What's behind pro-poor growth? An investigation of its drivers and dynamics

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Motivation

- Poverty-Growth-Inequality triangle
  - Is growth a "*rising tide that lifts all boats*"?
- Ferreira, 2010: Macroeconomic approach, three stylized facts :
  1. On average economic growth and changes in inequality are uncorrelated
  2. Poverty generally declines as the economy grows.
  3. The (absolute value of the) growth elasticity of poverty reduction falls with inequality.
- Mesoeconomic approach: not all growth is the same (role of spatial differences in economic structure and historical distribution).
- Microeconomic approach: distributional change at a fully disaggregated level, by decomposing changes in the growth incidence curve.
  - the three "corners" of the PGI triangle represent variant forms of aggregation of information about the *incidence of growth* on the initial income distribution.
  - understanding of what share of poverty, inequality or growth are related to particular economic events

Contribution and research objective

- Studies on the evaluation of the distributional implications of growth:
  - GIC: anonymous approaches (Ravaillon and Chen, 2003) plotting against each percentile of the distribution the mean income change in that percentile
  - na-GIC (ex ante): non-anonymous, history-dependent approaches (Grimm; 2007;Van Kerm, 2009; Bourguignon, 2011)
  - na-GIC (ex post): non-anonymous, ex post approaches (Palmisano, 2016). Rank individuals by their final position in the income distribution
  - NIGIC: non-income conditional or unconditional growth incidence curves (Grosse et al. (2008), Klasen (2008)).
- Our approach: na-GIC; na-predicted GIC
  - "X-ray" of motion
  - shocks and the pro-poorness of growth

Setting

- Individual income is

$$y_t = f_t(c, \varepsilon)$$

where

  - c denotes individual's characteristics
  - ε is measurement error

- Given a distribution of a population of individuals ranked according to their initial income quintile $p\ (y_{t-1})$, growth is:

$$g_t(p(y_{t-1})) = \frac{y_t(p(y_{t-1}))}{y_{t-1}(p(y_{t-1}))} - 1 = \frac{f_t(c_t, \varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1}, \varepsilon)_{p(y_{t-1})}} - 1$$

- Focusing on the initially poor, the individual rate of pro-poor growth is :

$$IRPPG_t = \frac{1}{H_{t-1}} \int_0^{H_{t-1}} g_t(p_{t-1}) dp_{t-1}$$

Counterfactual na-GIC

- Drivers of growth:
  - Changes in individual characteristics
  - Changes in the function $f(.)$

- Hypothesis: marginal returns of individual's characteristics are constant over time

$$f_{t-1} = f_t$$

- Counterfactual Growth:

$$\widehat{g_t}(p(y_{t-1})) = \frac{f_{t-1}(c_t, \varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1}, \varepsilon)_{p(y_{t-1})}} - 1 = \frac{\widehat{y_t}(p(y_{t-1}))}{y_{t-1}(p(y_{t-1}))} - 1$$

Counterfactual na-GIC: predicting incomes

- Regression model for quantile level p of the response y:

$$Q_p log(y)_{it} = \beta_0(p) + \beta_1(p)c_{it} + \beta_2(p)log(y)_{i,t-1} + \vartheta_d + \varepsilon_{i,t}$$

with p= .20; .40; .60; .80

- OLS Panel Fixed Effects Model

$$log(y)_{it} = \beta_0 + \beta_1 c_{it} + \beta_2 log(y)_{i,t-1} + \mu_i + \tau_t + \vartheta_d + \varepsilon_{i,t}$$

