Relationships Between Monetary Poverty and MPI: Joint, Separate or Correlated Distributions?

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Introduction & Motivation

- The SDGs propose a pressing issue related poverty measurement policy.: In stating that we need " *to end poverty in all its forms everywhere*".
  - implicitly mandate for both monetary and non-monetary poverty to inform policy.
  - Monetary and multidimensional poverty methods coexist but with real differences in approach, data and methods
  - Recent Development of 'combined indices' at global and regional (LAC) level, (some national approaches already do this)
- Two measures dominate global discussions
  - World Bank's monetary poverty ($ppp) ' extreme poverty' @ $1.90 pp per day, (higher lines for LMICs & UMICs and societal poverty lines developed)
  - UNDP-OPHI global Multidimensional Poverty Index (MPI) since 2010 revised 2018. Focuses on health, education and living standards.
- Three Questions of Interest
  - **What is the relationship between monetary ($ppp) and MPI welfare distributions?**
  - **How is the poverty relationship reflected by the poverty thresholds?**
  - **How do these relationships alter the construction and interpretation of combined indices?**

Introduction & Motivation

- We revist the relationship between these monetary and non-monetary notions of poverty at the two basic stages of poverty measruement (Sen, 1976):
  - the **aggregation** stage, to assess the extent to which they coincide in stating the amount of poverty at the country level, and
  - the **identification** stage, to assess if individuals are consistently identified as poor by both approaches of poverty.
  - **Even if both approaches coincide at the aggregate stage, they could still diverge to a great extent in terms of who is identified as poor.**

Literature tends to focus on

- Fundamentals of method to create the welfare measures
- Comparison of poor populations and the 'differences' defined by binary 'poor/not-poor' status
- Need to empirically consider:
  - Relationship of two welfare distributions
  - The relationships of the 'thresholds' on interpretations of 'difference'
  - How these relationships affect combined index

Mismatch Poor $ Not poor MD	**Overlap** Poor both $ and MD
Mismatch Poor MD Not poor $	**Neither poor** **$ or MD**

3 Analyses

- **Cross-national analysis** of poverty headcounts using different thresholds and rankings
  - 90 countries and data from the World Bank PovCalNet and OPHI's 2018 global MPI databases.
- **Individual level analysis using 6 national surveys** chosen from the 90 to reflect levels and volatility of poverty: from Ethiopia, Bolivia, Ecuador, Uganda, Brazil and Ghana
  - Of relationship between separate MPI and $ppp welfare distributions
  - Of how that relationship is seen at the $ppp poverty thresholds
- **Individual level analysis on combined index** – Ethiopia and Equador -reflecting the issues identified.

1.1 International Analysis

- Data: selective sample of aggregate poverty headcounts from 90 countries (observed in Both World Bank PovCalNet and OPHI's 2018 global MPI databases with data <10 years difference). (27 LICs, 39 LMICs & 24 UMICs)

- Poverty headcounts using multiple thresholds ($1.90. $3.20 and $5.50; 0.5, 0.33 and 0.2)

- **Headline Finding:** both approaches **are related**. The ranking correlation coefficient is around 0.6 and significant for **all combinations of the relevant povery lines/poverty cutoffs.**

Table 1: Monetary and MPI Poverty Headcounts: Kendall correlation coefficients

k(%)	$1.90	$3.20	$5.50
50	0.598***	0.621***	0.606***
33	0.616***	0.656***	0.645***
20	0.623***	0.671***	0.659***

However, these mean, overall relationships **mask important heterogeneity in country subgroups.**

- **Does not hold for tercile (30) coutnries with highest $1.90 poverty rates**

1:2 International Analysis (cont.)

