Measuring Poverty

LECTURE 14

Inequality and poverty measurement

1) a measure of living standards
2) high-quality data on households’ living standards
3) a distribution of living standards
4) a critical level (a poverty line) below which individuals are classified as “poor”
5) one or more poverty measures

Poverty lines
How to draw a poverty line? An Overview

Subjective poverty lines – I/III

- Poverty lines are inherently subjective judgments people make about what constitutes a socially acceptable minimum standard of living in a particular society at a given time (Ravallion 1994: 42).
- The subjective poverty approach is based on the self-assessed adequacy of a family’s food, housing, and clothing.
- How are poverty lines estimated, in practice?

Subjective poverty lines – II/III

- A surveys can ask the Minimum Income Question (MIQ): “What income level do you personally consider to be absolutely minimal? That is to say that with less you could not make ends meet?”
- Another possibility is the Economic Ladder Question (ELQ): “Imagine six steps, where on the bottom, the first step, stand the poorest people, and on the highest step, the sixth, stand the rich (show a picture of the steps). On which step are you today?”
Recommendation 4:

“The World Bank should explore the use of subjective assessments of personal poverty status (in “quick” surveys of poverty), and of the minimum consumption considered necessary to avoid extreme poverty, as an aid to interpreting the conclusions drawn from the global poverty estimates”.

Subjective poverty lines – III/III
World Bank (2017)

Objective poverty lines

- An objective poverty line is one based on some objective metric, such as consumption or income.

Absolute poverty lines

- An absolute poverty line is one which is fixed in terms of the average standard of living (or welfare).
- Example: cost of a bundle containing “basic commodities”, however defined.
- Note 1: ‘Fixed’ is a false friend. An absolute poverty is defined in a specific context and time, that is fully historically determined. Fixed ≠ unchanging.
- Note 2: ‘Absolute’ is not a synonym of ‘low’ – an absolute poverty line can be as generous as the analyst or the society wishes.
Relative poverty lines

- A **relative poverty line** is one which varies with the average standard of living.
- Example: half the mean of per capita income.
- The EU definition of relative poverty line:
  "Low income rate after transfers, with low-income threshold set at 60% of median [equivalized] income, with breakdowns by gender, age [...]"
- Question: why 60%? Why this specific number?
- Answer: who knows?
- Indicator 11 ("Dispersion around the low income threshold"). Three thresholds: 40, 50 and 70% of the median income.

The problem with relative poverty: the richer...the poorer?

<table>
<thead>
<tr>
<th>x1</th>
<th>x2</th>
<th>x3</th>
<th>x4</th>
<th>x5</th>
<th>total</th>
<th>poor</th>
<th>poverty line (60% of the mean)</th>
<th>mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>16</td>
<td>30</td>
<td>60</td>
<td>100</td>
<td>20</td>
<td>10 (40%)</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>24</td>
<td>240</td>
<td>300</td>
<td>500</td>
<td>100</td>
<td>50 (60%)</td>
<td>500</td>
</tr>
</tbody>
</table>

An awkward feature of relative poverty lines is that a policy which raises the living standards of all, but proportionally more of the rich, will increase poverty, notwithstanding the fact that the absolute living standard of the poor has increased!

Recommendation 16: The World Bank should introduce a "societal" headcount ratio measure of global consumption poverty that takes account, above an appropriate level, of the standard of living in the country in question, thus combining fixed and relative elements of poverty
Absolute poverty lines

many popular methods but one key idea: food is the anchor

1) Direct Calorie Intake (DCI)
   Kakwani (2003)

2) Food Energy Intake (FEI)

3) Food-share
   Orshansky (1963, 1965)

4) Cost of Basic Needs (CBN)
   Rowntree (1901) = Ravallion (1994)

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The Cost of Basic Needs (CBN) method

- In a nutshell: estimate the cost of a consumption bundle adequate to meet basic consumption needs.
- Question: What constitutes a ‘basic need’ and what does not?
- Constraint: The choice of the basic-needs bundle should reflect local perceptions of what constitutes poverty (specifically).
- Solution: A safe start consists in including foodstuffs among the basic needs. After, we’ll think of how to add an allowance for consumption of non-food goods/services.

