Poverty decomposition by regression: Application to Tanzania and Côte d'Ivoire

Tomoki Fujii

School of Economics, Singapore Management University

Presented at
UNU-WIDER Conference on Inclusive Growth in Africa: Measurement, Causes, and Consequences.
September 21, 2013

What is poverty decomposition?

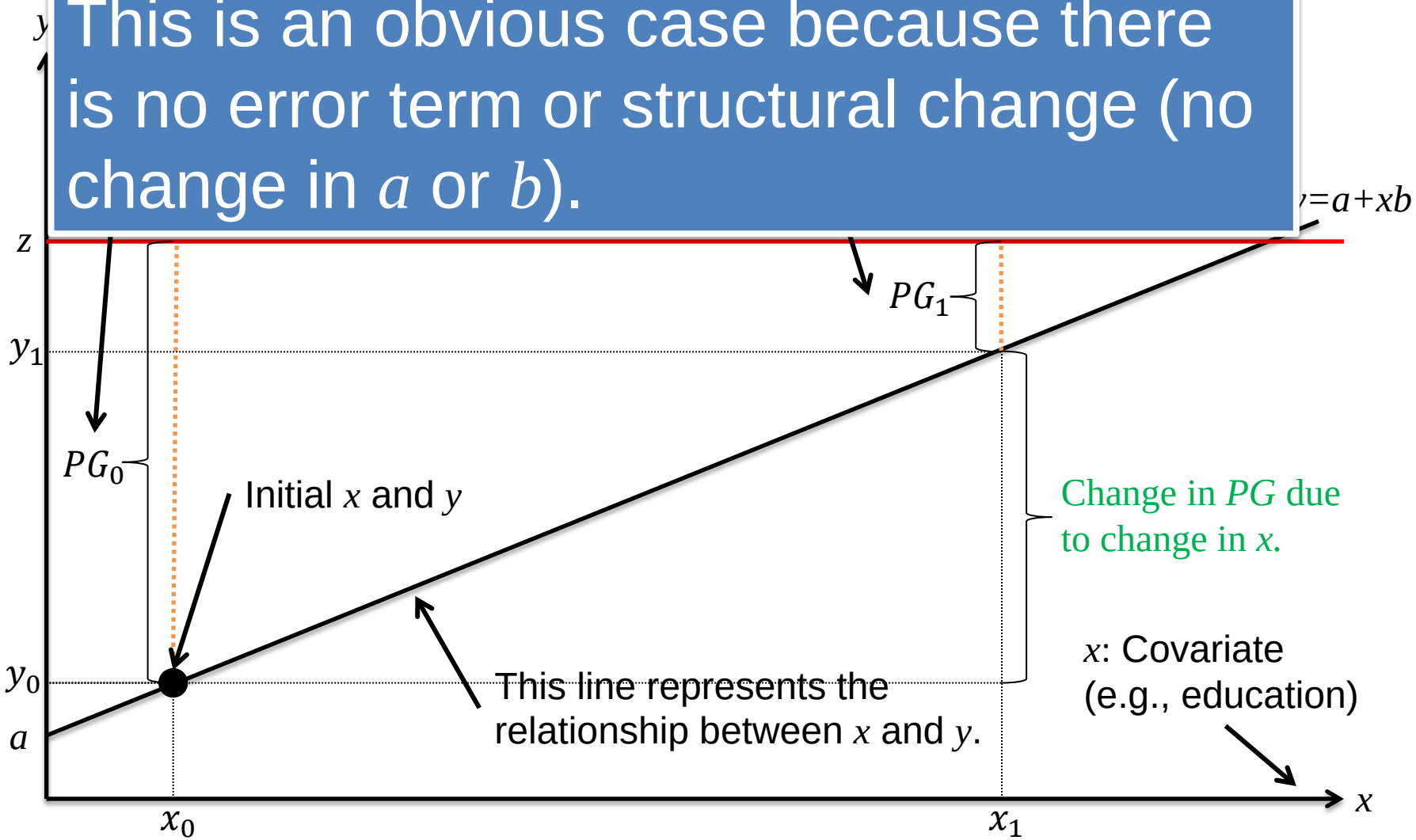
- Attributes observed poverty change to the components of interest.
  - e.g., Growth vs. redistribution components.
- Provides useful information on the sources of poverty change.
- Most studies use “move one thing at a time” approach.
  - They include Datt and Ravallion (1992; JDE), Ravallion and Huppi (1991; WBER), and Grooteart (1995; JDE).
  - Most existing decomposition methods fail to satisfy time-reversion consistency and sub-period additivity.

