

# **International Comparison Program (ICP) Technical Advisory Group (TAG)**

## **Research Topics Emerging from Previous ICP Cycles**



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# Outline

## **Research topics emerging from previous ICP cycles:**

- Dual Participation
- Productivity Adjustment Factors (PAFs)
- Subsidized prices
- Linking of Private Education
- Construction wages

## **Other operational issues:**

- Harmonize global and regional computation of reference PPPs

# Dual Participation

- The presence of economies participating in **multiple regional comparison** programs has raised some challenges to the current ICP methodology.
- Dual participating (DP) economies par-take in **distinct regional comparisons** at the same time and each **features twice** as separate economies in the global ICP results.
- While efforts are made to **fully harmonize the input data** for these economies, the current methodological approach for the estimation of global PPPs leads to **different results** for each DP economy.
- This, in turn, implies a trade off:

**harmonization** vs **regional fixity** of final global estimates

# Dual Participation – Current approach

In ICP 2021, the economies of **Egypt, Mauritania, Morocco, Sudan and Tunisia** participated in both AfDB and ESCWA regional comparisons. The PPPs estimation for this group of countries followed the steps below.

## ***Regional comparison***

- Each DP economy collected the same set of global items prices and national account data, but distinct regional items, resulting in distinct regional PPPs for each regional comparison.

## ***Global linking***

- *BH PPPs*: Linking factors were calculated including each DP economy in both regions, and then applied to the respective regional basic heading PPPs. Finally a geometric mean of the two DP economies estimates was taken.
- *GEKS Aggregation*: DP economies were included only once in the GEKS aggregation, but considered separately in both regions when CAR procedure was applied. Finally a geometric mean of the two DP economies estimates was taken.

# Dual Participation – Current approach (2)

## *Time-series PPPs*

For interim years BH PPPs, geo-mean between linked RegBM estimates by ESCWA and interpolated estimates using CPI data for AfDB. This is done to avoid breaks in the series with the Global BMs. GEKS aggregation follows the same procedure as for BM estimates.

|            | Before Harmonization |              | After Harmonization |           |
|------------|----------------------|--------------|---------------------|-----------|
| BH 1110111 | EGZ (WAS)            | EGY (AFR)    | EGZ (WAS)           | EGY (AFR) |
| 2017       | Global BM            | Global BM    | Global BM           | Global BM |
| 2018       | Reg BM               | Interpolated | GeoMean             | GeoMean   |
| 2019       | Reg BM               | Interpolated | GeoMean             | GeoMean   |
| 2020       | Reg BM               | Interpolated | GeoMean             | GeoMean   |
| 2021       | Global BM            | Global BM    | Global BM           | Global BM |

Current approach for both benchmark and time-series estimates favors **harmonization**: same estimates for the dual entries of Egypt, Morocco, Mauritania, Sudan and Tunisia are obtained, but regional fixity is lost.

# Dual Participation – Trade offs

## 1. CAR-Volume to BH PPPs?

- The presence of dual participating countries means the LFs data (distinct regional PPPs) and CAR data (harmonized through geo-mean) are different.
- Application of CAR Volumes to BH PPPs ensures consistencies with further Aggregate Headings
- **BUT** global linking procedure already ensures regional fixity for BH PPPs. Displaying without CAR-volume give other experts a possibility to recalculate aggregate results.

## 2. Geo-mean of BH PPPs for DP economies in interim years?

- Geo-mean ensures no breaks in the series between benchmark and interim years.
- **BUT** estimation no longer relies on benchmark estimates when available (one of the key methodology principles)

# Productivity Adjustment Factors (PAFs)

- To account for **differences in productivity** between countries, the ICP estimates and applies “**Productivity Adjustment Factors (PAFs)**” to the **PPPs of government compensation**.
- PAFs are applied in two stages:
  - 1<sup>st</sup> at the regional level
  - 2<sup>nd</sup> at the global level

The second stage is followed by a linking procedure at the global level

- The estimation of **PAFs requires data sourced from the Penn World Tables**, which is not updated with the same regularity as ICP cycles.