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The CBN method: A strategy

- Three steps:
  1) Estimate the cost of a ‘basic food bundle’: this gives the food poverty line
  2) Estimate the allowance for ‘basic non-food goods’
  3) Add 2 to 1): this gives the (total) poverty line
The food poverty line (FPL)

- How to define a "basic food bundle"?
- The key idea, which does not require any arbitrary assumption on consumption patterns, is to:
  1) estimate the minimum energy requirement for the average individual in the target population (say 2,000 kcal/person/day)
  2) price that amount of calories, using the average cost of one kcal which is computed using the survey data.
- A monetary amount is obtained, and that is the food poverty line (FPL)
- Note that it takes account for local tastes (preferences)

The non-food allowance (NFA)

- How much is the minimum for non-food necessities?
- We start by asking the data
- Focus on a subset of people that are most likely poor, and see how much they spend on non-food
- Two ways to define that target population:
  1) people whose total expenditure is about as much as the food poverty line (lower bound)
  2) People whose food expenditure is about as much as the food poverty line (upper bound)
Lower and Upper Bound CBN Poverty Lines

Recap

- \( \text{LBPL} = FPL + E_h \left( \frac{\text{nonfood}}{\text{food}} | x_h = \text{FPL} \right) \) (lower bound PL)
- \( \text{UBPL} = FPL + E_h \left( \frac{\text{nonfood}}{\text{food}} | x_h = \text{FPL} \right) \) (upper bound PL)

- Which one to choose?
- It is customary to report results on them all (FPL, LBPL, UBPL), but if there needs to be one number, it is often based on UBPL.

Important remark

- The CBN method hinges on the food poverty line
- A good food poverty line requires good estimates of calorie intake
- Good estimates of calorie intake require a well designed questionnaire (lectures 5-7)

Zambia, 2015
Living Conditions Monitoring Survey

<table>
<thead>
<tr>
<th>Food item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit price</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpeas</td>
<td>kg</td>
<td>2</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Bread</td>
<td>kg</td>
<td>5</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>Fruits</td>
<td>kg</td>
<td>5</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Cabbage</td>
<td>kg</td>
<td>4</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Millet</td>
<td>kg</td>
<td>4</td>
<td>11</td>
<td>44</td>
</tr>
<tr>
<td>Beans</td>
<td>kg</td>
<td>4</td>
<td>35</td>
<td>140</td>
</tr>
<tr>
<td>Rice</td>
<td>kg</td>
<td>3</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>Milk</td>
<td>kg</td>
<td>3</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Vegetables</td>
<td>kg</td>
<td>2.5</td>
<td>30</td>
<td>75</td>
</tr>
</tbody>
</table>

Food Poverty Line

Food per adult

Source: CBS/World Bank estimate
The non-food allowance was determined as the average non-food consumption of households whose total consumption was close to the food poverty line: $LBPL = FPL + E \cdot \frac{\text{Non-food}}{\text{Food}}$.

<table>
<thead>
<tr>
<th></th>
<th>LBPL</th>
<th>FPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-food</td>
<td>152</td>
<td>62</td>
</tr>
</tbody>
</table>

Note: At current annual prices of April/May 2015. Source: CIA/World Bank estimates.

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**Poverty measures**

Basic ideas

- Poverty measures aggregate information.
- A poverty measure is a function of individual incomes $x = (x_1, \ldots, x_n)$ and the poverty line $c$:
  \[ P: \mathbb{R}^n \to \mathbb{R}^+ \]
- The literature on poverty measures is huge and technical in nature. It deals with the choice of the functional form of a suitable poverty index.
- In practice, three indices have taken center stage:
  1) the headcount ratio
  2) the poverty gap index
  3) the poverty gap squared index
The poverty headcount ratio (H)
Mongolia HGES 2016, Cumulative distribution of per capita consumption (p.10)

- The headcount ratio is the proportion of the population that is classified as poor.
- \( H = \frac{1}{N} \sum_{i=1}^{N} I(x_i \leq \alpha) \)
- \( I(\cdot) \) is an indicator function that is 1 if its argument is true, 0 otherwise.
- Interpretation: incidence of poverty.

The headcount ratio
Discussion
- Easy to understand
- Insensitive to:
  1) the degree of poverty: cut in half every poor’s income ... H does not change!
  2) the distribution of income among the poor:
    - transfer from a poor person to a not-so-poor person (still poor after the transfer)... H does not change!
    - transfer from a very poor person to an ‘almost-not-poor’ person (not poor after the transfer)... H decreases!