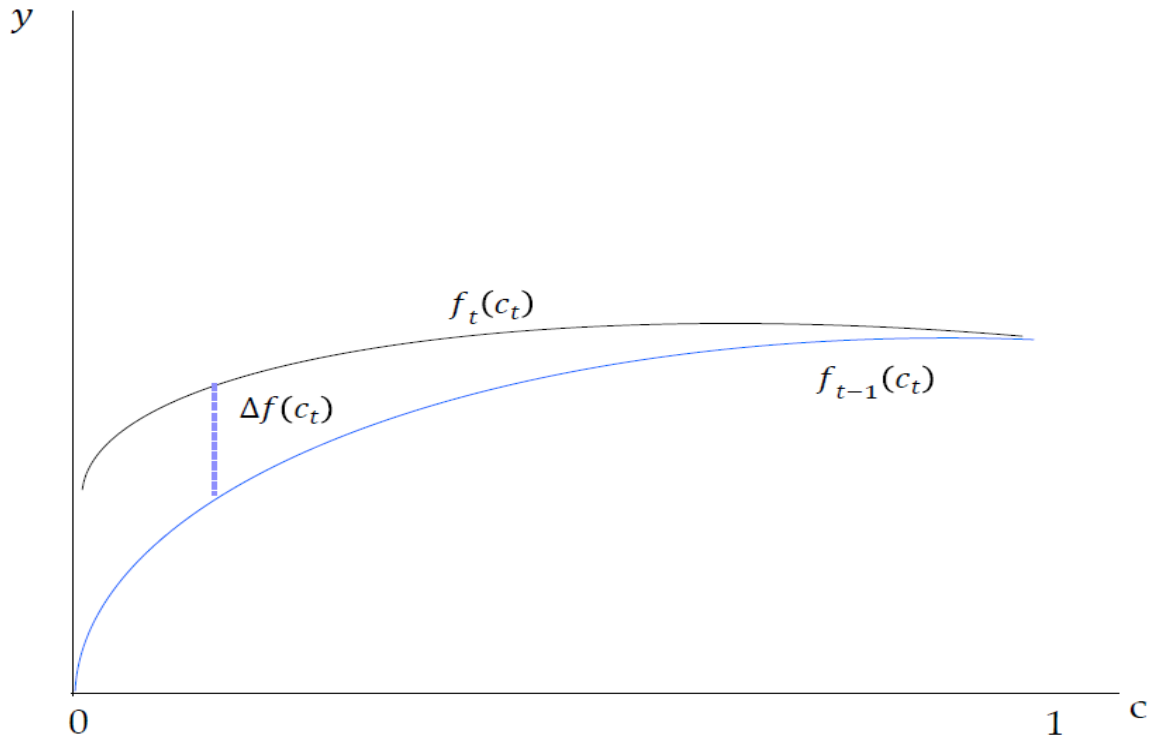
with ϑ_d district fixed effects; $\mu_i$individual fixed effects and τ_t year dummies.

Counterfactual na-GIC and Actual na-GIC

$$g_t(p(y_{t-1})) - \widehat{g_t}(p(y_{t-1})) = \frac{f_t(c_{t,}\varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1,}\varepsilon)_{p(y_{t-1})}} - \frac{f_{t-1}(c_{t,}\varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1,}\varepsilon)_{p(y_{t-1})}} = \frac{f_t(c_{t,}\varepsilon)_{p(y_{t-1})} - f_{t-1}(c_{t,}\varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1,}\varepsilon)_{p(y_{t-1})}}$$

Counterfactual na-GIC and Actual na-GIC

$$g_t(p(y_{t-1})) - \widehat{g_t}(p(y_{t-1})) = \frac{f_t(c_{t,\varepsilon})_{p(y_{t-1})}}{f_{t-1}(c_{t-1,\varepsilon})_{p(y_{t-1})}} - \frac{f_{t-1}(c_{t,\varepsilon})_{p(y_{t-1})}}{f_{t-1}(c_{t-1,\varepsilon})_{p(y_{t-1})}} = \frac{f_t(c_{t,\varepsilon})_{p(y_{t-1})} - f_{t-1}(c_{t,\varepsilon})_{p(y_{t-1})}}{f_{t-1}(c_{t-1,\varepsilon})_{p(y_{t-1})}}$$