# PAFs – Current approach (1)

## ❖ The required inputs for the calculation of PAFs are the following:

- **Non-ICP inputs** sourced from the Penn World Tables:
  - Net capital stock (subdivided in six categories)
  - Number of people employed
  - Share of labor compensation over total GDP
- **ICP inputs** sourced from the ICP participating economies and RIAs:
  - PPPs of construction, machinery and equipment
  - Expenditures of construction, machinery and equipment

# PAFs – Current approach (2)

1. Capital stock per employee, PPP adjusted =  $\frac{\text{Capital stock}_i}{\text{Employment}_i} \times \frac{1}{\text{Capital stock PPP}_i} = KS_i^w$

2. Share of labor compensation relative to regional average =  $\frac{LS_i + LS_{r.avg}}{2} = RSL_i$

3. Productivity Ratio =  $\left( \frac{KS_i^w}{KS_{avg}^w} \right)^{1-(RSL_i)} = PR_i$

4. Productivity Adjustment Factor =  $\frac{PR_i}{PR_{base}}$

# PAFs – Issues

## 1. Degree of variability between cycles

- PAFs of some countries may vary between cycles. While most countries' PAFs remain stable between cycles (variations lower than 10%) a few countries have registered variations above 30%.

## 2. Reliance on the Penn World Tables data

- The PWT are not updated with the same frequency as the ICP and we may have missing data for the current benchmark year. This requires PWT data to be extrapolated, adding an additional step to the calculation and data requirements.

## 3. Weight of Construction PPPs on PAFs

- Construction accounts for the majority of capital stock expenditure and as such has a high weight on PAF calculations.

# Alternative approaches

## 1. Fixed PAFs to clusters of economies

- Clustering of economies based on income level instead of estimating an individual PAF for each economy.
- Advantage of stabilizing PAFs between ICP cycles and reduces the dependence on detailed country level data.
- However, introduction of arbitrary selection criteria might lead to unforeseen inconsistencies in methodology.

## 2. Rounding and setting a fixed range to PAFs.

- Rounding up the PAFs to a certain degree i.e. one decimal space, and/or to limit their upper and lower levels would improve the stability.
- Latest 2021 PAFs varied from 0.5 in the most productive economy to 8 in the least productive.
- The majority of economies' PAFs are situated between 0.5 and 3, but the 30 least productive economies have PAFs between 3 and 8: true variation in productivity or matter of data quality?

# Subsidized Prices

- Some countries subsidize essential goods in whole or in part. These subsidized goods can be available to the entire population or only to those who meet certain criteria. **How does the ICP handle subsidized prices?**
- The ICP follows the **System of National Accounts (SNA)** and consistency between national accounts expenditures and prices collected for the ICP is crucial; this means the ICP requires data to be based on “**purchasers’ prices.**”
- “Purchasers’ prices” are defined as: *the amounts paid by buyers, including discounts, surcharges, rebates, and, in certain cases, invoiced service charges or voluntary gratuities.*

# Subsidized Prices – current approach

- For goods subsidized by governments, the subsidy is treated as a discount from the consumer's perspective.
- However, all discounts, surcharges, and rebates should be included in transaction prices only if they are broadly available to all consumers throughout most of the year. Selective discounts (e.g., based on age, income, membership, or special status) should not be included.
- **The prices collected for the ICP should thus represent market prices accessible to the average consumer.**

# Subsidized Prices - Issues

- In countries where essential goods are provided for free to a large portion of the population, the ICP is currently overestimating costs, since PPPs are based on market prices.
- Currently the ICP excludes discounts not available to the general consumer (e.g. discounts based on coupons or loyalty cards). However, if subsidized prices are available to a significant proportion of the population, should they be priced by the ICP? What constitutes a significant proportion of the population?
- If goods are distributed freely, household expenditures in those categories will also be lower. Therefore, the Price Level Index of any given expenditure component, will be adjustment by the market expenditure in that component.

# Simplifying Private Education linking

- EUO do not price items for Private Education BH - PPPs for other regions can not be linked through standard procedure.
- Current approach based on adjusting the linking factors for Private EDU for all other regions with a scalar obtained from the linking factors of AH "Production of Education Services (1304200)", in the following steps:
  1. Compute regional PPPs for Group "Production of Education Services – 1304200" for EUO through GEKS approach
  2. Compute unrestricted global PPPs for EDU-GOV (1304200) through GEKS approach
  3. Compute regional linking factors for EDU-GOV (1304200)
  4. Estimate private education linking factor

# Simplifying Private Education linking

- Notably, 4/5 of BHs under the AH "Production of Education Services (1304200)" are reference PPPs themselves.

