

Robust Multiperiod Poverty Comparisons

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CPRC, Manchester, October 23 2006

Motivation

- Poverty is widely seen as a dynamic phenomenon
- Dynamic characteristics of poverty bear on the extent to which people stay below or cross the poverty line in a given time span
- That raises the question how poverty can be measured and compared over multiple periods?
- Most existing concepts rely on arbitrary assumptions regarding the aggregation rule over time and the specification of the poverty line

Motivation

- E.g. Jalan and Ravallion (1998)

$$P_i = \frac{1}{T} \sum_{t=0}^T p(y_{it})$$

$$C_i = p(\bar{y}_i)$$

$$T_i = P_i - C_i$$

with p being the squared poverty gap function.

- *Why average income?*
- *Why the squared poverty gap function?*
- *Which poverty line?*

Motivation

- Inspired by the literature on multi-dimensional poverty comparisons
- Duclos, Sahn and Younger (2004, 2006) suggested to use stochastic dominance tests to compare poverty over multiple *dimensions* (e.g. income and high-for-age-z-score), avoiding arbitrarily
 - aggregating various dimensions (as does the 'HDI') and
 - setting poverty lines
- Duclos *et al.* produce poverty orderings which are robust to both issues!

Outline

- 1 A new concept of multiperiod poverty measurement based on the approach of Duclos *et al.*
- 2 An embedded new concept of chronic and transient poverty
- 3 Illustration: Multiperiod poverty comparisons over time and space

Stochastic Dominance in a one-period welfare measure

$F(y_1) \mathbf{P}(\mathbf{Z}) F(y_2)$ if and only if $P(F(y_1); z) \leq P(F(y_2); z) \forall z \in Z$

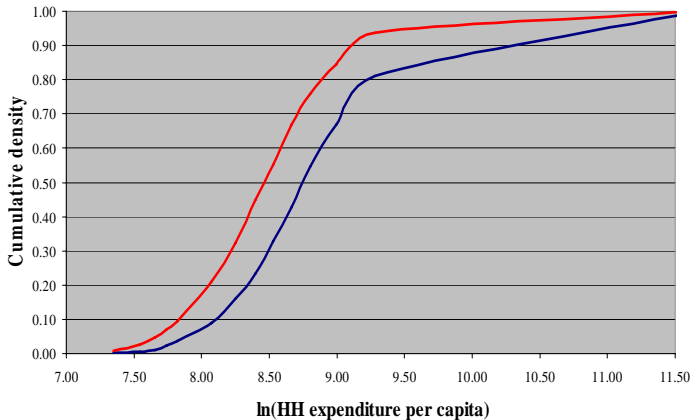
and $P(F(y_1); z) < P(F(y_2); z)$ for some $z \in Z$,

$F(y_1)$ stochastically dominates $F(y_2)$ for:

- a broad class of poverty measures, $P(F; z)$ within the FGT-family, P_α , with $\alpha \geq 0$
- a large range of poverty lines, $z \in Z$.

(Foster and Shorrocks, 1988a, b)

'BLUE' has less poverty than 'RED' for all z and all P_α ,
with $\alpha \geq 0$!



Stochastic dominance in a two-period welfare measure

- Bivariate welfare measure (y_1, y_2)
- Poverty comparisons over multiple time spans, T_j , like $T_A = [t = 1; t = 2]$ vs. $T_B = [t = 2; t = 3]$

Stochastic dominance in a two-period welfare measure

$$F(y_1, y_2) \mathbf{P}(\mathbf{Z}) F(y_2, y_3)$$

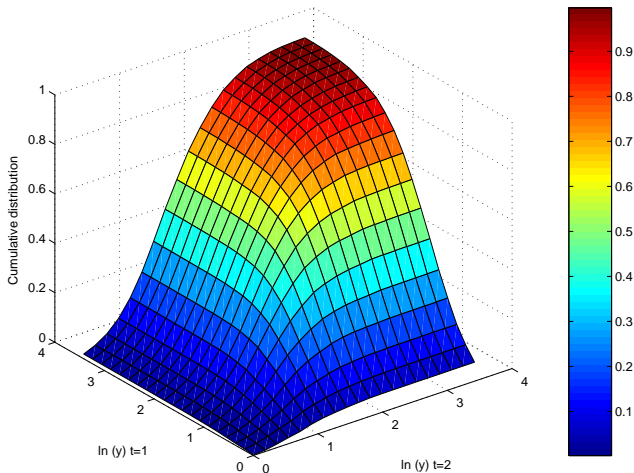
if and only if $P(F(y_1, y_2); z) \leq P(F(y_2, y_3); z) \forall z \in Z$