Counterfactual na-GIC and Actual na-GIC

$$g_t(p(y_{t-1})) - \widehat{g_t}(p(y_{t-1})) = \frac{f_t(c_t,\varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1},\varepsilon)_{p(y_{t-1})}} - \frac{f_{t-1}(c_t,\varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1},\varepsilon)_{p(y_{t-1})}} = \frac{f_t(c_t,\varepsilon)_{p(y_{t-1})} - f_{t-1}(c_t,\varepsilon)_{p(y_{t-1})}}{f_{t-1}(c_{t-1},\varepsilon)_{p(y_{t-1})}}$$

Let $\varepsilon = 0$

if 1) $$\frac{Var[\varepsilon_{t-1}]}{Var[Y^*_{t-1}]} = \frac{\beta^*(1+\delta_{t-1})(1-\delta_t) + (1+\delta_{t-1})(\delta_t - \delta_{t-1}) - \beta(1+\delta_{t-1})^2}{1-\rho+\beta} > 0.1$$

and 2) $$\hat{\beta}^*_t < 0;\ \hat{\beta}_t < 0\ (\ or \hat{\beta}^*_t > 0;\ \hat{\beta}_t > 0)$$

where: $$\varepsilon_{i,t} = \delta_t(Y^*_{i,t} - \bar{Y}^*_t) + \rho u_{i,t-1} + u_{i,t}$$ and $$\hat{\beta}^*_t = \hat{\beta}_t + (1+\hat{\beta}_t)\frac{Var[\varepsilon_{t-1}]}{Var\,[Y^*_{t-1}]}$$

Counterfactual na-GIC and Actual na-GIC

$$g_t(p(y_{t-1})) - \widehat{g_t}(p(y_{t-1})) = \frac{f_t(c_t)_{p(y_{t-1})}}{f_{t-1}(c_{t-1})_{p(y_{t-1})}} - \frac{f_{t-1}(c_t)_{p(y_{t-1})}}{f_{t-1}(c_{t-1})_{p(y_{t-1})}} = \frac{f_t(c_t)_{p(y_{t-1})} - f_{t-1}(c_t)_{p(y_{t-1})}}{f_{t-1}(c_{t-1})_{p(y_{t-1})}}$$

A shock is pro-poor if:

- $\Delta f(c_t) = f_t(c_t) - f_{t-1}(c_t) > 0$ up to the poverty line (absolute definition)
- $\Delta f(c_t) = f_t(c_t) - f_{t-1}(c_t) > 0$ and $\frac{\partial \Delta f}{\partial p(y_t)} < 0$ for all p (relative definition).

State dependency, income retention and recovery from past negative shocks

- First-order Markov model of state dependency (Cappellari and Jenkins, 2004)
- Probability of experiencing a positive shock at time *t*, conditional on shock experience at time *t*-1:
  - Let $\boldsymbol{PS_{it}}$ be a binary variable summarizing information on whether individual *i*'s experienced a positive shock at time *t*, equal to 1 if $y_{it} \geq \hat{y}_{it}$ and 0 otherwise
  - Let $\boldsymbol{R_{it}}$ be a binary variable equal to 1 if individual *i*'s income is observed in *all* the waves and 0 otherwise
    1. *Conditional probability of experiencing a positive shock:*