|                                                         |                  |
|---------------------------------------------------------|------------------|
| 1304200 PRODUCTION OF EDUCATION SERVICES                |                  |
| 1304211 Compensation of employees - Ind. Edu. Govt (BH) |                  |
| 1304221 Intermediate consumption - Ind. Edu. Govt (BH)  | stage 1 ref PPPs |
| 1304231 Gross operating surplus - Ind. Edu. Govt (BH)   | stage 1 ref PPPs |
| 1304241 Net taxes on production - Ind. Edu. Govt (BH)   | stage 2 ref PPPs |
| 1304251 Receipt from sales - Ind. Edu. Govt (BH)        | stage 2 ref PPPs |

- COTT proposal to simplify this approach by making Private Education a reference PPP of BH "Compensation of employees - Ind. Edu. Govt (BH) with PA" (1304211)
- This BH (1304211) makes up on average 77% of AH "PRODUCTION OF EDUCATION SERVICES" total volume, thus impact on PPPs estimates would be moderate.
- Benefit of reducing significantly computational procedure, improve standardization, clarity and transparency.

# Construction wages

- Current ICP methodology assumes direct estimates of wages in construction sector (hourly rates)
- Resulting labor inputs in real terms (i.e., nominal wage bill divided by those rates) produce some unrealistic results for selected economies with impact on GDP and GFCF aggregates.

## Current approach

- Labor inputs are combined with inputs for construction materials and equipment hire to produce Construction aggregates for three Construction BHs:
  1. Residential
  2. Non-Residential
  3. Civil Engineering
- In turn, the three basic headings of construction are estimated based on the “resource mix” approach: nine sub-headings, out of which three sub-headings are labor inputs.

# Construction wages – 6 economies

Table 1. Construction sector in ICP and National Accounts, by country

|                                                                      | BGD     | CHN     | HKG     | IDN     | IND     | USA      |
|----------------------------------------------------------------------|---------|---------|---------|---------|---------|----------|
| <b>Total economy</b>                                                 |         |         |         |         |         |          |
| [1] GDP, PPP, bln. USD                                               | 1,328   | 28,874  | 489     | 3,537   | 10,983  | 23,594   |
| [2] Employment, total                                                | 65,534  | 798,808 | 3,864   | 131,171 | 497,616 | 158,141  |
| [3] labor factor share                                               | 52.2%   | 58.6%   | 51.9%   | 46.4%   | 52.2%   | 59.7%    |
| [4] Wages, economy-wide, real ([1]/[2]*[3])                          | 10,574  | 21,191  | 65,656  | 12,505  | 11,517  | 89,084   |
| <b>Construction, labor</b>                                           |         |         |         |         |         |          |
| [5] Wages, nominal, bln. LCU                                         | 2,270   | 7,970   | 156     | 896,678 | 8,361   | 844      |
| [6] PPP for labor input (from global linking)                        | 2.263   | 1.031   | 3.491   | 459.3   | 2.243   | 1        |
| [7] Wages total in construction, real, PPP ([5]/[6]), bln. USD       | 1,003   | 7,728   | 45      | 1,952   | 3,727   | 844      |
| [8] construction employment                                          | 6,104   | 52,020  | 326     | 8,041   | 48,835  | 8,018 *) |
| [9] Wages per empl. in construction ([7]/[8])                        | 164,318 | 148,557 | 136,974 | 242,788 | 76,319  | 105,274  |
| [10] Relative wages in construction vs. economy-wide wages ([9]/[4]) | 1554%   | 701%    | 209%    | 1942%   | 663%    | 118%     |
| [11] Construction wage bill to GDP ratio, in PPP ([7]/[1])           | 75.5%   | 26.8%   | 9.1%    | 55.2%   | 33.9%   | 3.6%     |
| <i>from National Accounts:</i>                                       |         |         |         |         |         |          |
| [12] Construction Value Added, share                                 | 9.8%    | 6.9%    | 4.0%    | 10.4%   | 8.1%    | 4.1%     |
| [13] Construction employment, share                                  | 9.3%    | 6.5%    | 8.4%    | 6.1%    | 9.8%    | 5.1%     |
| [14] Relative Construction productivity ([12]/[13])                  | 105%    | 106%    | 47%     | 170%    | 83%     | 81%      |

