

Income Poverty has been Halved in the Developing World, even when Accounting for Relative Poverty.

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MOTIVATION

- First Millennium Development Goal: halve extreme poverty over 1990-2015.
- Developing world over 1990-2015:
 - ▶ Strong income growth
⇒ substantial decrease in absolute poverty (goal met):
physical needs - line independent of standard of living
 - ▶ *But* simultaneous increase in within-country inequality (Bourguignon, 2015; Milanovic, 2016; Ravallion, 2014)
⇒ increase in relative poverty:
social inclusion - line increasing in standard of living

MOTIVATION

- Opposite conclusions cast doubt on progress against overall poverty.
- **What has happened to *overall* poverty?**
Typically depends on the arbitrary priority assigned to absolute poverty:
How much more (or less) overall poverty decreases when \$1 is given to absolutely poor individual rather than to only relatively poor.
 - ▶ Limits usefulness.

CONTRIBUTION

- *Novel assessment of overall poverty in developing world under new normative assumption that avoids debatable interpersonal comparisons.*
- *New method for overall income poverty evaluation that can potentially provide judgments independent of priority to absolute poverty.*
- Assumption: absolutely poor is poorer than relatively poor, regardless of income standard in their societies.
- Mild: absolute poverty more severe largely shared
 - ▶ Questionnaire experiment (Corazzini et al., 2011).
 - ▶ Poverty measurement literature (Atkinson and Bourguignon, 2001; Decerf, 2017).

CONTRIBUTION

- We consider recent family of overall poverty measures satisfying assumption.
- Key role of assumption: allows independent poverty evaluations
 - ▶ even when absolute and relative measures disagree
- We develop theoretical conditions for independence of priority parameter.
- We exploit conditions empirically to evaluate overall poverty *independently of priority parameter* in developing world over 1990-2015.

PREVIEW OF RESULTS

- All measures in our family declined by at least 50% in developing world over 1990-2015.
 - ▶ Overall poverty halved, regardless of priority parameter.
 - ▶ Reduction in absolute poverty more than compensates increase in relative poverty.
- Results robust to:
 - ▶ alternative absolute and relative poverty lines.
 - ▶ exclusion of major countries such as China or India.
 - ▶ result holds for 1/3 of countries.
- Comparison with standard measures yields:
 - ▶ Alternative approaches find much lower overall poverty reduction: at least 44% larger poverty reduction with our measures.
 - ▶ Our approach is less sensitive to relative line.

RELATED LITERATURE

- Atkinson and Bourguignon (2001): global perspective should consider absolute and relative line.
 - ▶ Mixed index that aggregates income gaps wrt both poverty lines.
- Ravallion and Chen (2011): weak relativity axiom (WRA)
 - ▶ Weakly relative line
- Standard approach: HC and weakly relative line
 - ▶ Chen and Ravallion (2013); Jolliffe and Prydz (2016); World Bank (2018)
 - ▶ Problem: debatable inter-personal comparisons.

RELATED LITERATURE

- Our approach:
 - ▶ Based on both absolute and relative line (AB, 2001)
 - ▶ Satisfy WRA (RC, 2011)
 - ▶ Avoid questionable inter-personal comparisons
 - ▶ Check for full robustness to priority parameter

BASIC FRAMEWORK

- Two poverty lines:
 - ▶ Absolute poverty line: $z_a \in \mathbb{R}_{++}$
 - ▶ Relative poverty line: $z_r = b + s\bar{y}$
- Overall poverty: combines absolute and relative poverty.
- Our approach (satisfies normative assumption):
 - ▶ Recent index (Decerf, 2017): $P_\lambda := \frac{1}{n} \sum_{i=1}^q(y) (1 - d_\lambda(y_i, \bar{y}))$

where individual i 's poverty contribution is $1 - d_\lambda(y_i, \bar{y})$ and

$$d_\lambda(y_i, \bar{y}) := \begin{cases} \lambda \frac{y_i}{z_a} & \text{if } y_i < z_a, \\ \lambda + (1 - \lambda) \frac{y_i - z_a}{z_r(\bar{y}) - z_a} & \text{if } z_a \leq y_i < z_r(\bar{y}), \end{cases}$$