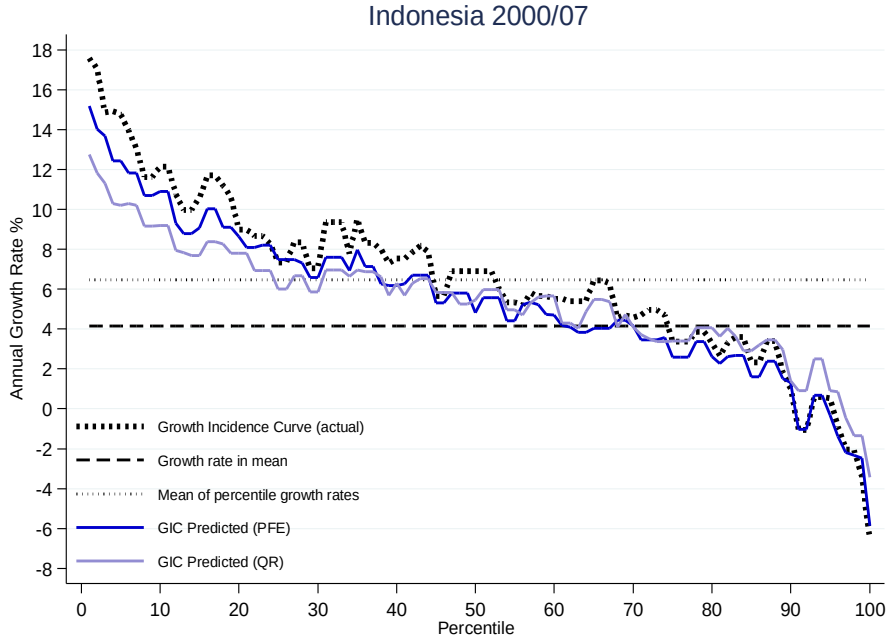
$$\boldsymbol{pr\,(PS_{it} = 1 | PS_{it-1}, R_{it})} \;\; \boldsymbol{= \Phi\{[(PS_{it-1})\lambda'_1 + (1 - PS_{it-1})\lambda'_2]Z_{it-1}\}\; if\; R_{it} = 1}$$

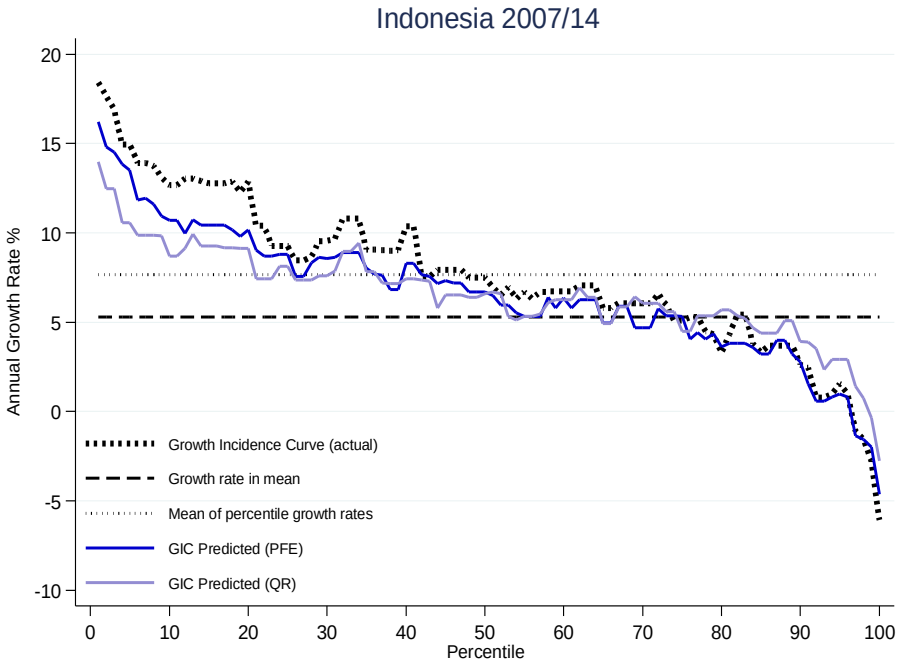
    2. *Initial Status:* $\boldsymbol{pr(PS_{it-1} = 1) = \Phi\,(\beta'\, X_{it-1})}$
    3. *Retention:* $\boldsymbol{pr(R_{it} = 1) = \Phi\,(\delta'\, Y_{it-1})}$
- If $\lambda_1 = \lambda_2$ a positive shock is exogenous