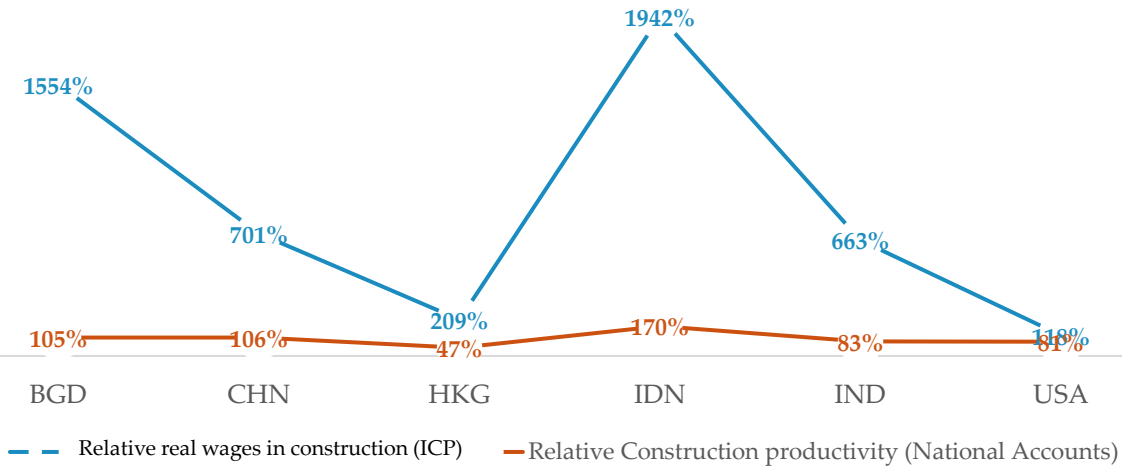
Line [7] - Total real construction wages in BGD, CHN, IDN and IND higher than USA.

Line [10] – Real construction wages between two to 19 times higher than economy wide wages .

Line [11] – Construction wage bill to GDP ratio as high as 75.5% and 55.2% in BGD and IDN

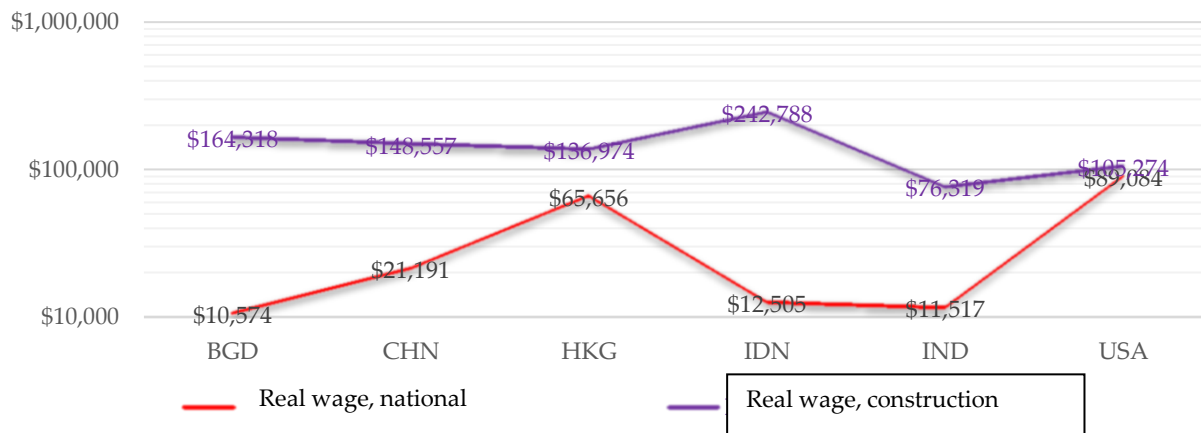
# Construction wages – 6 economies (2)

FIG. 1. RELATIVE REAL WAGES IN CONSTRUCTION (ICP), LINE [10] VS. RELATIVE CONSTRUCTION PRODUCTIVITY (NATIONAL ACCOUNTS), LINE [14]