Table 3: Monetary and MPI Poverty Headcounts by Tertiles: Kendall Coefficients

	Ranked by GNI per capita			Ranked by MPI (k=0.3333)		
	$1.90	$3.20	$5.50	$1.90	$3.20	$5.50
	Poorest tercile of countries (n=30)			Poorest tercile of countries (n=30)		
MPI (k=0.50)	0.258	0.250	0.298	0.145	0.137	0.198
MPI (k=0.33)	0.29	0.290	0.315 *	0.246	0.246	0.266
MPI (k=0.20)	0.323 **	0.331 *	0.347 **	0.306 *	0.339 *	0.251 *
	Middle tercile of countries (n=30)			Middle tercile of countries (n=30)		
MPI (k=0.50)	0.496 **	0.500 ***	0.5 ***	0.278	0.298	0.286
MPI (k=0.33)	0.556 ***	0.544 ***	0.544 ***	0.310	0.355 *	0.359 **
MPI (k=0.20)	0.597 ***	0.601 ***	0.601 ***	0.375	0.411 ***	0.391 **
	Richest tercile of countries (n=30)			Richest tercile of countries (n=30)		
MPI (k=0.50)	0.285	0.341 **	0.263	0.329 *	0.264	0.15
MPI (k=0.33)	0.252	0.368 **	0.308 *	0.298	0.343 **	0.298
MPI (k=0.20)	0.213	0.329 **	0.303	0.262	0.363 **	0.319 *

- Only holds for middle tercile of countries ranked by GNI per capita.
- If country subgroups are defined by MPI 0.33 headcounts , the overall association is statistically weaker

- In **neither case**, the rank correlation of poverty headcounts by $1.90 and MPI(k=1/3) are significant among the poorest tercile of countries. → Important international policy implications

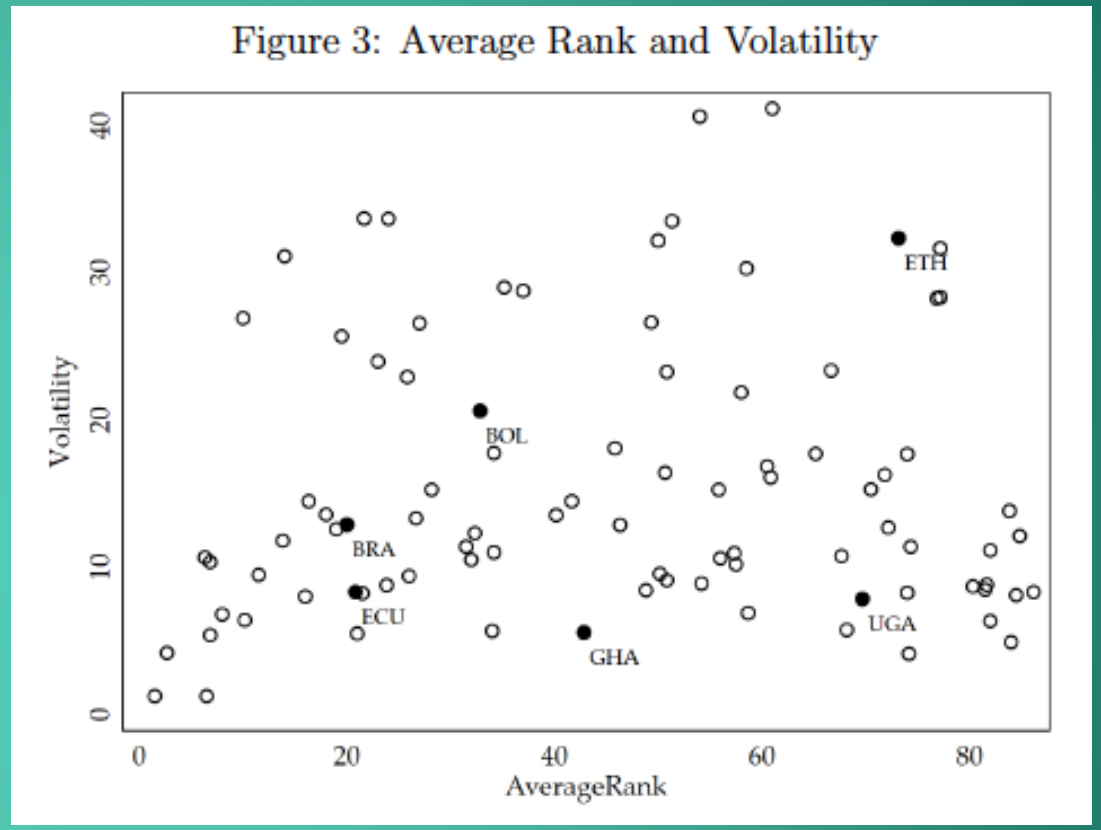
1.4 Selecting Countries for Individual Level analysis