Data

- **Data**: Longitudinal Survey Data :
  - *The Indonesia Family Life Survey*; 4 waves (1997,2000, 2007, 2014)
- Main variables of interest:
  - household p.c. consumption expenditure,
  - Characteristics of the HH head:
    - Female HH head dummy; education; age and age^2 ; dummies for employment status (Self-employed, government worker, private worker, unpaid);
  - HH size, HH size^2 ,
  - Residence (rural);
  - Ratio of HH member aged 0-5, 6-12, 13-15,16-18, 19plus

Indonesia, 2000-2014





Indonesia, 2000-2014

PANEL A: Using predicted values from ***Panel Fixed Effects Regressions.***	2000-2007		2007-14	
	Actual	Predicted	Actual	Predicted
Annual Growth in mean	4.14	3.38	5.30	4.57
IRPPG 10	14.16	12.37	15.03	12.99
IRPPG 25	11.64	10.30	13.07	11.09
IRPPG 50	9.69	8.46	10.98	9.42
Average difference in the rates of growth:	2000-2007		2007-14	
Percentiles 0-25	1.34		1.98	
Percentiles 0-50	1.23		1.56	
Percentiles 75-100	0.38		0.27	
PANEL B: Using predicted values from ***Quintile Regressions.***	2000-2007		2007-14	
	Actual	Predicted	Actual	Predicted
Annual Growth in mean	4.14	3.78	5.30	5.05
IRPPG 10	14.16	10.44	15.03	10.83
IRPPG 25	11.64	8.79	13.07	9.56
IRPPG 50	9.69	7.53	10.98	8.46
Average difference in the rates of growth:	2000-2007		2007-14	
Percentiles 0-25	2.85		3.51	
Percentiles 0-50	2.16		2.52	
Percentiles 75-100	-0.91		-1.34	

Diminishing returns along the distribution

Dep.Var: lrealpce00	(1) Q=20	(2) Q=40	(3) Q=60	(4) Q=80
lrealpce97	0.337***	0.391***	0.428***	0.451***
	(0.00817)	(0.00844)	(0.00810)	(0.00959)
farmaland00	0.0589***	0.0575***	0.107***	0.129***
	(0.0143)	(0.0147)	(0.0141)	(0.0167)
electricity00	0.102***	0.0987***	0.125***	0.0826***
	(0.0197)	(0.0204)	(0.0195)	(0.0231)
FeHHhead00	-0.104***	-0.0705***	-0.0488***	-0.0284
	(0.0177)	(0.0183)	(0.0176)	(0.0208)
edu_HHhead00	0.0152***	0.0140***	0.0113***	0.0125***
	(0.00151)	(0.00156)	(0.00150)	(0.00177)
age_HHhead00	0.0129***	0.0125***	0.00703**	6.31e-05
	(0.00281)	(0.00291)	(0.00279)	(0.00330)
age_HHheadsq00	-0.000151***	-0.000143***	-9.24e-05***	-2.57e-05
	(2.76e-05)	(2.86e-05)	(2.74e-05)	(3.24e-05)
selfemp_HHhead00	-0.0681	-0.0531	-0.0644	-0.0876*
	(0.0452)	(0.0467)	(0.0448)	(0.0530)
selfemp_HHspouse00	0.463**	0.250	0.243	0.892***
	(0.224)	(0.231)	(0.222)	(0.262)
govwork_HHhead00	0.219	0.464***	0.339**	0.274
	(0.169)	(0.174)	(0.167)	(0.198)
govwork_HHspouse00	0.478	0.0750	-0.186	-0.552
	(0.367)	(0.380)	(0.364)	(0.431)