Standard approach to overall poverty

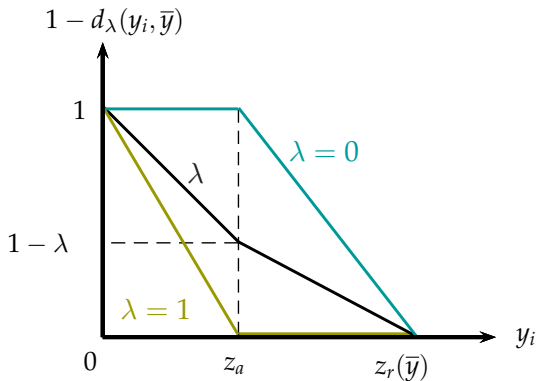
OVERALL POVERTY MEASURES - P_λ

- Support of λ contains all possible views on priority to absolutely poor individuals.
- Two extreme cases:
 - ▶ $\lambda = 1$: infinite priority to absolutely poor $\Rightarrow P_\lambda$ boils down to PGR below z_a .
 - ▶ $\lambda = 0$: infinite priority to relatively poor.

Example

OVERALL POVERTY MEASURES - P_λ

Poverty contribution as a function of y_i given fixed \bar{y} .



OVERALL POVERTY MEASURE

Proposition 1

The overall poverty in y is robustly smaller than the overall poverty in x if and only if $P_0(x) \geq P_0(y)$ and $P_1(x) \geq P_1(y)$.

Proposition 2

The overall poverty in y is robustly less than half the overall poverty in x if and only if $\frac{P_0(y)}{P_0(x)} \leq \frac{1}{2}$ and $\frac{P_1(y)}{P_1(x)} \leq \frac{1}{2}$.

DATA

Source

- PovcalNet, 1990-2015.
 - ▶ 1990 reference year for our analysis.

Sample restrictions

- Low and middle income countries.
- Final sample size: 120 units - 3 countries are divided in rural/urban.

POVERTY LINES

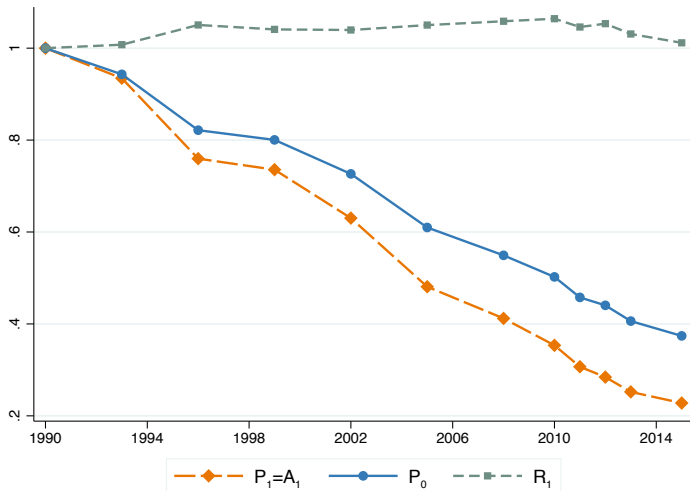
Two lines necessary to construct measures P_λ :

1. Absolute line: $z_a = 1.9$ (World Bank extreme poverty threshold)
2. Relative line: $z_r = 0.5\bar{y}$ with \bar{y} being mean national income.
 - ▶ $s=0.5$ in line with most mean-sensitive relative lines.
 - ▶ Mean sensitive is a conservative assumption.

