
GDP
Gross Domestic Product
100
100
100

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How large is cross-country income inequality?

The case for international price comparisons

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Large, obviously

49th St & 7th Ave,
New York City, USA

Dharavi, Mumbai, India

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Towards greater precision: GDP/capita

- Exchange rate conversion
  - India ($1600) vs. United States ($54300) ⇒ 1:34
  - Global p90/p10: 62
  - Global Gini (population-weighted): 0.62

Source: Penn World Table, version 9.0; Feenstra, Inklaar & Timmer (*AER*, 2015); data for 2014

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However, prices differ…

	India	United States
Whole wheat bread	$0.52	$0.90
Men's haircut	$0.87	$28.00

NB: This limits the use of a Big Mac index

Source: International Comparison Program 2011: Data for Researchers (World Bank, 2014)

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…as do budget shares

Price	India	United States
Whole wheat bread	$0.52	$0.90
Men’s haircut	$0.87	$28.00
Budget share	**India**	**United States**
Food	29%	6%
Personal care	4%	2%

Source: International Comparison Program 2011: Data for Researchers (World Bank, 2014)

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Price index comparison

- Fisher index: geometric mean of
  - What would Indians spend with Indian prices and US spending patterns (Laspeyres)?
  - What would Americans spend with US prices but Indian spending patterns (Paasche)?

$$P^F = \left(\left[\frac{\mathbf{p}'_{IND}\mathbf{q}_{USA}}{\mathbf{p}'_{USA}\mathbf{q}_{USA}} \right] \times \left[\frac{\mathbf{p}'_{IND}\mathbf{q}_{IND}}{\mathbf{p}'_{USA}\mathbf{q}_{IND}} \right] \right)^{0.5}$$

NB: adaptation needed for number of countries $N > 2$

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Price index comparison

- Fisher index: the best (accepted) there is
  - Though see e.g. Neary (2004)

- Yet inherently imperfect, especially when comparing very ‘different’ countries (Deaton and Heston, 2010)

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Practical pricing problems

Comparability vs. representativity

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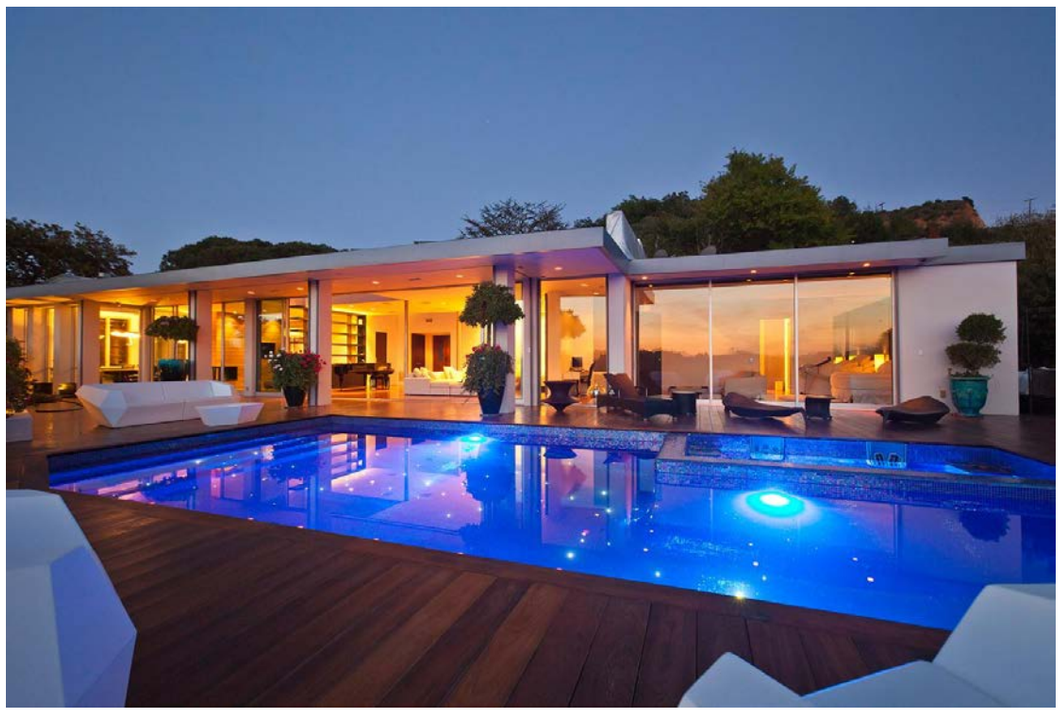
Practical pricing problems