Dep.Var: lrealpce00	(1) Q=20	(2) Q=40	(3) Q=60	(4) Q=80
privwork_HHhead00	-0.00651	-0.0677	-0.0418	-0.0660
	(0.0427)	(0.0442)	(0.0424)	(0.0502)
privwork_HHspouse00	-0.289	-0.198	-0.433**	-0.261
	(0.211)	(0.218)	(0.209)	(0.247)
hhsize00	-0.131***	-0.153***	-0.171***	-0.162***
	(0.0111)	(0.0115)	(0.0111)	(0.0131)
hhsize00sq	0.00499***	0.00697***	0.00870***	0.00780***
	(0.000864)	(0.000894)	(0.000858)	(0.00101)
rural00	-0.0503***	-0.0424***	-0.0443***	-0.00361
	(0.0147)	(0.0152)	(0.0146)	(0.0173)
R61200	0.463***	0.359***	0.389***	0.286***
	(0.0578)	(0.0598)	(0.0574)	(0.0678)
R131500	0.592***	0.559***	0.413***	0.340***
	(0.0627)	(0.0648)	(0.0622)	(0.0736)
R161800	0.576***	0.534***	0.551***	0.560***
	(0.0603)	(0.0623)	(0.0598)	(0.0708)
R19plus00	0.542***	0.525***	0.526***	0.604***
	(0.0562)	(0.0581)	(0.0558)	(0.0660)
Constant	7.652***	7.380***	7.421***	7.601***
	(0.141)	(0.145)	(0.140)	(0.165)
Observations	13,632	13,632	13,632	13,632

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
District fixed effects included.

Role of measurement error

Ratio of measurement error variance to true PCE variance implying zero correlation between true initial PCE and true PCE change

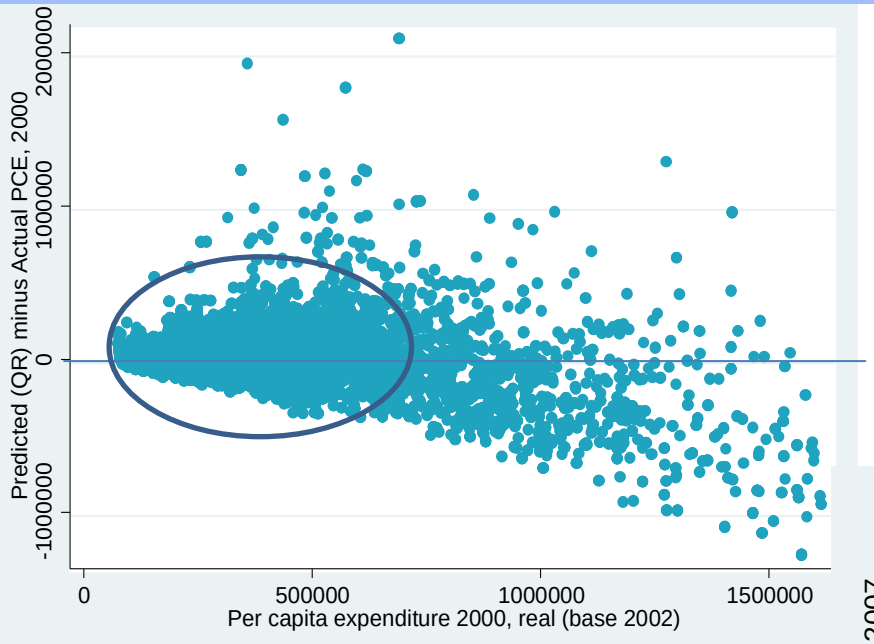
δ	ρ	**Indonesia**	
		2000-2007	*2007-2014*
		β = -0.711	β = -0.457
0	0	2.463	0.841
0	0.1	3.768	1.031
0	0.2	8.015	1.331
-0.1	0	1.995	0.681
-0.1	0.1	3.052	0.835
-0.1	0.2	6.492	1.078
-0.2	0	1.577	0.538
-0.2	0.1	2.412	0.660
-0.2	0.2	5.129	0.852
-0.4	0	0.887	0.303
-0.4	0.1	1.357	0.371
-0.4	0.2	2.885	0.479