case studies to cover the whole range across both approaches to poverty

- **average rank** of each country by 3 + 3 poverty lines
- **volatility** around this average rank, as measured by the Euclidian distance.

$$Average\ Rank = \bar{r}_j = \frac{1}{6}\sum_{i=1}^{6} r_{ij}$$

$$Volatility = \sigma_j = \sqrt{\sum_{i=1}^{6} (r_{ij} - \bar{r}_j)^2}$$

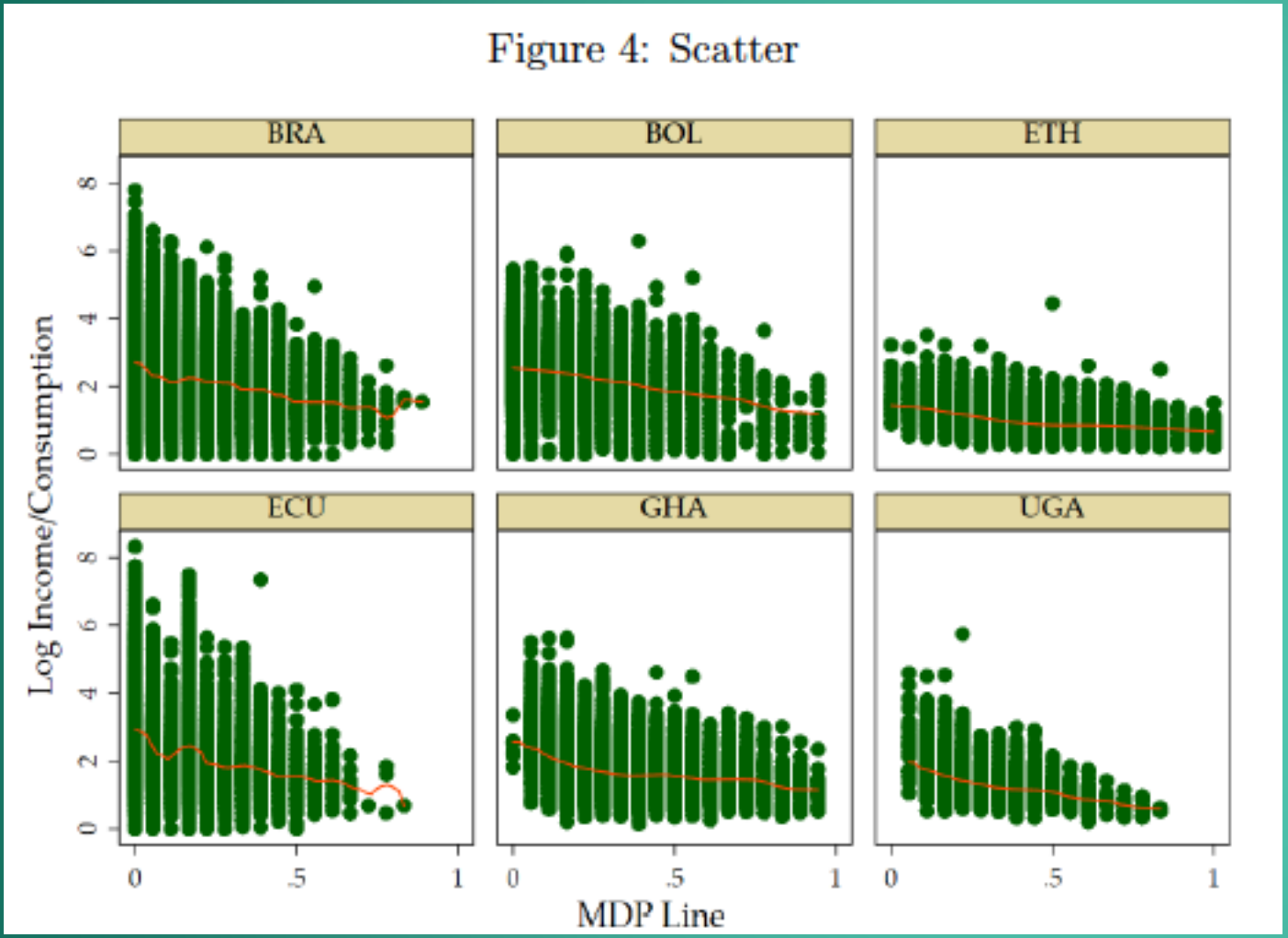


We choose six countries based on criteria:

1. **Data availability**. Replicate global MPI alongside $ poverty
2. **Coverage across the average level of poverty, rank and volatility**.

Not 'representative' but an array of 6 poverty contexts: Brazil, Ecuador, Bolivia, Ghana, Uganda & Ethiopia

2:1 Gradients & Dispersion



On average, people facing a low number of deprivations tend to have higher levels of monetary welfare (decreasing lines).

However, **the dispersion of monetary welfare among people with a very low number of deprivations is staggering**. This is particularly true in the least-poor countries (Brazil and Ecuador)

Among people who do not face any non-monetary deprivation, one can find some that have the lowest and the highest levels of monetary welfare

2:2 Quintile Regression

Table 6: Variant (a): Quantile Regression of Income/Consumption on Deprivation Score

