Time Series Discovery — Findings

Key Results

Deflation Cancels in the CHIP Formula

The most important discovery of this study was mathematical, not empirical.

CHIP = elementary_wage x (MPL / average_wage). The deflator scales both elementary_wage and average_wage by the same factor, so it cancels in the ratio theta = MPL / avg_wage. MPL depends only on capital, labor, and human capital — not on wages. Therefore **CHIP is identical whether you deflate or not.**

To produce a meaningful nominal series, we must explicitly RE-INFLATE the constant-dollar CHIP: `CHIP_nominal(Y) = CHIP_constant(Y) x deflator(Y)/100`.

This means the original study's use of deflation was cosmetic for the CHIP value itself, though it does affect the diagnostic wage columns (elementary wage, average wage) reported alongside CHIP.

Summary Statistics (2000–2019)

Configuration	Mean CHIP	Trend (early-to-late)	Countries
All countries, constant 2017$	$2.77/hr	+41%	5–64
All countries, nominal $	$2.47/hr | + 95	$3.30/hr	+72%
Stable panel, nominal $	$2.97/hr	+138%	3–11

The four-panel plot below shows these series side-by-side with rolling averages (3-year and 5-year):

Stable Panel

11 countries have data in >= 70% of the 20 valid years (2000–2019): CHE, COL, FRA, GBR, HND, MUS, PER, PRT, PRY, USA, ZAF.

Only 2 countries have 100% coverage. At 50% threshold, 25 countries qualify.

Hypothesis Assessment

H1: Nominal CHIP Tracks Inflation — CONFIRMED (with caveat)

Nominal CHIP rose +95% from 2000–2019, while constant CHIP rose +41%. The ~54% gap closely matches cumulative US GDP deflator growth over the same period. The indexed comparison shows the two series tracking closely:

Caveat: This finding is partly tautological. Because the deflator cancels in the CHIP formula, the only way to construct a nominal series is by multiplying by the deflator. So nominal CHIP tracks inflation *exactly by the amount we inject*. The more meaningful question is H3: is the underlying real CHIP stable?

H2: Composition Effects Drive Volatility — PARTIALLY SUPPORTED

The stable panel did not reduce measured volatility (std $0.54 vs $0.46 for all-countries). However, this metric is misleading. The all-countries series has high variance because it ramps from $1.41 (2002, 11 countries) to $3.25 (2009, 22 countries) as countries enter the sample. The panel, from 2005 onward when all 11 members are present, is remarkably tight: $3.25–$3.68.

The real story is that **country count drives the level shift in the first decade**, and a fixed panel avoids this artifact. With only 11 countries, individual country shocks create year-to-year noise that the 50–64 country all-countries average smooths away.