Housing vs. Housing



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Institutional setting

- Inflation measurement is in the national domain
- International price comparisons have a less convenient ‘home’
  - Permanent program at Eurostat and OECD
- International Comparison Program (ICP)
  - Academic initiative in the 1960s (Kravis, Heston, Summers), global scope
  - Permanent status from UNSC: March 2016

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Source: Penn World Table, version 9.0; Feenstra, Inklaar & Timmer (*AER*, 2015); data for 2014

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The importance of purchasing power parities

- Relative price level in India (PPP/XR): 28% of the US
- PPP-converted GDP/capita:
  - India ($5700) vs. United States ($54300) ⇒ 1:10
  - Global p90/p10: 13
  - Global Gini (population-weighted): 0.46

Source: Penn World Table, version 9.0; Feenstra, Inklaar & Timmer (*AER*, 2015); data for 2014

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Cross-country income inequality

From a single year to a trend

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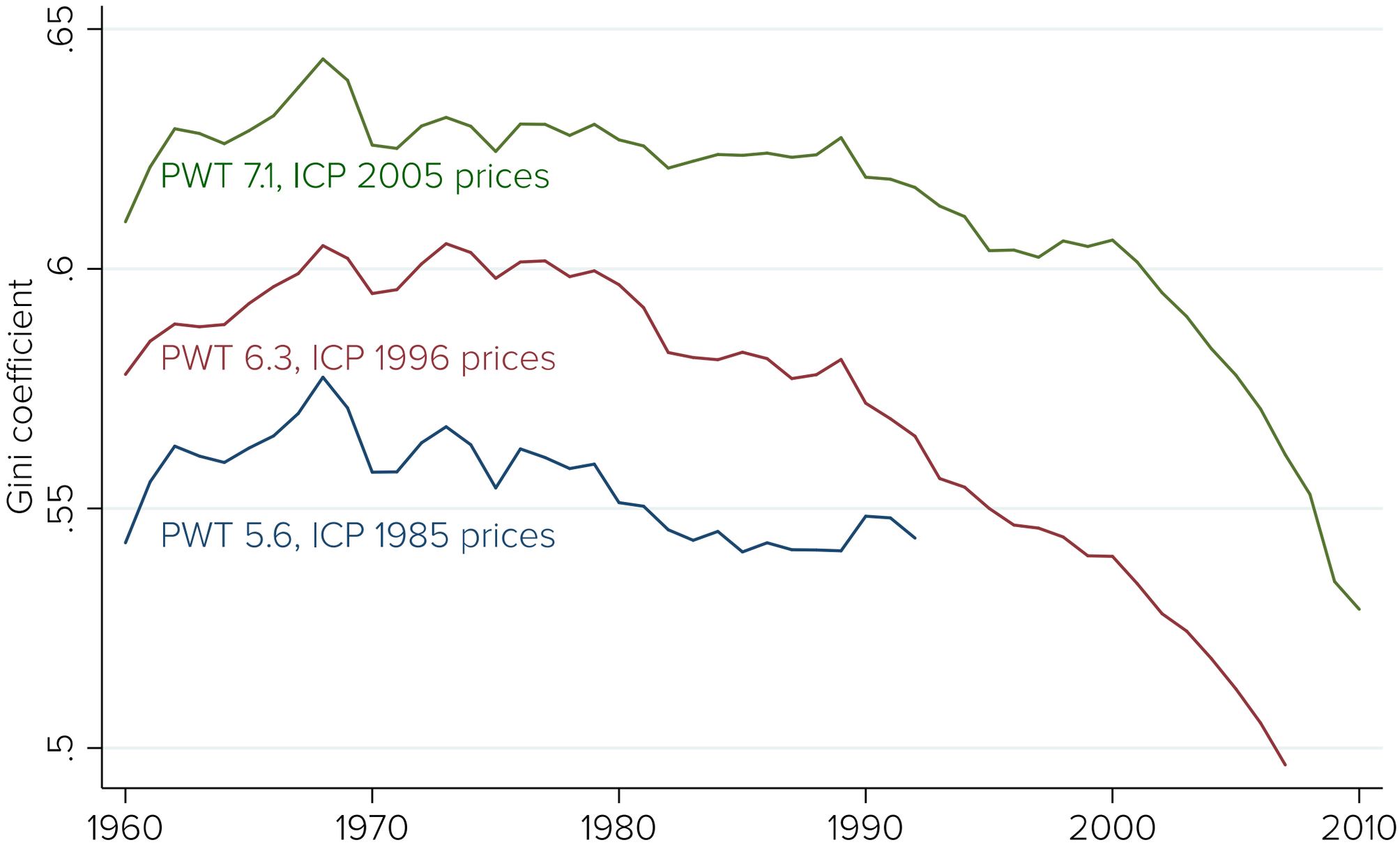
Conflicting trends