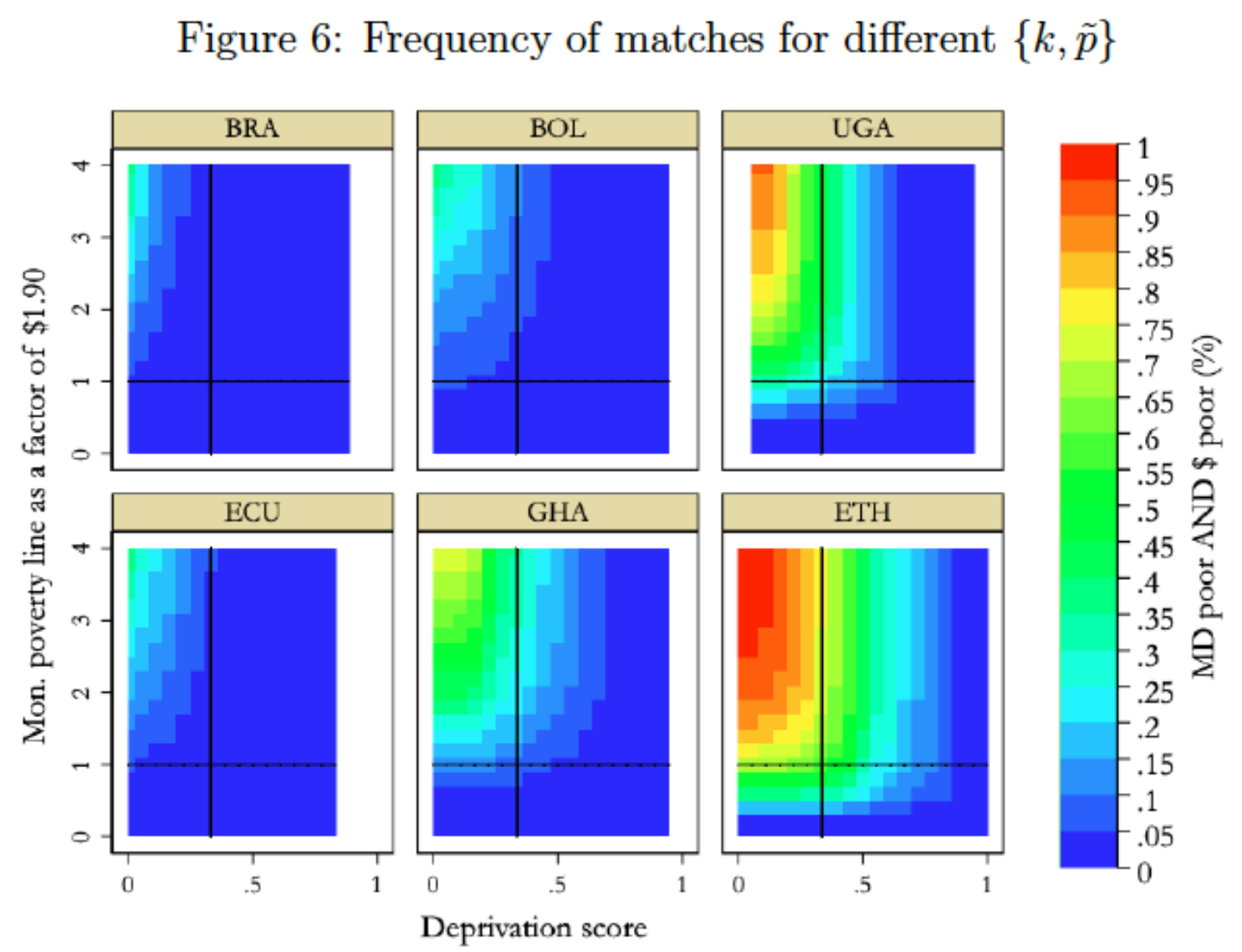
	(1) **BRA** Coef./S.E.	(2) **BOL** Coef./S.E.	(3) **ETH** Coef./S.E.	(4) **ECU** Coef./S.E.	(5) **GHA** Coef./S.E.	(6) **UGA** Coef./S.E.
q10						
Dep. Score	-8.1096***	-7.7424***	-0.7917***	-9.0124***	-2.4437***	-1.9280***
	(0.0656)	(0.1443)	(0.0175)	(0.1137)	(0.0382)	(0.0509)
Constant	4.0226***	4.7314***	1.0151***	4.2642***	2.6115***	1.8061***
	(0.0000)	(0.0541)	(0.0114)	(0.0275)	(0.0145)	(0.0250)
q30						
Dep. Score	-12.4903***	-11.7392***	-1.3536***	-15.9331***	-4.2857***	-3.3929***
	(0.0580)	(0.1548)	(0.0170)	(0.1315)	(0.0572)	(0.1119)
Constant	7.5988***	8.4918***	1.7151***	8.1827***	4.5986***	2.9528***
	(0.0173)	(0.0430)	(0.0106)	(0.0342)	(0.0255)	(0.0423)
q50						
Dep. Score	-17.8517***	-15.1159***	-1.6784***	-26.0001***	-6.4042***	-5.2580***
	(0.0946)	(0.2163)	(0.0245)	(0.2327)	(0.0627)	(0.1473)
Constant	11.7944***	12.1106***	2.2780***	13.3688***	6.7964***	4.2639***
	(0.0204)	(0.0723)	(0.0110)	(0.0529)	(0.0315)	(0.0644)
q70						
Dep. Score	-25.6322***	-19.0370***	-2.2541***	-44.4003***	-9.0181***	-7.6463***
	(0.1686)	(0.1376)	(0.0341)	(0.3941)	(0.1089)	(0.1481)
Constant	18.0858***	17.4271***	3.1331***	23.1560***	9.8136***	6.0644***
	(0.0379)	(0.0858)	(0.0240)	(0.0960)	(0.0546)	(0.0684)
q90						
Dep. Score	-58.3472***	-30.0063***	-3.8030***	-103.1813***	-16.6450***	-14.7848***
	(0.4170)	(0.3398)	(0.0876)	(0.9152)	(0.1640)	(0.2611)
Constant	37.4105***	29.7025***	5.1748***	58.2966***	17.8107***	11.2224***
	(0.1844)	(0.2312)	(0.0544)	(0.2815)	(0.0820)	(0.1342)
N	348258	36876	26670	108093	71277	17465