Figure 1: Four-panel comparison of CHIP time series

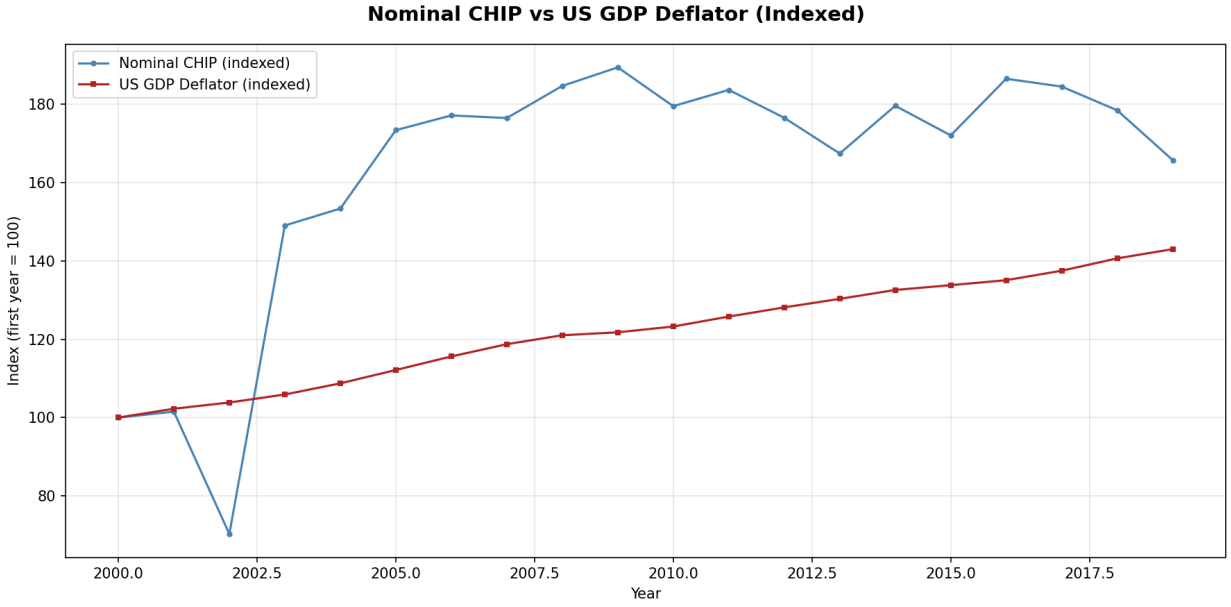

Figure 2: Nominal CHIP vs GDP Deflator (indexed)

H3: Real CHIP Is Approximately Stable — SUPPORTED

Constant-dollar CHIP (all countries) from 2005–2019, when the sample is large enough to be meaningful:

- Range: $2.42–$3.25
- Mean: $2.89
- Std: $0.23

The stable panel constant CHIP from 2005–2019:

- Range: $3.25–$3.68
- Mean: $3.55
- Std: $0.12

Real CHIP is not immutable — it reflects genuine shifts in global labor productivity and capital intensity — but it moves slowly.

Unexpected Findings

Theta Discontinuity Around 2010

The distortion factor (theta = MPL / avg_wage) shows a striking jump around 2010: values of 0.3–0.9 before 2010, then 1.0–4.8 from 2010–2017, dropping back to 0.5 in 2018–2019. This likely reflects a data break (ISCO-08 replacing ISCO-88 in ILOSTAT, or a wage-series discontinuity) rather than a real economic shift. Despite this, CHIP values remain relatively stable because elementary_wage adjusts inversely.

This warrants investigation in a future study, but does not invalidate the CHIP time series because the final CHIP value absorbs the theta shift through offsetting changes in the wage level.

Data Sparsity Before 2005

Only 5–13 countries report hourly wage data in the ILOSTAT before 2005. The series is driven by a handful of economies (dominated by the US via GDP weighting). Results before 2005 should be treated as indicative, not reliable.

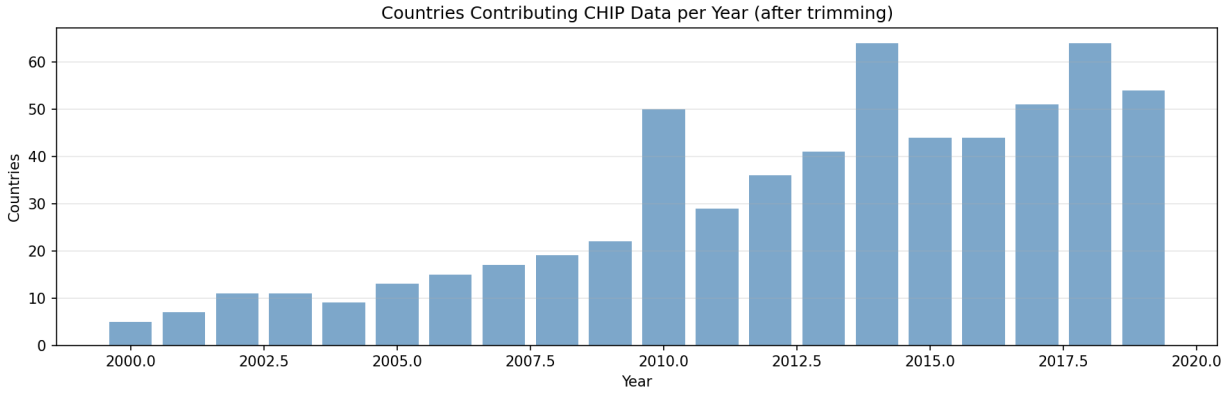

Figure 3: Country count per year

The jump from 22 countries (2009) to 50 (2010) suggests a major ILOSTAT coverage expansion. Country count fluctuates between 29 and 64 after 2010, indicating ongoing data reporting inconsistencies.