The headcount ratio
In terms of policy
- A transfer to a very poor household would probably leave the headcount index unchanged (if poor remains below the line) even though poverty has overall lessened.
- The easiest way to reduce the headcount index is to target benefits to people just below the poverty line. Policies based on the headcount index might be sub-optimal (Lipton, Ravallion 1993: 24)
- H only shows the effect of poverty-eliminating policies, not poverty-alleviating policies.
The Poverty Gap (PG) index

The PG index is defined as the average poverty gap in the population as a proportion of the poverty line (where the non-poor have zero gaps):

\[ PG = \frac{1}{N} \sum_{i=1}^{N} (z_i - \chi_i D_i) \leq \frac{1}{N} \sum_{i=1}^{N} (z_i - \chi_i) \]

The poverty gap index (PG) accounts for the depth of poverty: it tells how poor the poor are.

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The Poverty Gap index
Disassembling the PG index

- Use simple algebra to rewrite PG as follows:
  \[ PG = H \times I \]
  where \[ I = 1 - \mu_z \]

- The term \( I \) is the 'income-gap ratio', where \( \mu_z \) is the average income among the poor.
- Neither \( H \) nor \( I \) are individually taken ‘good’ poverty indicators, but are useful building blocks...
- PG combines incidence of poverty (H) with depth (I).

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The Poverty Gap index
Interpretations

- Suppose PG = 0.20

**Interpretation 1**
“On average, the poor have an expenditure shortfall of 20 percent of the poverty line.”

- Now suppose \( z = \$1,000 \) per month (poverty line).

**Interpretation 2**
The per capita cost of eliminating poverty is equal to PG \( \times z \). In our example: \( \$200 (= 0.20 \times 1,000) \) per month.
Why do we need to go beyond the PG index?

<table>
<thead>
<tr>
<th>$\alpha$</th>
<th>$\beta$</th>
<th>$\gamma$</th>
<th>$\delta$</th>
<th>$H$</th>
<th>PG</th>
<th>PG2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>0.75</td>
<td>0.375</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>9</td>
<td>0.75</td>
<td>0.375</td>
</tr>
</tbody>
</table>

PG is insensitive to distribution of income among the poor

The Poverty Gap Squared

Definition

- The squared poverty gap index attributes more weight to the poorest among the poor:

$$PG^2 = \frac{1}{N} \sum_{i=1}^{N} \left(1 - \frac{x_i}{z}\right)^2 f(x_i) \leq z - \frac{1}{N} \sum_{i=1}^{N} \left(1 - \frac{x_i}{z}\right)^2$$

- The contribution of the $i$-th individual to $PG^2$ is larger the poorer she is, that is, the larger is her poverty gap $(z - x_i)/z$:

$$PG^2 = \frac{1}{N} \sum_{i=1}^{N} \left(1 - \frac{x_i}{z}\right)^2 \left(1 - \frac{x_i}{z}\right)$$

A highly influential article

The headcount ratio, the PG and PG2 all belong to the Foster-Greer-Thorbecke (FGT) class of poverty measures.
FGT (1984)
Definition
The FGT class of poverty measures:
\[ P_a = \sum_{i=1}^{n} \left( \frac{x_i}{y_i} \right)^a I(x_i \leq y_i), \quad a \geq 0 \]

<table>
<thead>
<tr>
<th>a</th>
<th>( P_a )</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>( P_0 = H )</td>
<td>HEADCOUNT RATIO</td>
</tr>
<tr>
<td>1</td>
<td>( P_1 = FG )</td>
<td>POVERTY GAP INDEX</td>
</tr>
<tr>
<td>2</td>
<td>( P_2 = FG_2 )</td>
<td>POVERTY GAP Squared</td>
</tr>
<tr>
<td>( \infty )</td>
<td>( P_{\infty} )</td>
<td>weights the poorest person</td>
</tr>
</tbody>
</table>

Lessons learned
1) We argued in favour of objective, absolute, CBN poverty lines.
2) Regarding poverty measures:
   - The headcount ratio is a crude and 'theoretically inferior' poverty index. It is useful, but should not be used exclusively.
   - The Poverty Gap Index and the Squared Poverty Gap Index are complements to H; poverty analysis should combine the three measures. We recommend FGT (1984).
   - The axiomatic approach does not succeed in identifying the "best" poverty measure. Yet, it is useful, as it reveals the principles underlying the poverty measures.

References
Required readings:
Suggested readings:

Thank you for your attention

Homework

Exercise 1 – Engaging with the literature

• What does Zheng (1997) show regarding the Watts index?
Exercise 2 – ADePT

- Take any expenditure survey dataset of your interest
- Download ADePT Poverty
- Generate selected poverty measures through the software

Exercise 3 – DASP

http://dasp.ecn.ulaval.ca

- Take any expenditure survey dataset of your interest
- Install DASP for Stata
- Generate selected poverty measures through the package