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The findings:

- monetary hardships tend to be more concentrated among the population suffering the highest number of simultaneous deprivations,
- particularly true in the least-poor countries is corroborated in a model-approach

2:3 Joint Distribution: Heatmaps of Matching Poverty



Naturally, the proportion of people who are poor by both approaches tends to be higher in contexts of high poverty (Uganda and Ethiopia)

Ceteris paribus, **a change in the monetary poverty line (in the vertical sense) around the duo {$1.90, k=1/3} seems to generate important changes,** particularly in contexts of high poverty (Ghana, Uganda, Ethiopia)

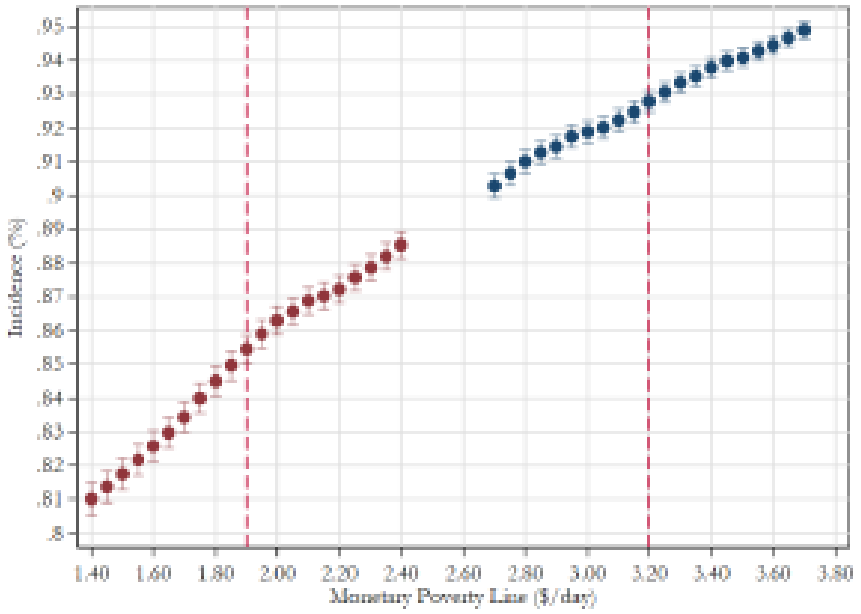
3.1 Combined 4D MPI index

We computed a 4-dimensional MPI (Income, Education, Health, Living Standards), with equal relative importance (25% each).