EVOLUTION OF POVERTY FOR SELECTED COUNTRIES

	<i>Mean</i> $\frac{2015}{1990}$ (1)	<i>Gini</i> $\frac{2015}{1990}$ (2)	P_0 $\frac{2015}{1990}$ (3)	$P_1 = A_1$ $\frac{2015}{1990}$ (4)	R_1 $\frac{2015}{1990}$ (5)	Dis. (6)	Rob. (7)
Bangladesh	1.51	1.24	0.40	0.29	1.53	Yes	Yes
China							
Rural	4.68	1.09	0.11	0.01	1.79	Yes	Yes
Urban	5.25	1.41	0.28	0.01	3.60	Yes	Yes
India							
Rural	1.64	N/A	0.29	0.19	1.11	Yes	Yes
Urban	1.71	N/A	0.53	0.21	1.44	Yes	Yes
Indonesia							
Rural	2.64	1.26	0.18	0.06	2.45	Yes	Yes
Urban	2.37	1.23	0.49	0.10	2.15	Yes	Yes
Jamaica	1.53	1.11	1.03	0.47	1.32	Yes	No
Pakistan	2.19	N/A	0.17	0.04	0.62	No	Yes
Dping world	1.97	N/A	0.37	0.23	1.01	Yes	Yes

EVOLUTION OF POVERTY IN DEVELOPING WORLD



By regions

ROBUSTNESS

- Population weights
 - ▶ Exclusion of China and/or India Results
 - ▶ Fully ignoring population weights Results
 - ▶ We identify % of countries for which overall poverty robustly declined/halved. Among 120 units in our sample:
 - 78% robust overall poverty reduction
 - 30% overall poverty robustly halved
- Six alternative poverty lines Results
 - ▶ Even considering the most conservative pair of lines among six alternatives, overall poverty decreases by at least 50% from 1990-2015.

COMPARISON WITH ALTERNATIVE MEASURES

- Magnitude of poverty change
 - ▶ Alternative measures underestimate the decline in poverty
 - ▶ At least 44% larger poverty reduction with our measures

Estimation method & results
- Sensitivity to choice of relative line
 - ▶ Our approach is less sensitive
 - ▶ Illustration using urban China. [Illustration](#)
 - ▶ We show theoretically lower elasticity of our measure to z_r (under simplifying assumptions).

CONCLUDING REMARKS

- Increase in mean income and intra-country inequality in developing world over 1990-2015.
- Sharp decrease in absolute poverty but increased relative poverty in many countries.
- Making rather mild assumption, overall income poverty robustly declined by at least 50%.
- Result is robust to poverty lines & holds for many developing countries.
- Alternative measures underestimate poverty decrease and are more sensitive to choice of relative poverty line.
- Findings confirm and strengthen positive evaluations of success achieved on first Millennium Development Goal.

Thanks for your attention!
Any comments are welcome
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STANDARD APPROACH TO OVERALL POVERTY

► Standard approach to overall poverty measure:

► $O_\alpha(y) := \frac{1}{n} \sum_{i=1}^{q(y)} (1 - d_{ar}(y_i, \bar{y}))^\alpha$ where $d_{ar}(y_i, \bar{y}) = \frac{y_i}{\max\{z_a, z_r(\bar{y})\}}$

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OVERALL POVERTY MEASURES - P_λ

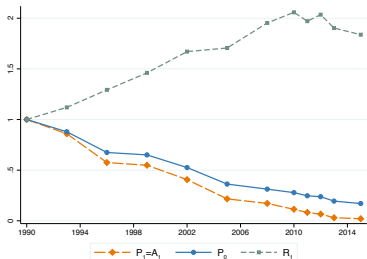
- Overall poverty comparison of x' and y' depends on priority assigned to absolutely poor individuals.
 - ▶ $\lambda = 0.7 \Rightarrow P_\lambda(x') > P_\lambda(y')$.
 - ▶ $\lambda = 0.3 \Rightarrow P_\lambda(x') < P_\lambda(y')$.
- Decreasing λ places more emphasis on only relatively poor and less on absolutely poor.

Non-robust overall poverty comparison of x' and y' .