What do we do?

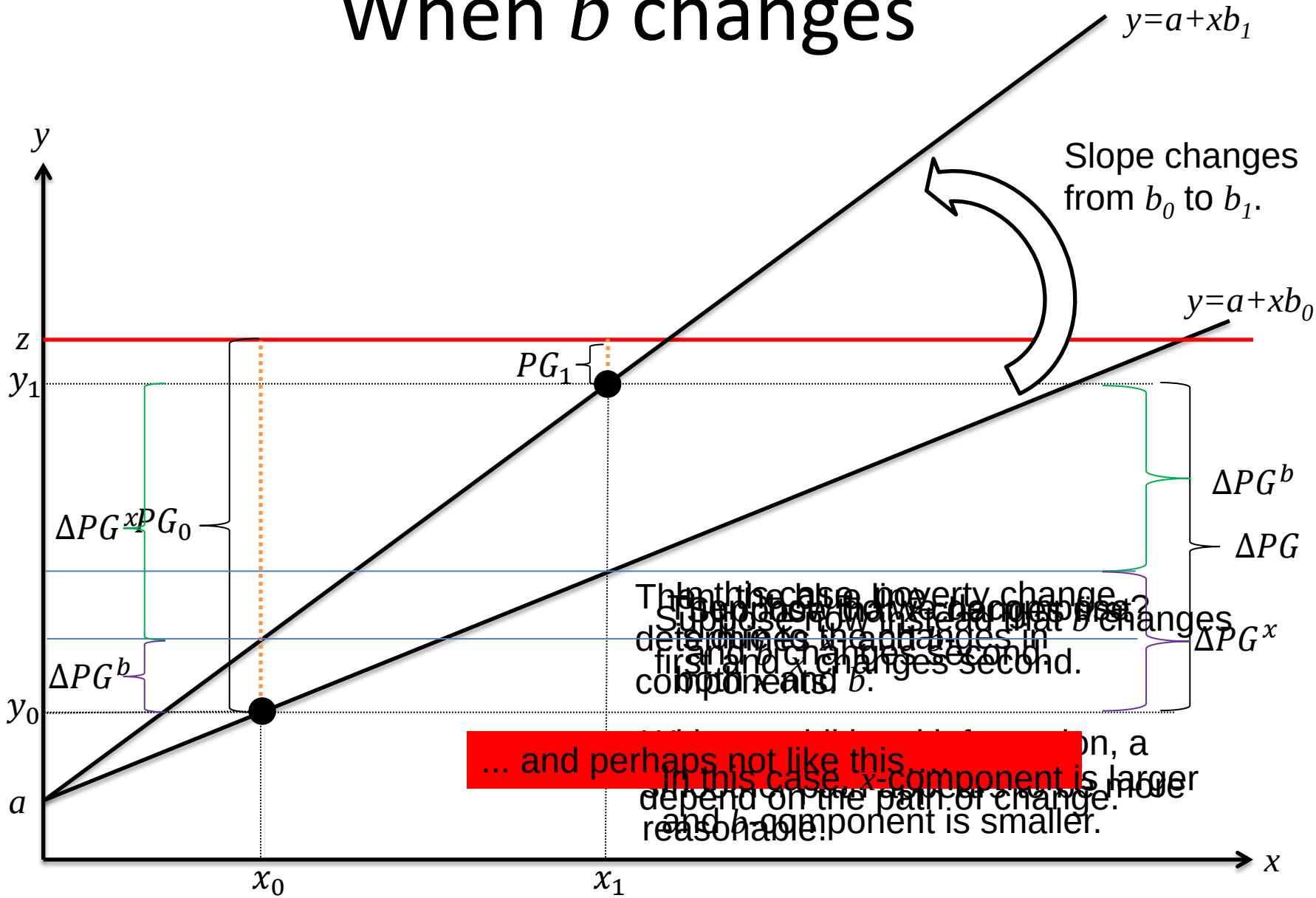
- Fujii (2012) propose an integration-based decomposition that remedies these problems.
- This study also develops an integration-based decomposition, but it links the decomposition to a consumption regression model.
  - This allows us to see how covariates have contributed to the change in poverty.
- Consider additively decomposable measures of poverty.
  - e.g., FGT measure, Watts measure.
  - Decomp. individual poverty. (Aggregation straightforward).
  - Only consider poverty gap and consumption model is given by: $y=a+bx+\varepsilon$.