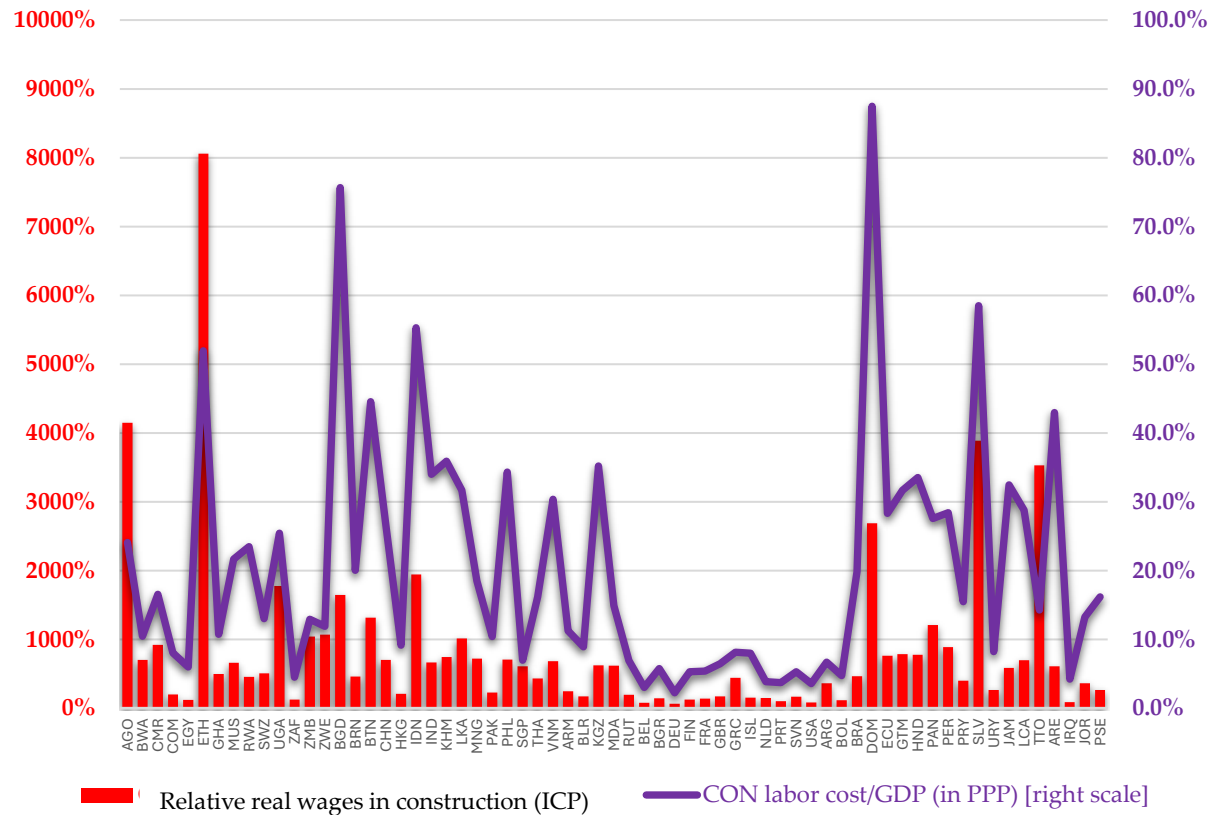
- Differences between relative wages in CON as estimated by ICP and those from National Accounts.
- Similar trends if we consider average real CON wages vs overall wages.
- The expectation is that these two lines should not deviate significantly from each other, as in the cases of HKG and USA.