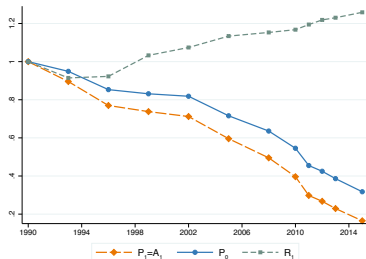
	$i = 1$	$i = 2$	$i = 3$	z_a	z_r	A_1	R_1	$P_{0.7}$	$P_{0.3}$
Distribution x'	1	4	25	1.9	5	0.16	0.33	0.24	0.36
Distribution y'	1.5	3	25.5	1.9	5	0.07	0.37	0.21	0.41

Evolution of poverty by region. 1990-2015.

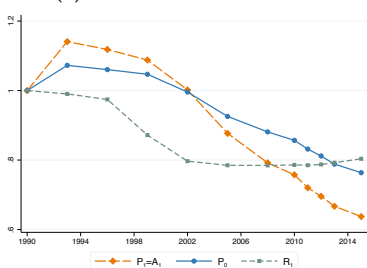
(a) East Asia and Pacific



(b) South Asia

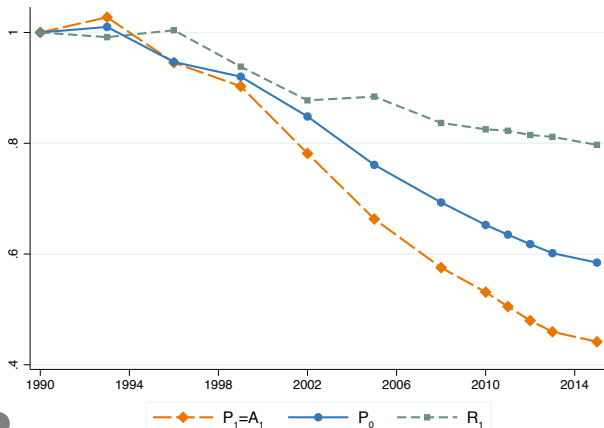


(c) Sub-Saharan Africa



ROBUSTNESS TO POPULATION WEIGHTS

Evolution of poverty in the developing world (excluding China and India). 1990-2015.



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ROBUSTNESS TO POPULATION WEIGHTS

Poverty statistics for the developing world excluding China and India. 1990-2015.

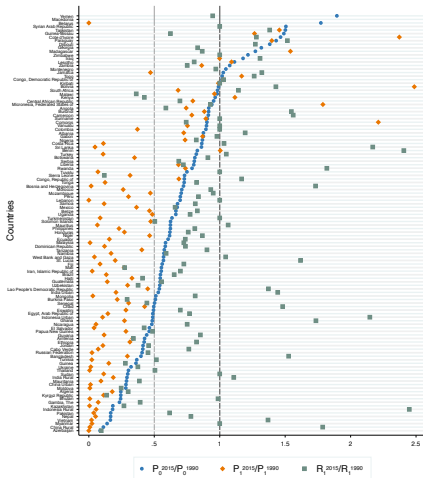
	$\frac{\text{Mean}_{2015}}{\text{Mean}_{1990}}$	$\frac{\text{Gini}_{2015}}{\text{Gini}_{1990}}$	$\frac{P_0_{2015}}{P_0_{1990}}$	$\frac{P_1 = A_1_{2015}}{P_1 = A_1_{1990}}$	$\frac{R_1_{2015}}{R_1_{1990}}$	Dis.	Rob.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Both China & India	1.42	N/A	0.58	0.44	0.80	No	Yes
Only China	1.47	N/A	0.50	0.37	0.85	No	Yes
Only India	2.02	N/A	0.38	0.24	0.99	No	Yes

Source: PovcalNet, 1990 & 2015.

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ROBUSTNESS TO POPULATION WEIGHTS

Evolution of poverty by country. 2015/1990.



