PPP Time Series

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5th TAG Meeting – February 20–21, 2020

Background

Goal: estimate annual global PPPs

Important distinctions:

1. Extrapolation vs. Interpolation
2. Level of calculation

Background

	Extrapolation	Interpolation
Aggregate level		
BH level		

Background

	Extrapolation	Interpolation
Aggregate level	Old approach/ consistency checks	Relevant for comparison
BH level	Earlier comparison	New results

Terminology

- **Extrapolation (benchmark in period 1):**

$$PPP_{i,b,t} = PPP_{i,b,1} \times \frac{P_{i,t}}{P_{i,1}} \Big/ \frac{P_{b,t}}{P_{b,1}}$$

- **Interpolation (benchmarks in periods 1 and T):**

$$PPP_{i,b,t} = \left[PPP_{i,b,1} \times \frac{P_{i,t}}{P_{i,1}} \Big/ \frac{P_{b,t}}{P_{b,1}}\right]^{1-w_t} \times \left[PPP_{i,b,T} \times \frac{P_{i,t}}{P_{i,T}} \Big/ \frac{P_{b,t}}{P_{b,T}}\right]^{w_t}$$

With $w = \frac{t-1}{T-1}$

Weighted average of forward & backward extrapolation

Plan today

Discuss a general framework for publishing annual PPP time series.

- Integration of:
  - Global benchmarks
  - Regional benchmarks
- Deal with:
  - Interpolation between benchmarks (main focus)
  - Extrapolation to more recent years
  - ICP idiosyncracies

Plan today

1. Discuss implementation approach (based on note)
   a. General steps
   b. Specific issues
2. Illustrate using time series results
   a. Extrapolation vs. interpolation
   b. Interpolation at aggregate vs. at BH level
   c. Impact of RBMs

General approach

For the years 2012–2016:

1. Interpolate benchmark linked basic heading PPPs
2. Integrate regional benchmarks (RBMs)
3. Aggregation using 2011/2017 methodology

Implementation challenges

1. Interpolate linked basic heading PPPs between 2011 and 2017
   a. Estimate inflation and expenditure at BH level
   b. Apply ICP 2017 reference PPP mapping
   c. Apply annual productivity adjustment
2. Integrate regional benchmarks (RBMs)
   a. Use CAR-PPP method to maintain fixity
3. Aggregation using 2011/2017 methodology
   a. Deal with 'regional switchers'

1a. Estimating inflation

Two GO-constructed datasets:

1. CPI indices
2. National Accounts deflators

Combine as follows:

- Use most detailed price data for each heading
- Use overall CPI if GDP deflator is missing
- Use GDP deflator is overall CPI is missing

1a. Estimating inflation

Household consumption:

- Typically COICOP-12 data
- Greater detail in EUO (CPI) and AFR (NA)

Beyond consumption:

- Typically Main Aggregates data
- GDP deflator needed most often in CAR, followed by ASI

1a. Estimating expenditure data

Combine:

- BH expenditure data in benchmark years
- Expenditure data at (typically) higher levels of aggregation

By interpolating expenditure shares in higher-level aggregats

1b. Reference headings

Reference headings:

- Use 2017 reference PPP mapping for annual (interpolated) PPPs.
- Advantages:
  - Use same method as in benchmark years
  - No need to rely on NA deflators for hard-to-deflate headings such as change in inventories

1c. Productivity adjustment

Two options:

1. Interpolate productivity-adjusted BH PPPs
2. Interpolate non-adjusted BH PPPs and apply PAFs in every year

Little practical difference for interpolation, but option 2 is more appealing for extrapolation, as government deflators will often be based on input costs.

2. Integrate RBMs

Table 1. Availability of ICP and Regional benchmark data, 2011–2017

	Africa	Asia-Pacific	CIS	Eurostat-OECD	Latin America	Caribbean	Western Asia
2011	ICP	ICP	ICP	ICP	ICP	ICP	ICP
2012				RBM			RBM
2013				RBM			RBM
2014			RBM	RBM			RBM
2015				RBM			RBM
2016				RBM			RBM
2017	ICP	ICP	ICP	ICP	ICP	ICP	ICP

2. Integrate RBMs

- Let:
  - PPP^L be the interpolated linked BH PPPs,
  - PPP^R the regional BH PPPs, and
  - PPP^F the global BH PPPs based on the regional PPPs
- Then PPP^F for country j is calculated using the CAR-PPP method as:

$$PPP_j^F = PPP_j^R \times \frac{\left[\prod_{c \in R} PPP_c^L\right]^{\frac{1}{N_R}}}{\left[\prod_{c \in R} PPP_c^R\right]^{\frac{1}{N_R}}}$$

3. Aggregation

- Follow ICP2011/ICP2017 methods
  - Maintains fixity within region using CAR-Volume method
  - Special treatment of CIS, CAR and special participation countries
  - See implementation note for a brief summary
- BUT: only for countries that are in the same region in 2011 and in 2017

3a. Dealing with switching countries

Two types:

1. **Participants in 2011 but not in 2017 (GTM, MAC, VEN, YEM) or participants in 2017 but not in 2011 (ARG, GUY)**
2. **Switching between regions (COL*, CRI*, GEO**, MAS***, IRN**, UKR****)**

* LAT in 2011, EUO since 2016

** Singleton countries in 2011 (IRN linked via TUR, GEO via ARM) and Special Participation countries in 2017 (IRN linked via WAS, GEO via EUO)

*** Ony a dual-participation country from 2014 onwards

**** CIS in 2011, Special Participation in 2017

3a. Dealing with switching countries

Step 1: Estimate BH PPPs for all years

Type 1: only one set of benchmark BH PPPs => use extrapolation

Type 2: interpolation as for other countries

Step 2: Integrate RBMs

Only relvant for type 2, same method as for other countries

3a. Dealing with switching countries

Step 3: Aggregation

For type 1: Countries with extrapolated PPP should not affect PPP estimates for 'continuing' countries,