Between-country income inequality – earlier evidence



Source: computations based on PWT 5.6, 6.3 and 7.1; Aten, Heston and Summers.
Note: figure shows population-weighted Gini coefficient for GDP per capita in each year

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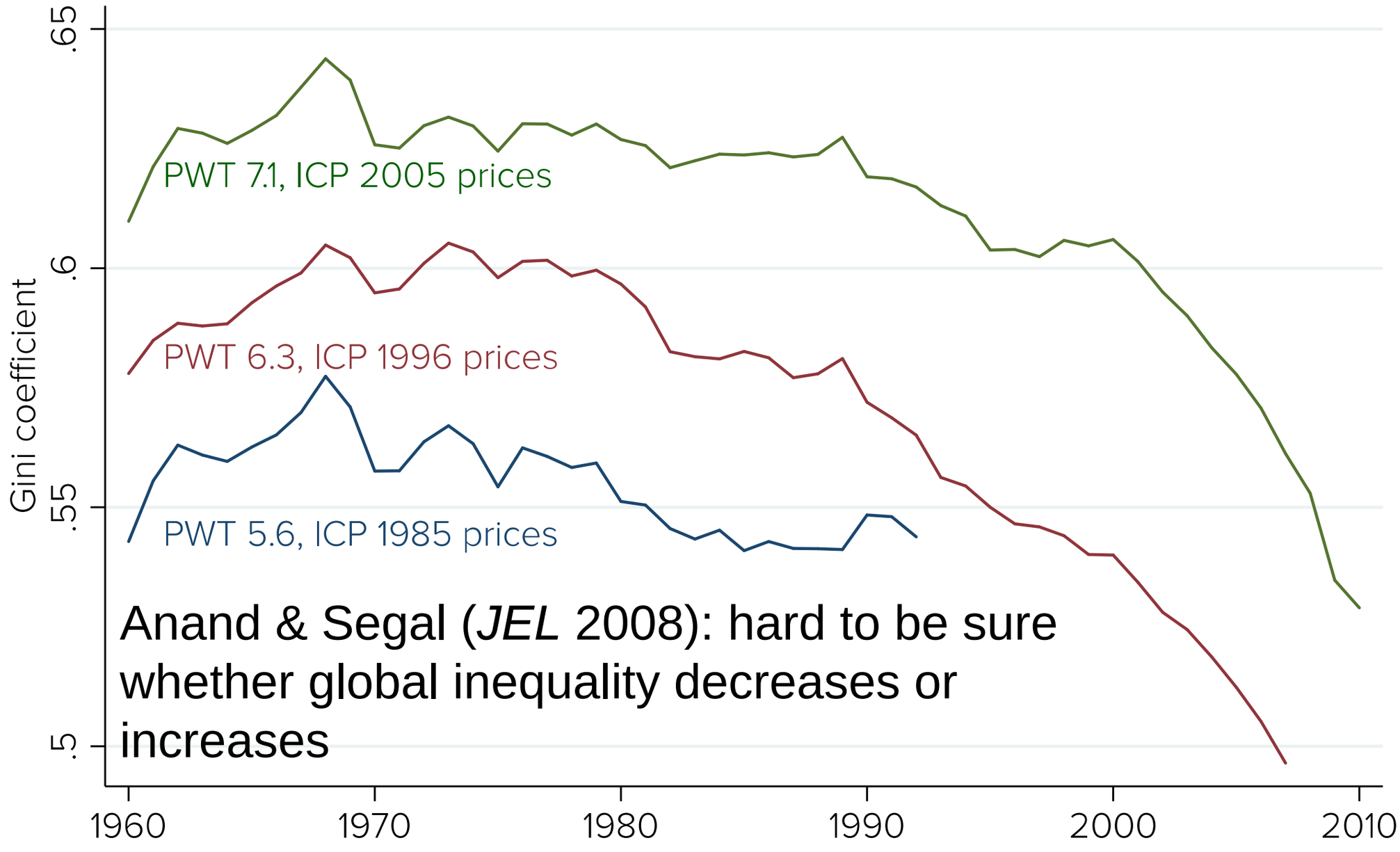
Conflicting trends

Between-country income inequality – earlier evidence



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Traditional approach

- Assumption: PPPs change with relative inflation

$$\Delta PPP_{ijt} = \frac{P_{it}/P_{it-1}}{P_{jt}/P_{jt-1}}$$

- ‘Constant PPP assumption’, followed by:
  - Penn World Table (until version 7.x),
  - Maddison Project Database
  - World Development Indicators

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Why not?