Among 120 units in our sample:

- 78% robust overall poverty reduction
- 30% overall poverty robustly halved

ROBUSTNESS TO POPULATION WEIGHTS

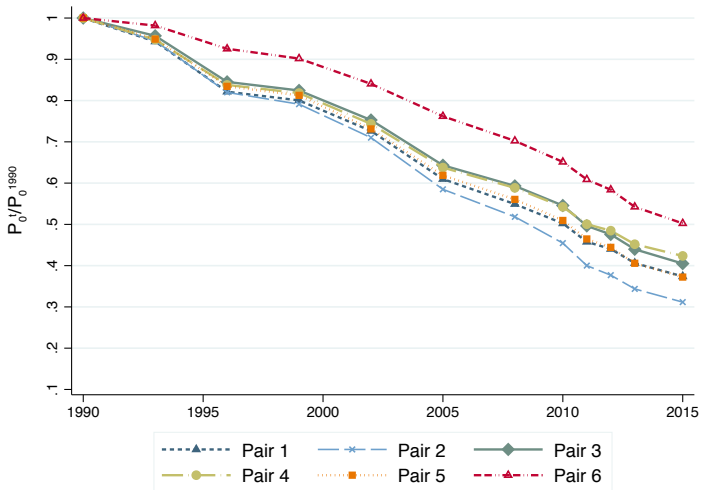
Change in P_0 by robustness status. 2015
vs. 1990.

Evolution of P_0 by robustness status	No.	%
Partially robust		
P_0 increases	5	4
P_0 decreases (less than halved)	6	5
Fully robust		
P_0 increases	16	13
P_0 decreases (less than halved)	57	48
P_0 decreases (at least halved)	36	30
Total	120	100

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ROBUSTNESS TO POVERTY LINES

Evolution of P_0 in developing world by lines. 1990-2015 (1990=100).



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ROBUSTNESS TO POVERTY LINES

Statistics and robustness conditions for selected countries.
Pair of lines 6.

	$\frac{Mean_{2015}}{1990}$	$\frac{Gini_{2015}}{1990}$	$\frac{P_0_{2015}}{1990}$	$\frac{P_1 = A_1_{2015}}{1990}$	$\frac{R_1_{2015}}{1990}$	Dis.	Rob.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bangladesh	1.51	1.24	0.67	0.51	1.53	Yes	Yes
China							
Rural	4.68	1.09	0.17	0.05	1.79	Yes	Yes
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Pakistan	2.19	N/A	0.45	0.21	0.62	No	Yes
Dping world	1.97	N/A	0.50	0.33	1.01	Yes	Yes

ROBUSTNESS TO POVERTY LINES

Change in P_0 by robustness status. 2015
vs. 1990. Pair of lines 6.

Evolution of P_0 by robustness status	No.	%
Partially robust		
P_0 increases	4	3
P_0 decreases (less than halved)	3	2
Fully robust		
P_0 increases	18	15
P_0 decreases (less than halved)	62	52
P_0 decreases (at least halved)	33	28
Total	120	100

Source: PovcalNet, 1990 & 2015.

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COMPARISON - MAGNITUDE

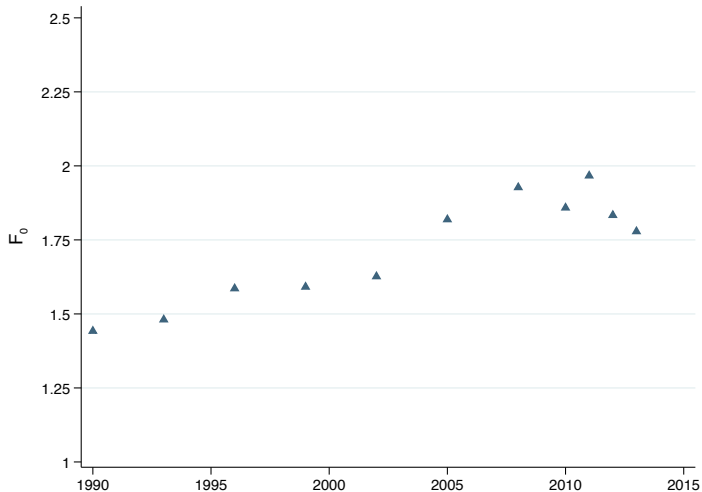
We quantify magnitude of underestimation by O_0 - Head-Count ratio below the upper-contour of the absolute and relative lines (dominant practice for overall poverty)

$$F_0^t = \frac{\left(\frac{P_0^{2015}}{P_0^t}\right)^{\frac{1}{2015-t}} - 1}{\left(\frac{O_0^{2015}}{O_0^t}\right)^{\frac{1}{2015-t}} - 1}$$