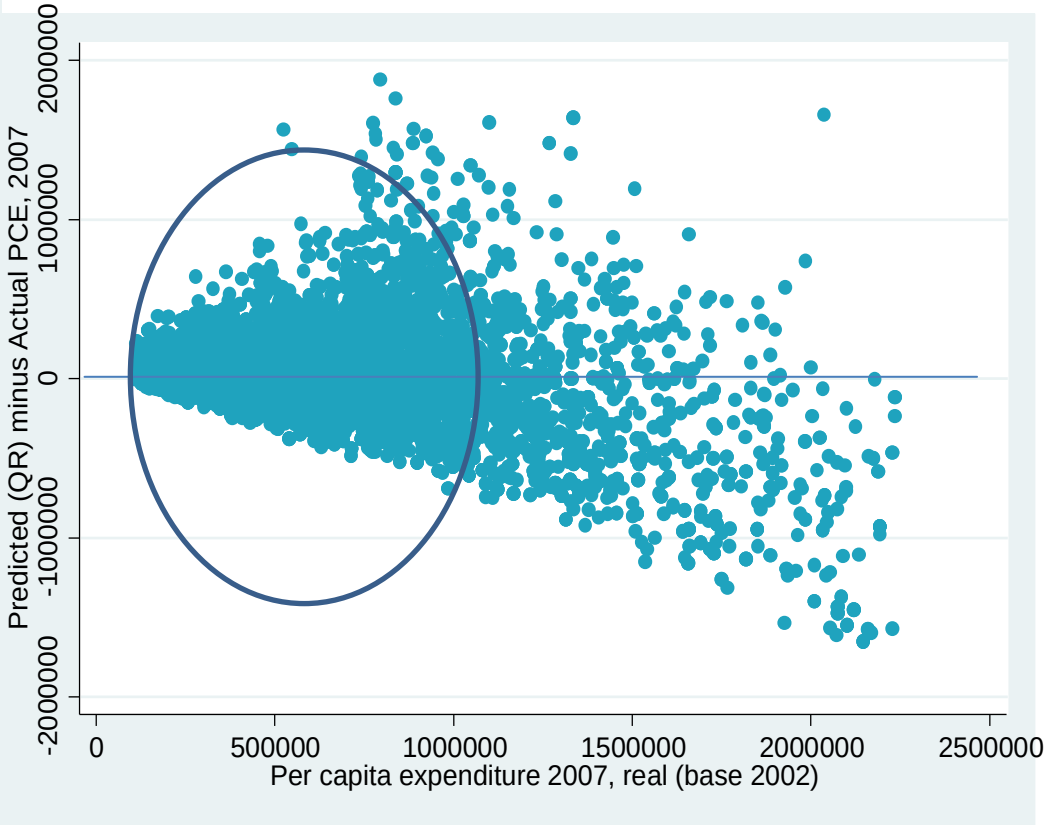
Role of measurement error

Coefficient from hypothetical regression of predicted PCE change on true initial PCE, by measurement error parameters

	PANEL A: Using predicted values from ***Panel Fixed Effects Regressions.***		*PANEL B: Using predicted values from* ***Quintile Regressions.***	
	2000-2007	*2007-2014*	*2000-2007*	*2007-2014*
Correlation with true income δ*= 0; -0.1; -0.2; -0.4*	$\hat{\beta}_2$ = -0.657	$\hat{\beta}_2$= -0.391	$\hat{\beta}_2$= -0.204	$\hat{\beta}_2$= -0.104
	β_2^* = 0.188	β_2^* = 0.122	β_2^* = 1.758	β_2^* = 0.649