Obvious case (constant b)

This is an obvious case because there is no error term or structural change (no change in a or b).



When b changes



Smooth path (1)

- What would be a reasonable path?
- We make the following assumptions:

$$x=x_0+t(x_1-x_0)$$
$$b=b_0+t(b_1-b_0)$$

- In this assumption, $\mathrm{E}[y|x]$ is given by:

$$\mathrm{E}[y|x]=a+xb$$
$$=a+x_0b_0+[(x_1-x_0)b_0+(b_1-b_0)x_0]t+(x_1-x_0)(b_1-b_0)t^2$$

  – Note: $\mathrm{E}[y|x]$ does <u>not</u> change linearly under these assumptions.

Smooth path (2)

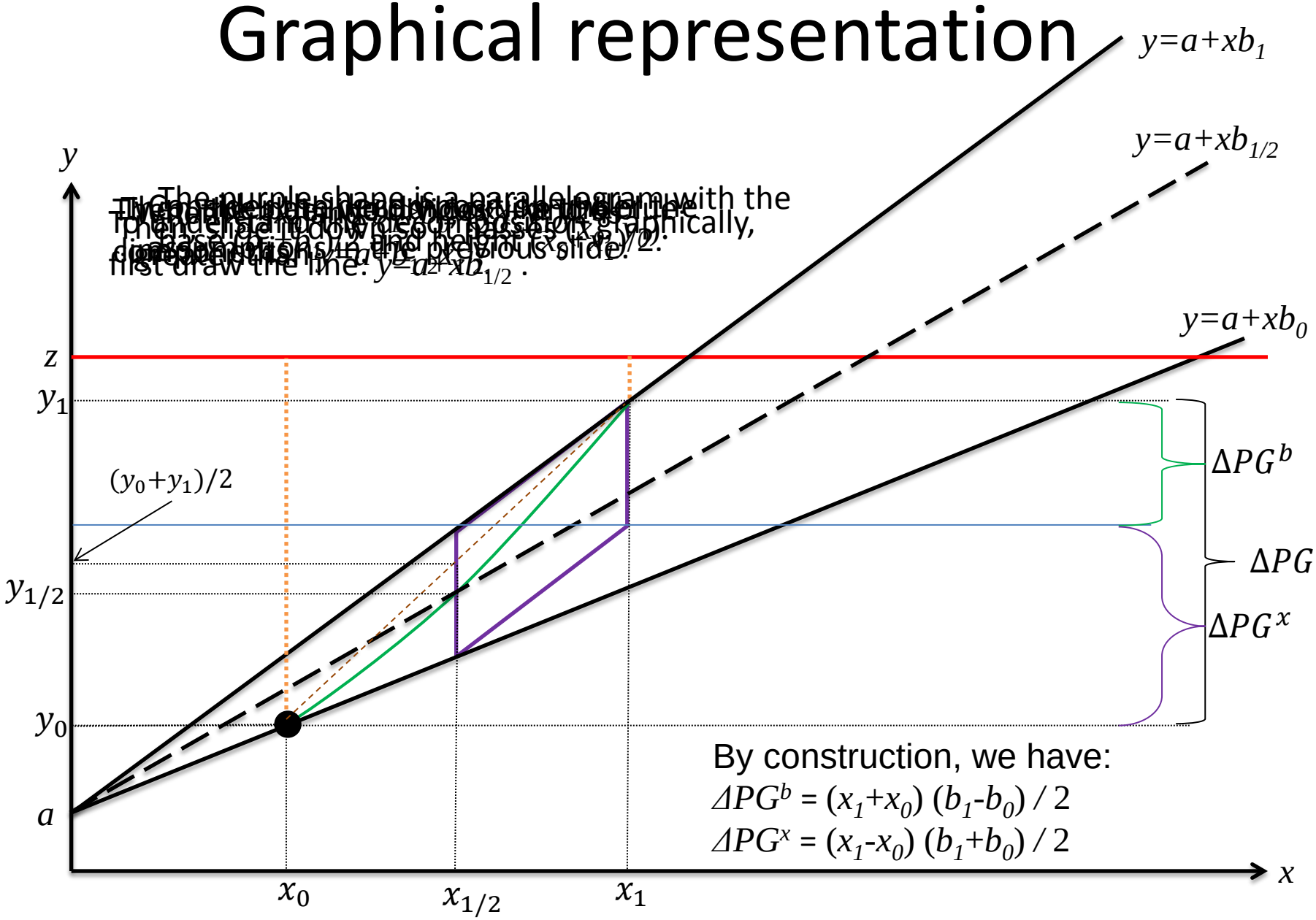
- Consider an individual who is always under poverty line between $t=0$ and $t=1$.
- In this case, the following relationship holds.