- ▶ Factor by which progress recorded by O_0 should be multiplied in order to account for the progress achieved by P_0
- ▶ F_0 provides conservative estimation (given that P_0 gives upper bound)

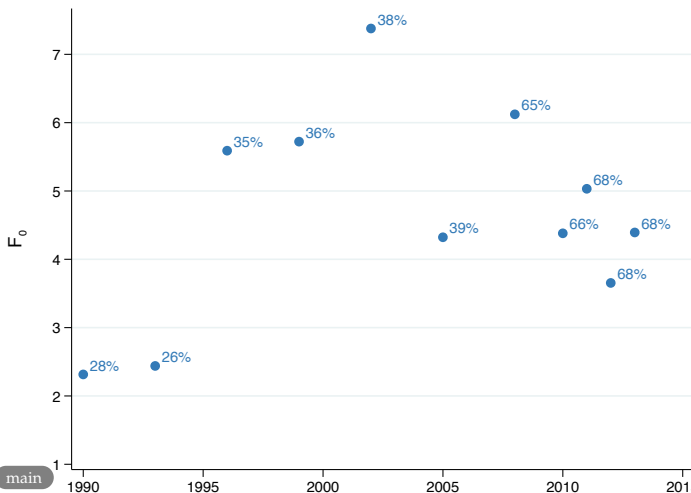
COMPARISON - MAGNITUDE

Factor F_0 . 1990-2015. All countries.



COMPARISON WITH ALTERNATIVE MEASURES

Factor F_0 . 1990-2015. Countries with $z_a < z_r$.



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COMPARISON WITH ALTERNATIVE MEASURES

Percentage change in P_0 and P_1 relative to percentage change in O_0 . 1990-2015.

Reference year	Y_0		Y_1	
	All	$z_a < z_r$	All	$z_a < z_r$
1990	1.27	2.08	1.57	3.95
1993	1.31	2.17	1.64	4.25
1996	1.40	4.71	1.80	9.65
1999	1.41	4.91	1.83	10.45
2002	1.46	6.63	1.92	16.24
2005	1.66	3.99	2.25	9.65
2008	1.79	5.41	2.50	12.62
2010	1.76	4.01	2.45	9.87
2011	1.90	4.73	2.66	12.73
2012	1.79	3.50	2.35	9.09
2013	1.76	4.33	2.13	11.19

Source: PovcalNet, 1990 & 2015.

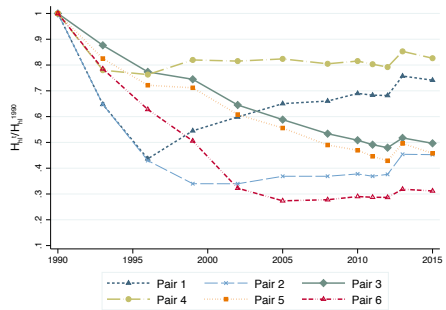
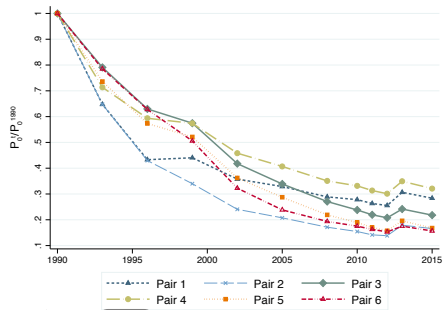
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COMPARISON - SENSITIVITY TO RELATIVE LINE - ILLUSTRATION

Evolution of poverty by P_0 and O_0 for urban China. 1990-2015.

(a) P_0

(b) O_0



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