and $P(F(y_1, y_2); z) < P(F(y_2, y_3); z)$ for some $z \in Z$,

where $F(y_1, y_2) \mathbf{P}(\mathbf{Z}) F(y_2, y_3)$ means that $F(y_1, y_2)$ has unambiguously less poverty than $F(y_2, y_3)$ with respect to the poverty index P and the range Z , ...

... i.e. multiperiod poverty is less over time span T_A than over time span T_B

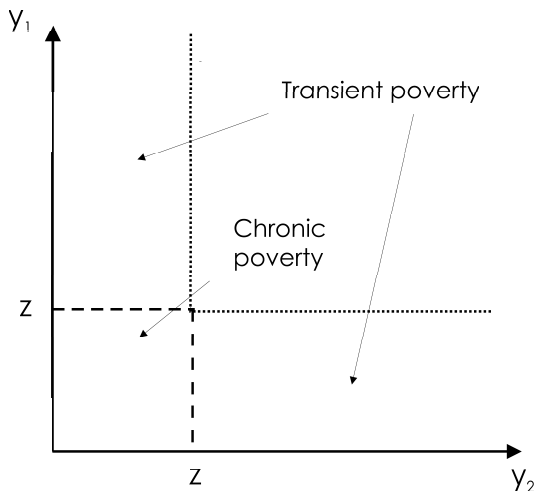
Bivariate cumulative income distribution function



Chronic and transient poverty based on stochastic dominance

- **Chronic poverty:** An individual is chronically poor if her income is below the poverty line z in both periods constituting time span T_j
- **Transient poverty:** An individual is transient poor if her income is below the poverty line z in *either* period of time span T_j and above the poverty line in the other period

Test domains



Dominance in chronic poverty

- Dominance in chronic poverty can be established if time spans A 's (B 's) dominance surface is above time span B 's (A 's) dominance surface at every point in the rectangle
- If $z_1 = z_2$ and $z_3 = z_4$ the test domain reduces to the bisector of that rectangle

Dominance in transient poverty

- The test domain for transient poverty consists of all couples of pairs (y_1, y_2) for which: $y_1 < z \wedge y_2 > z$ and $y_1 > z \wedge y_2 < z$, $\forall z \in Z$
- If $z_1 = z_2$ and $z_3 = z_4$ the test domain reduces to the upper and lower analogy of the bisector

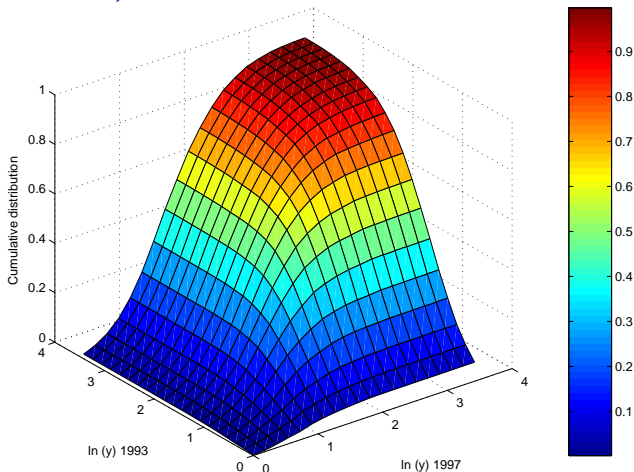
Multiperiod poverty comparisons for Indonesia

- Three waves of the Indonesian Family Life survey (1993, 1997, 2000)
- Real household expenditures per capita
- Two time spans: 1993 to 1997 and 1997 to 2000
- Cumulative distribution function of each two-dimensional poverty index creates a three-dimensional dominance surface