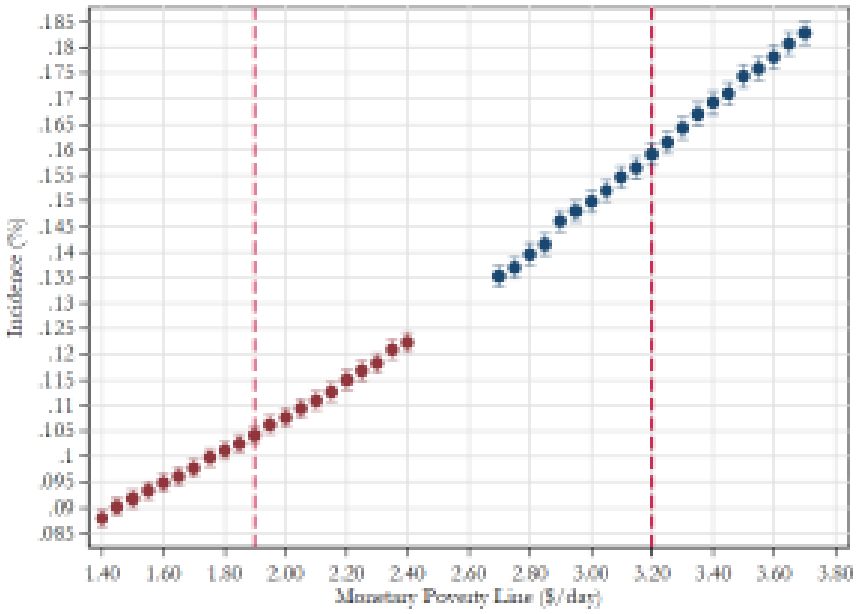
If the multidimensional poverty cutoff is set to 25%, **one area of mismatch disappears**! Every person who was poor by one approach in isolation, is poor by the this 4DMPI.

But a trade-off in Sensitivity: Hardly any room for changes in this cutoff. Another multidimensional poverty cutoff (greater than 4.17%, which is the step at which the new deprivation score changes), re-introduces mistmaches and distortions.

Ethiopia



Ecuador



$0.50 variation from $1.90 -> poverty range 81% to 89% in Ethiopia.

$0.50 variation $3.20 -> poverty rango 13.5% to 18.5% in Ecuador.

3.2 Poverty Sets & Sensitivity in Combined 4DMPI

Changing the poverty line not only modifies the aggregate level of poverty, but **it changes the non-monetary profiles of people who are moved into or out of poverty due to this change.**

Table 8: t-tests: shifting the monetary poverty from $1.90 to $1.65

	Ethiopia			Ecuador		
	Reference group : 4DMPI poor with $1.90	Previously 4DMPI poor with $1.90; Now 4DMPI non-poor with $1.65	pvalue	Reference group : 4DMPI poor with $1.90	Previously 4DMPI poor with $1.90; Now 4DMPI non-poor with $1.65	pvalue
Proportion of pop.	84.55	1.57		10.42	0.82	
Mean Dep. Score	52.08	20.84	0.000	32.27	13.12	0.000
Nutrition	24.69	0.00	0.000	48.23	25.17	0.000
School Attendence	51.26	34.70	0.000	16.37	3.97	0.000
Education	59.80	0.61	0.000	21.30	5.22	0.000
Electricity	75.55	27.85	0.000	20.55	5.56	0.000
Water	47.39	16.74	0.000	38.25	15.65	0.000
Sanitation	66.92	48.71	0.000	52.73	23.92	0.000
Housing	97.39	77.63	0.000	26.17	14.17	0.000
Cooking Fuel	97.94	75.19	0.000	47.69	19.16	0.000
Assets	70.99	23.14	0.000	54.23	32.88	0.000

e.g: lower $ poverty line from $1.90 to $1.65 will lift people out of multidimensional poverty. **Because of the correlation,** on average**,** this decisions ends up **significantly altering every element of the non-monetary deprivation profile of the new set of poor people.**

Policy for non-monetary deprivations may have to readjusted because of a change in the monetary poverty line.

Influence on effective policy making in reducing poverty in all its forms…?

Conclusions

- Overall correlation of international $ppp and MPI poverty thresholds when ranked by $ppp.
  - But correlation stronger in ‘middle’ group of countries
  - Correlation weaker in poorer group and using other rakings (MPI especially)
- Gradient and correlation of MPI and $ ppp welfare distributions at national levels in 6 countries of differing rank and volatility of.
  - MPI goes down as $ppp rises
  - But density around the thresholds – sensitivity of $ threshold in particular.
- Combined 4DMPI – to include $ppp as 4th Dimension
  - ‘solves’ mismatch of poor population
  - Promotes sensitivity to mismatched Multiple Deprivation above the $threshold.