For type 2: Shifts between regions should be smooth (in the absence of RBMs)

Example: Argentina (type 1)

For any particular year and level of aggregation:

1. Estimate aggregate PPPs for continuing Latin American countries (LAT_c)
2. Estimate aggregate PPPs based on 2017 regional composition, LAT_{2017} (i.e. including Argentina)
3. Use the CAR-PPP method to adjust Argentina's PPP:

$$PPP_{ARG} = PPP_{ARG}^{LAT_{2017}} \times \frac{\left[\prod_{c \in LAT_c} PPP_c^{LAT_c}\right]^{\frac{1}{N_{LAT_c}}}}{\left[\prod_{c \in LAT_c} PPP_c^{LAT_{2017}}\right]^{\frac{1}{N_{LAT_c}}}}$$

Example: Colombia (type 2)

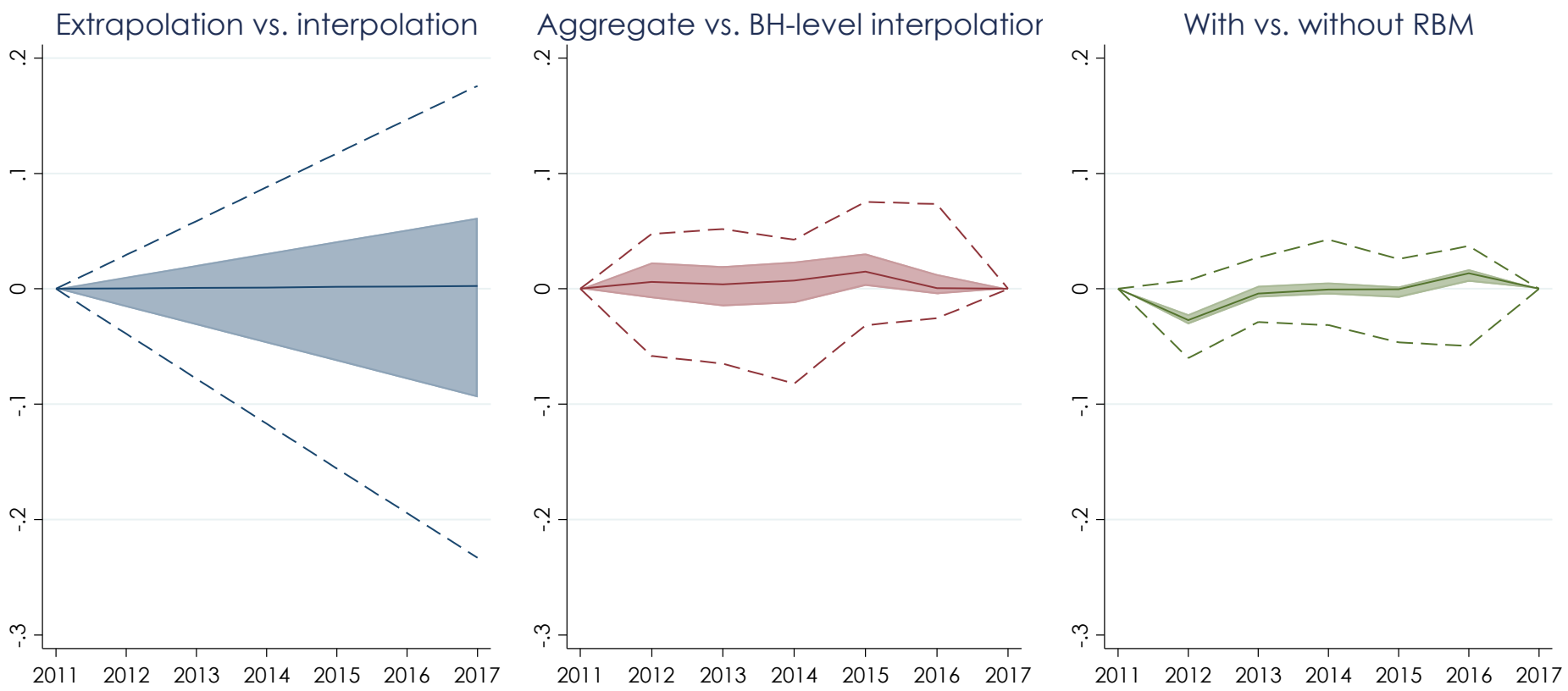
For any particular year and level of aggregation:

1. Follow previous steps to link COL to its 2011 region (LAT), $PPP_{COL,t}^{LAT_{2011}}$
2. Follow previous steps to link COL to its 2017 region (EUO), $PPP_{COL,t}^{EUO_{2017}}$
3. Interpolate:

$$PPP_{COL,t} = \left[PPP_{COL,t}^{LAT_{2011}}\right]^{1-w} \times \left[PPP_{COL,t}^{EUO_{2017}}\right]^{w},$$

for $t = 2012, \ldots, 2015$, with $w = \frac{t-2011}{2017-2011}$

Summary of differences



Notes: Each figure is based on comparing two series of PPPs for each country and computing the difference. Plotted is the median difference, the interquartile range and, in dashed lines, the 5 th and 95th percentile across countries for each year.

Summing up

- Estimating time series introduces novel challenges:
  - Integrating RBMs
  - Regional switches
- Difference between interpolation at aggregate level or from basic heading level is relatively modest
- But greater credibility from basic heading level => Same reference PPP mapping, same aggregation procedure
  - Plus greater flexibility in terms of incorporating data detail

CLOSING – THANK YOU