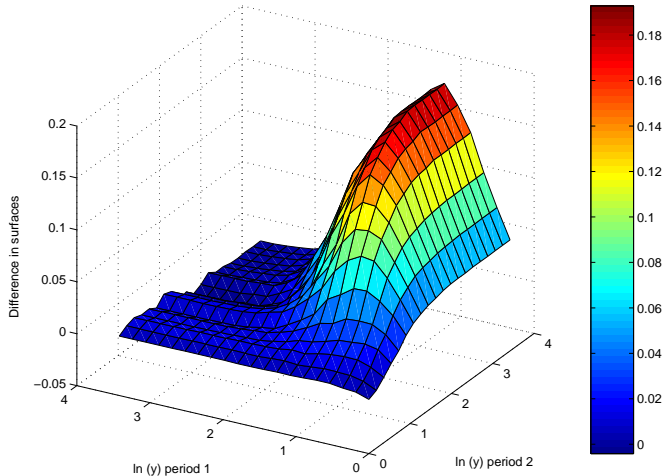
Multiperiod poverty comparisons for Indonesia

- Poverty comparisons by testing for significant differences between the dominance surfaces
- We choose a 20×20 grid of test points spread evenly over the entire domain of the surfaces

Absolute poverty in Indonesia: Dominance surface of times span (1993-1997)



Absolute poverty in Indonesia: Differences in dominance surfaces ([1993-1997]-[1997-2000])



Absolute poverty in Indonesia: Differences in dominance surfaces between 1993/1997 and 1997/2000

ln(y) period 1	ln(y) period 2																			
	0.00	0.18	0.36	0.54	0.72	0.90	1.08	1.26	1.44	1.62	1.80	1.98	2.16	2.34	2.52	2.70	2.88	3.06	3.24	3.42
0.00	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.36	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.54	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.72	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0.90	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1.08	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1.26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1.44	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1.62	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1.80	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
1.98	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
2.16	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
2.34	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
2.52	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
2.70	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.88	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.06	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.24	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.42	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Absolute poverty in Indonesia: Differences in dominance surfaces between 1993/1997 and 1997/2000

ln(y) period 1	ln(y) period 2										
	0.00	0.18	0.36	0.54	0.72	0.90	1.08	1.26	1.44	1.62	1.80
0.00	(1)	1*	1	1	1	1	1	1	1	1	1
0.18	1*	1	1	1	1	1	1	1	1	1	1
0.36	1	1	1	1	1	1	1	1	1	1	1
0.54	1	1	1	1	1	1	1	1	1	1	1
0.72	1	1	1	1	(1)	1*	1	1	1	1	1
0.90	1	1	1	1	1*	1	1	1	1	1	1
1.08	1	1	1	1	1	1	(1)	1*	1	1	1
1.26	1	1	1	1	1	1	1*	1	1	1	1
1.44	1	1	1	1	1	1	1	1	1	1	1
1.62	1	1	1	0	0	0	1	1	1	(1)	1*
1.80	1	1	1	0	0	0	0	0	0	1*	1

Absolute poverty in urban Indonesia

ln(y) period 1	ln(y) period 2										
	0.00	0.18	0.36	0.54	0.72	0.90	1.08	1.26	1.44	1.62	1.80
0.00	0	0	1	1	1	1	1	1	1	1	1
0.18	0	0	1	1	1	1	1	1	1	1	1
0.36	0	0	1	1	1	1	1	1	1	1	1
0.54	0	0	0	1	1	1	1	1	1	1	1
0.72	0	0	0	0	0	1	1	1	1	1	1
0.90	0	0	0	0	0	1	1	1	1	1	1
1.08	0	0	0	0	0	0	1	1	1	1	1
1.26	0	0	0	0	0	0	0	1	1	1	1
1.44	0	0	0	0	0	0	0	0	1	1	1
1.62	0	-1	0	0	0	0	0	0	0	0	1
1.80	0	-1	0	0	0	0	0	0	0	0	1