Initially poor were transitory poor





Drivers of the conditional probability of experiencing a positive shock

Age of the HH Head$_{t-1}$	.026***
Squared Age of the HH Head$_{t-1}$	-.000***
Female HH Head$_{t-1}$	-.057***
Years of schooling of the HH Head$_{t-1}$	-.008***
HH Size$_{t-1}$	-.032***
Squared HH Size$_{t-1}$	.000
Ratio of HH members 6-12$_{t-1}$	.759***
Ratio of HH members 13-15$_{t-1}$	1.31***
Ratio of HH members 16-18$_{t-1}$	1.36***
Ratio of HH members 19+$_{t-1}$	1.11***
Rural$_{t-1}$	.014
HH Head job government$_{t-1}$	-.244**
HH Head job private$_{t-1}$	-.120
HH Head job family/unpaid$_{t-1}$	-.434
Number of observations	75895

Initial shock experience and retention are not exogenous to shock recovery

Cross-equation correlations between unobserved effects	
Correlation between unobservable factors affecting $(PS_{it}\|PS_{it-1}, R_{it})$ and PS_{it-1}	- 0. 182***
Correlation between unobservable factors affecting $(PS_{it}\|PS_{it-1}, R_{it})$ and R_{it}	0.833***
Correlation between unobservable factors affecting R_{it} and PS_{it-1}	- 0.019***

High Mobility

Indonesia		Deciles 2014									
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Deciles 2007	***1***	29.37	20.10	14.28	12.56	7.85	5.98	4.63	3.29	1.87	0.07
	2	17.37	16.62	14.52	10.55	11.08	7.56	7.78	7.93	5.09	1.50
	3	18.94	15.12	14.60	13.02	10.78	8.46	6.51	6.81	3.97	1.80
	4	10.92	11.74	11.29	11.74	11.22	8.98	12.72	9.35	6.66	5.39
	5	9.66	10.11	10.04	13.56	11.84	12.96	11.39	8.99	7.19	4.27
	6	5.54	8.01	10.55	11.15	14.00	12.87	10.25	12.80	8.83	5.99
	7	4.64	8.23	9.05	8.38	10.55	11.97	13.69	11.29	13.46	8.75
	8	2.10	5.01	7.93	7.86	8.83	14.82	11.83	14.00	16.54	11.08
	9	1.42	3.59	4.42	6.89	7.34	10.33	12.13	12.80	17.81	23.28
	10	0.07	1.50	3.29	4.27	6.51	6.06	9.36	12.72	18.34	37.87

Indonesia		Deciles 2007									
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Deciles 2000	***1***	31.59	18.30	12.99	10.98	7.77	7.54	5.75	2.69	2.32	0.07
	2	19.79	17.47	13.42	9.67	11.92	9.45	7.57	5.10	4.35	1.27
	3	13.83	17.19	15.77	13.60	9.94	10.01	8.45	5.16	3.29	2.77
	4	9.40	12.91	11.72	13.21	13.66	11.12	7.39	8.73	7.09	4.78
	5	7.96	9.77	12.47	13.75	11.04	10.07	12.32	8.94	8.11	5.56
	6	6.80	7.62	10.16	11.66	13.00	10.16	11.73	12.11	11.36	5.38
	7	5.23	7.32	8.29	10.38	10.08	12.02	11.20	14.04	9.93	11.50
	8	3.45	4.20	9.37	7.42	8.70	9.82	13.72	16.79	13.12	13.42
	9	1.65	3.52	4.34	6.37	7.94	11.31	12.88	13.11	19.03	19.85
	10	0.30	1.65	1.57	2.85	5.92	8.46	9.06	13.41	21.35	35.43

Concluding remarks

- Our description of the underlying dynamics behind pro-poor growth shows:
  - High mobility;
  - The actual path of pro-poor growth is not affected by measurement error;
  - Initially poorer experience larger positive shocks;
  - However, in most of the cases, positive shock meant simply a recovery from past negative shock;
  - Initial shock experience and retention are not exogenous to shock recovery;
  - Unobserved factors decreasing the chances of experiencing a positive shock in the past, increase the conditional probability of experiencing a positive shock in the present.

Thank you for your attention!