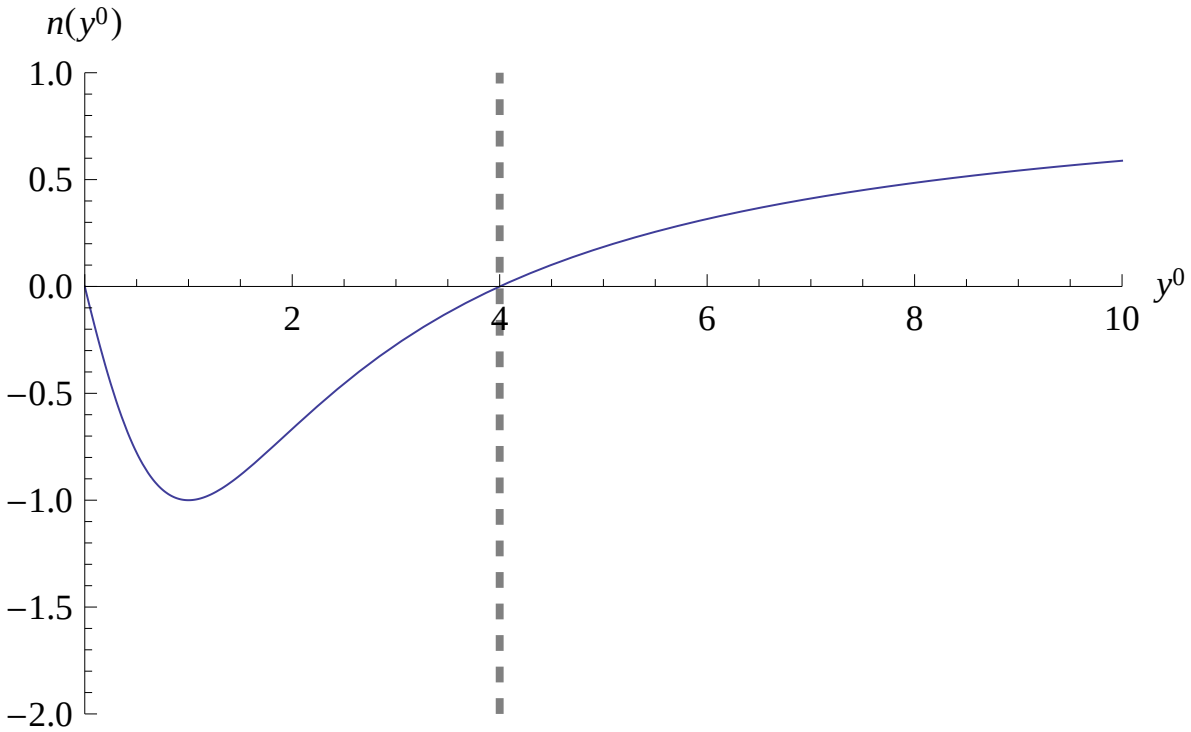


FI and Progressivity

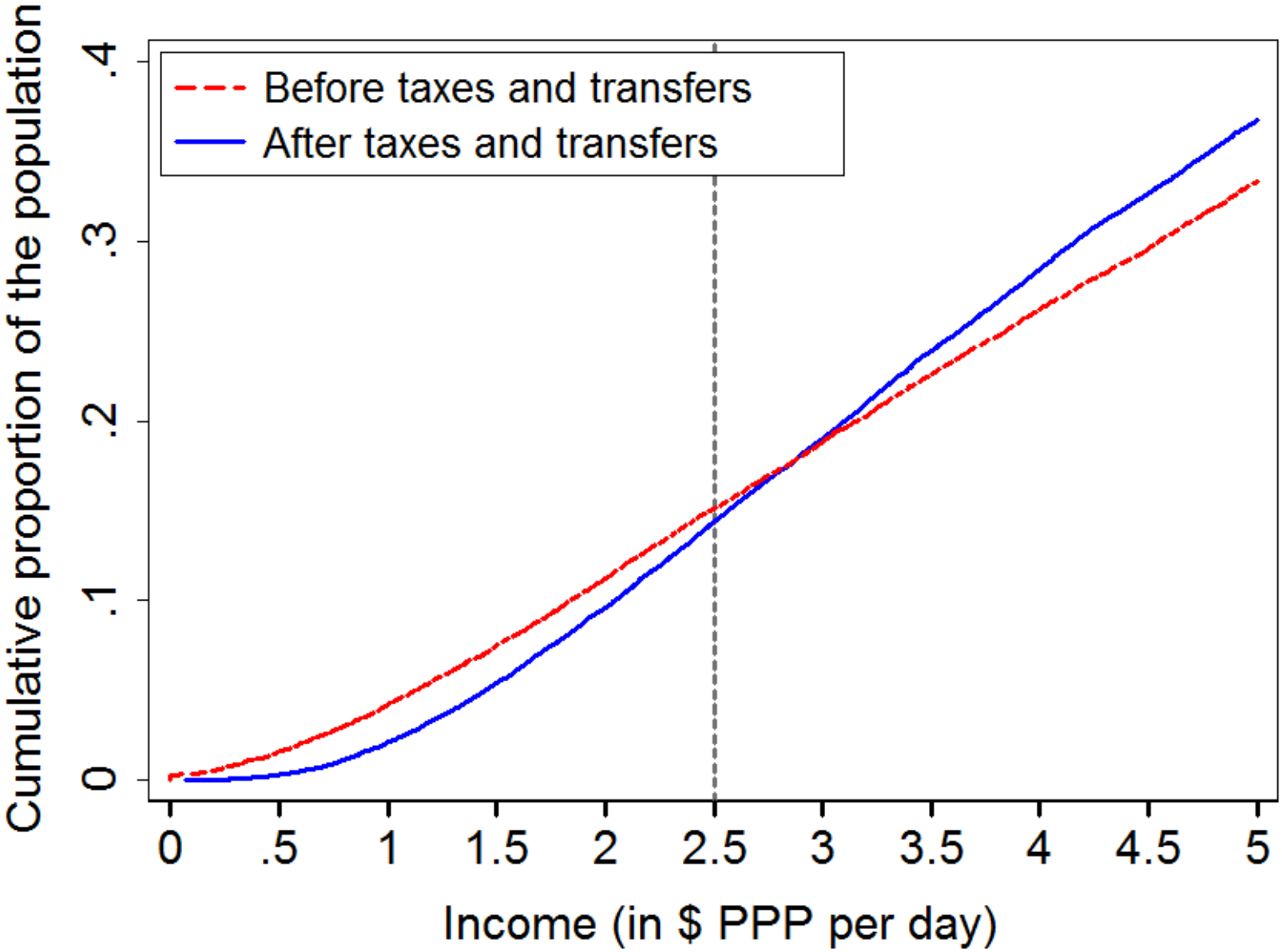
Proposition

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

Not necessary:



An Illustration: Brazil



Axiomatic Measure of FI

- Propose a set of axioms
  1. Monotonicity
  2. Focus
  3. Normalization
  4. Continuity
  5. Permutability
  6. Translation invariance
  7. Linear homogeneity
  8. Subgroup consistency

Axiomatic Measure of FI

- 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

$$f(\mathbf{y^0}, \mathbf{y^1}; z) = k \sum_{i \in S} \left(\min\{y_i^0, z\} - \min\{y_i^0, y_i^1, z\} \right)$$

FI in Brazil

- 36.8% of post-fisc poor are fiscally impoverished
- Total FI, $f(\boldsymbol{y^0}, \boldsymbol{y^1}; z)$ with $k = 1$, equals over \$700 million
- Per capita FI, $f(\boldsymbol{y^0}, \boldsymbol{y^1}; z)$ 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 $(\boldsymbol{y^0}, \boldsymbol{y^1})$ *than* $(\boldsymbol{x^0}, \boldsymbol{x^1})$ *for any measure of FI satisfying Axioms 1–8 and any poverty line in* $[0, z^+]$ *if and only if*

$$f(\boldsymbol{y^0}, \boldsymbol{y^1}; z) \leq f(\boldsymbol{x^0}, \boldsymbol{x^1}; z) \; \forall \; z \in [0, z^+]$$

with strict inequality for some $z \in [0, z^+]$*.*

- In other words, compare FI curves