Absolute poverty in rural Indonesia

ln(y) period 1	ln(y) period 2										
	0.00	0.18	0.36	0.54	0.72	0.90	1.08	1.26	1.44	1.62	1.80
0.00	1	1	1	1	1	1	1	1	1	1	1
0.18	1	1	1	1	1	1	1	1	1	1	1
0.36	1	1	1	1	1	1	1	1	1	1	1
0.54	1	1	1	1	1	1	1	1	1	1	1
0.72	1	1	1	1	1	1	1	1	1	1	1
0.90	1	1	1	1	1	1	1	1	1	1	1
1.08	1	1	1	1	1	1	1	1	1	1	1
1.26	1	1	1	1	1	1	1	1	1	1	1
1.44	1	1	1	1	1	1	1	1	1	1	1
1.62	1	1	1	1	1	1	1	1	1	1	1
1.80	1	1	1	1	1	1	1	1	1	1	1

Conclusions on absolute poverty comparisons in Indonesia

- Chronic as well as transient poverty declined from the first (1993-1997) to the second time span (1997-2000) in Indonesia
- This is true no matter what poverty line is chosen
- Poverty reduction largely driven by rural areas

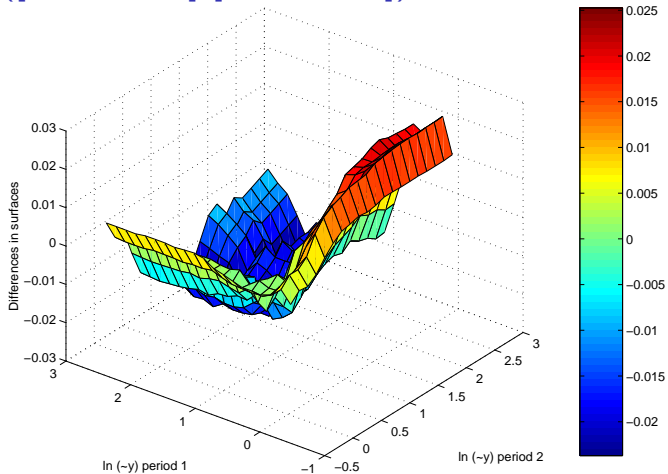
Multiperiod relative poverty comparisons

- Relative poverty measures take into account *social* mobility
- ... frontier becomes endogenous, e.g. a ratio of the median income
- Individuals are relatively chronic poor, if their income as a ratio of the median income stays below a given proportion for consecutive years
- Relative multiperiod poverty is also known as 'social exclusion' (Bossert, Ambrosio and Peragine, 2006)

Multiperiod relative poverty comparisons for Indonesia

- Standardization of household expenditures by a relative poverty line \tilde{z} : $\tilde{y} = y/\tilde{z}$
- We choose $\tilde{z} = 50\%$ of the median income

Relative poverty in Indonesia: Differences in dominance surfaces ([1993-1997]-[1997-2000])



Relative poverty in Indonesia: Differences in dominance surfaces between 1993/1997 and 1997/2000

$\ln(\tilde{y})$ period 1	$\ln(\tilde{y})$ period 2							
	-0.30	-0.15	0.00	0.15	0.30	0.45	0.60	0.75
-0.30	0	0	0	0	0	1	1	1
-0.15	1	1	0	0	1	1	1	1
0.00	0	0	0	0	0	0	0	0
0.15	0	0	0	0	0	0	0	0
0.30	0	0	0	0	0	0	0	0
0.45	0	0	0	0	0	0	0	0
0.60	0	0	0	0	0	0	0	0
0.75	0	0	0	0	0	0	0	0

Conclusions on relative poverty comparisons for Indonesia

No robust result, neither for relative chronic nor for relative transient poverty

Cross-country multiperiod poverty comparisons

- Absolute multiperiod poverty comparisons when similar living standard
- Relative multiperiod poverty comparisons when living standard strongly differs

Multiperiod poverty comparisons for Indonesia and Peru

- Panel data for Peru: 1997 and 1999
- Absolute chronic as well as absolute transient poverty is higher in Indonesia than in Peru
- Relative multiperiod poverty is higher in Peru