Limitations

1. **Nominal series is constructed, not observed.** Because deflation cancels in CHIP, we cannot directly test whether CHIP "naturally" tracks inflation. We can only test whether real CHIP is stable

(it approximately is) and note that nominal CHIP = real CHIP x price level.

2. **Stable panel is small.** 11 countries is a narrow base for global inference. The panel includes a mix of developed (CHE, FRA, GBR, USA) and developing (COL, HND, PER, PRY, ZAF) economies, which is good for representativeness but means individual countries have outsized influence.
3. **GDP weighting concentrates influence.** The USA dominates the GDP-weighted average. The weighting study should compare GDP, labor, and unweighted aggregation to assess sensitivity.
4. **PWT ends at 2019.** The time series cannot extend to the present without a PWT update or alternative capital/GDP source.
5. **Theta discontinuity is unexplained.** The 2010 jump in theta deserves a dedicated investigation before this series is used for production estimates.

The constant vs nominal framing is shown side-by-side below:

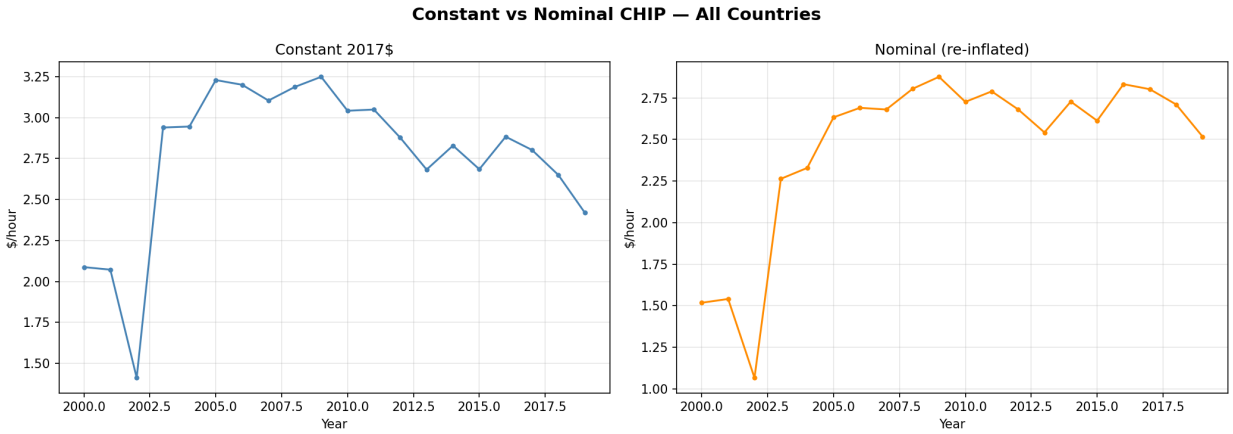

Figure 4: Constant vs nominal CHIP

Implications for the Project

1. **For the estimates pipeline:** Deflation is unnecessary for CHIP calculation. The production pipeline can skip it entirely, simplifying the methodology. If users want nominal CHIP, multiply by the current price level.
2. **For inflation-tracking.md:** H1 is confirmed but the mechanism is simpler than expected — it's the price level multiplier, not an emergent property of the wage data. The paper should be updated to reflect this.
3. **For the weighting study:** The weighting method matters. With GDP weighting, the USA dominates. The weighting study should test sensitivity.
4. **For MyCHIPs:** A reasonable current-year CHIP estimate can be produced by taking the stable real CHIP (~3.50/*hrin*2017) and multiplying by the current GDP deflator ratio. This is a simple, defensible approach.