Fig. 2. Real wages in construction vs. economy-wide, in PPP USD



# Construction wages – 62 economies

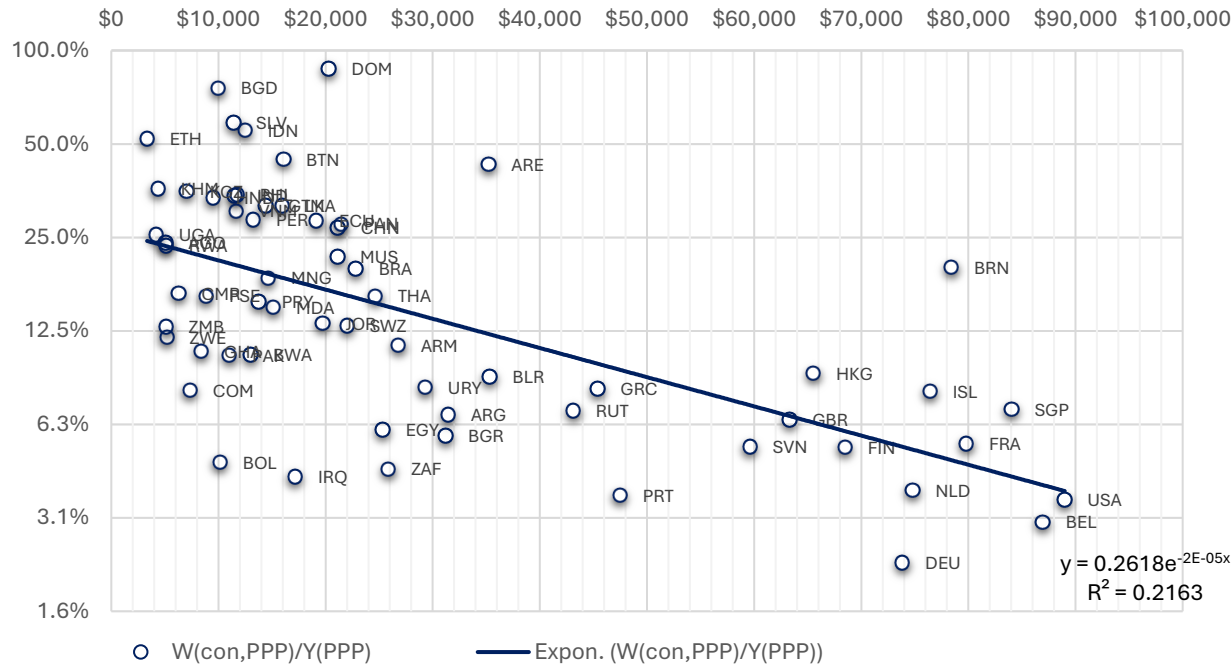
Fig. 4. Construction real wages to national average wages ratio, vs.  
Construction labor cost-to-total GDP ratio (in PPP terms)



- Heterogeneity in *Relative CON wages* and *Real CON labor cost-to-total GDP ratio* across the world
- Highest CON labor-to-GDP ratio in DOM (87.5%), and max *CON wages-to-national wages* in Ethiopia (8,058%)
- Positive relationship between those two indicators.

# Construction wages – 62 economies (2)

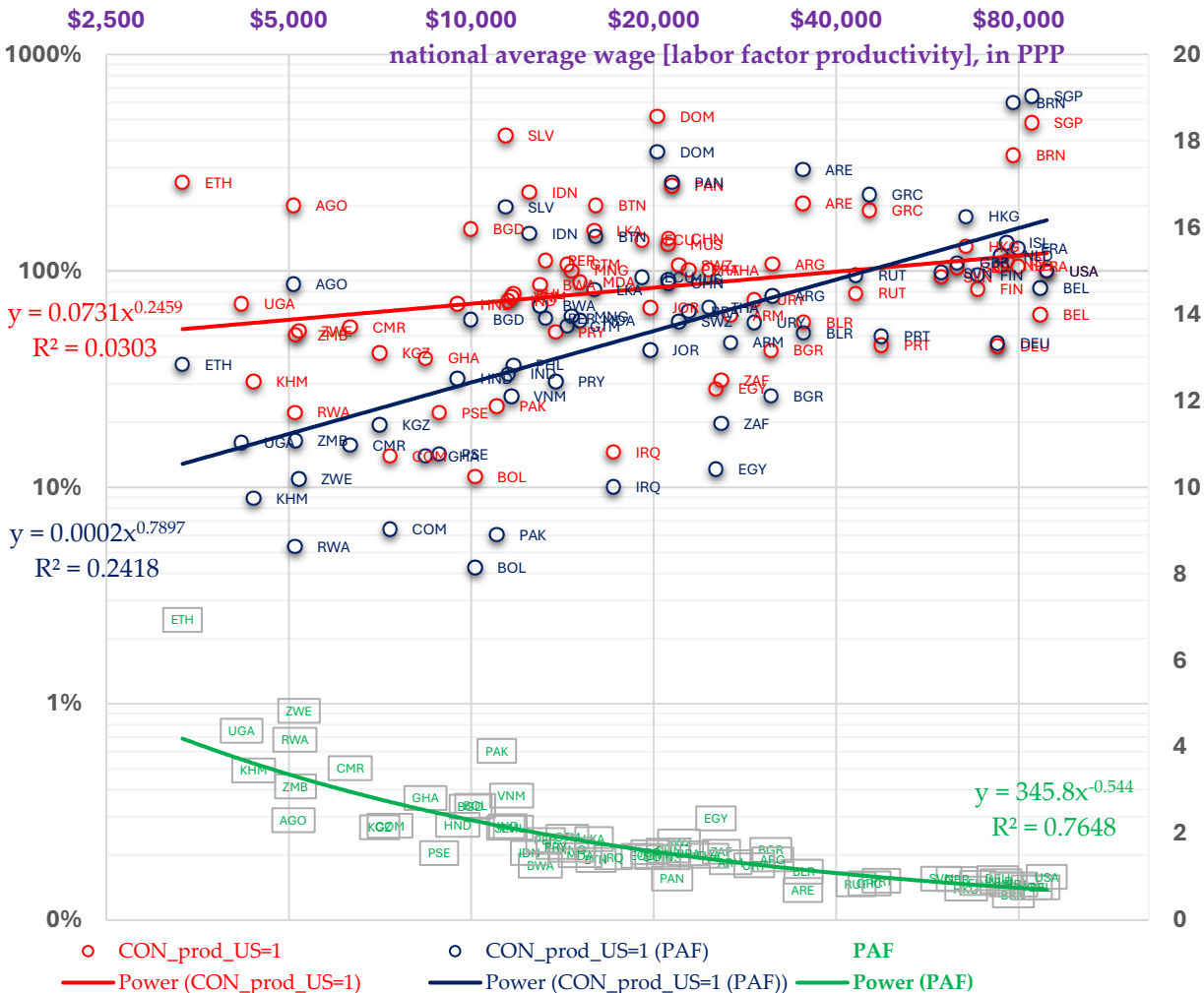
Fig. 7. CON labor cost/GDP vs.national average wage, in PPP