$$\Delta PG^b = (x_1+x_0)\,(b_1-b_0)\,/\,2$$

$$\Delta PG^x = (x_1-x_0)\,(b_1+b_0)\,/\,2$$

- Now, let us see how this can be represented in the graph.

Graphical representation



A bit of details

- What if $\varepsilon \neq 0$?
  - Using a panel data, we have ε_0 and ε_1.
  - Then, we assume: $\varepsilon = \varepsilon_0 + (\varepsilon_1 - \varepsilon_0)\, t$.
  - Hence, we have:

$$\dot{y} = \dot{a} + \dot{b}x + b\dot{x} + \dot{\varepsilon}$$

  - Using this, we can compute the contribution of each term to poverty change.
  - In practice, run regressions for two rounds of panel data separately.
  - Use linear interpolation to obtain decomposition.
- Can we do this for poverty rate?
  - Poverty rate is a bit tricky to deal with.
  - We propose to use the estimated probability of poverty.

Data

- Côte d'Ivoire
  - CLISS: Côte d'Ivoire Living Standards Survey for 1985, 1986, 1987, and1988.
  - Rotating panel.
  - Each contiguous two years contain about 800 panel households.
- Tanzania
  - TZNPS: Tanzania National Panel Survey for 2008/09 and 2010/11.
  - Use panel households that didn't split up or missing data for our purpose.
  - About 2,600 observations.
- For both data sets, we focus on rural areas and access to market.

Côte d'Ivoire

[Poverty Gap]	Comp	HH size	HH pri edu	Dist. paved rd.	Dist. market	Constant	Total	Residual	Change in PG
CLISS 85-86	*X*	-0.37	-0.02	0.08	-0.39	0.00	-0.69		
	b	2.68	0.03	-0.41	0.71	-2.03	0.99		
	X+b	2.32	0.01	-0.33	0.33	-2.03	0.30	-2.62	-2.32
CLISS 86-87	*X*	-0.86	0.03	0.32	-0.15	0.00	-0.67		
	b	0.11	-0.01	-0.44	-1.15	2.95	1.46		
	X+b	-0.75	0.02	-0.13	-1.30	2.95	0.79	0.45	1.24
CLISS 87-88	*X*	-0.68	-0.44	-0.10	-4.53	0.00	-5.75		
	b	3.13	0.09	0.91	-1.01	10.03	13.15		
	X+b	2.45	-0.35	0.81	-5.54	10.03	7.40	-0.65	6.75

Note: All figures are in percentage.

- Between 87-88: both the improvement of market access and increased importance of market access improved poverty, although not the largest period.
- However, the residual is much larger than 87-88, suggesting that the actual change.

Tanzania

[Poverty Gap]	Comp	HH size	Head usec edu	Agric HH	Dist. market	Constant	Total	Residual	Change in PG
TZNPS	*X*	0.40	-0.03	-0.28	0.17	0.00	0.25		
	b	-3.13	0.00	-0.78	-0.13	-0.22	-4.27		
	X+b	-2.74	-0.03	-1.07	0.04	-0.22	-4.02	-0.05	-4.07

Note: All figures are in percentage.

- Decomposition works well.
  - Residual and constant terms remarkably small.
- Good example of poverty reduction through agricultural development.
  - Exiting from agriculture
  - Reduction in the consumption gap between ag and non-ag households.
- During the study period, market access did not affect poverty much.

Discussion

- Developed a regression-based poverty decomposition method.
  - Satisfy time-reversion consistency and subperiod additivity.
  - Poverty decomp. with a flavor of Oaxaca-Blinder.
  - Could complement the RCT approach (cheap *ex post* evaluation of policy possible).
- Our decomposition analysis may help researchers and policy makers to understand the important sources of poverty change.

Thank you very much!