- Negative correlation between ratios of CON labor cost/GDP and national average wages indicates systematic overestimation of CON salaries in lower-income economies.
- At the same time, no correlation is observed between CON labor cost/GDP and employment share of Construction sector.
- This indicates that CON salaries and total construction wage bill (in LCU) are main drivers for observed anomalies.

# Construction wages – PAFs application

Fig.8. CON relative wage [US=1] and PAF (right scale) vs. national average wage [labor factor productivity], in PPP



- PAFs (Productivity Adjustment Factor) already applied to gov wages could correct systematic error.
- Application of PAFs leads to improvement in overall trend, however still drastic variations in relative construction wages (in PPP) for countries with similar levels income.
- For example, SLV and BOL have similar overall productivity (\$11,400 vs. \$10,148), yet the real CON wages differ by about 40 times, - 421% vs. 11%.

# Construction wages – Conclusions

- Current method for estimating PPPs for construction salaries has a significant impact on both GFCF and GDP, but ICP2021 show some anomalies.
- For ICP 2024 round, it's recommended to :
  1. Test the **application of productivity adjustments** to construction wages, akin to the one applied in Government Services, though *not necessarily identical*.
  - 2. Improve data validation** by including CON wages into other wage data collected by NSOs.
- Future ICP rounds should consider new methodologies and/or revisit past alternatives, such as the BOCC approach (2005 ICP methodology), the OECD/Eurostat approach, and the CIS methodology..

# Harmonization of reference PPPs

The ICP 2017 round established the same computational approach to the estimation of regional and global reference PPPs.

As the ICP 2024 cycle is underway, a review of the current reference PPPs approach would be desirable.

Furthermore, COTT highlighted some **discrepancies** in the computation of **reference** PPPs **between global** and **regional comparisons**, as listed below.

1. AFR and LAC used unweighted GM for the calculation of all ref PPPs (with more than 1 ref. BH) instead of the use the aggregated EKS PPPs (with expenditure weights).
2. BHs "1110111 Education" and "1304111 Education benefits and reimbursements" should have the same PPPs due to the concept of "Full prices" (like it is done for "Hospital services"). This is not so in the LAC Region.
3. BHs "1104111 Actual rentals for housing", "1201111 Housing - NPISH" and "1301111 Housing - GG" should have the same PPPs but this is not so in LAC Region (and ASI Region) where PPPs for BH "1104211 Imputed rentals for housing" is used as reference for BH "1201111 Housing - NPISH"

# Discussion



**Thank you!**