- Conceptual reasons, e.g.:
  - National inflation depends on national budget shares, PPPs depend on budget shares of multiple countries

- Practical reasons, e.g.:
  - Price measurement methods differ between CPI and ICP (trade balance)
  - Product samples differ (partly by design)

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Next Generation approach

- Use multiple PPP benchmarks
  - Introduced with PWT version 8.0
- Separate series for cross-country levels and growth rates over time
  - National inflation best-suited for national growth measurement

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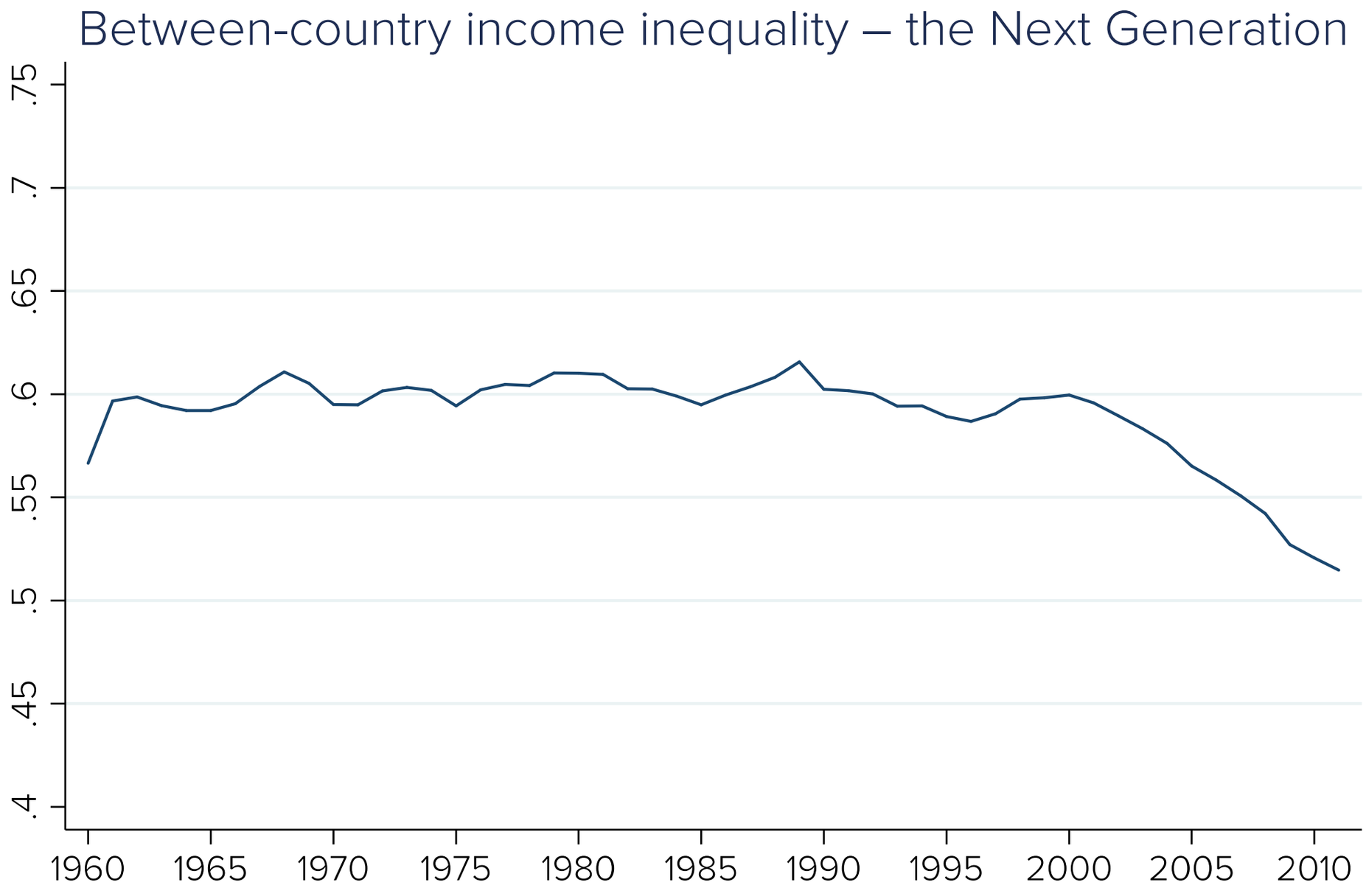
The new pattern, …



Source: computations based on PWT 8.0 , Feenstra, Inklaar and Timmer (*AER*, 2015)
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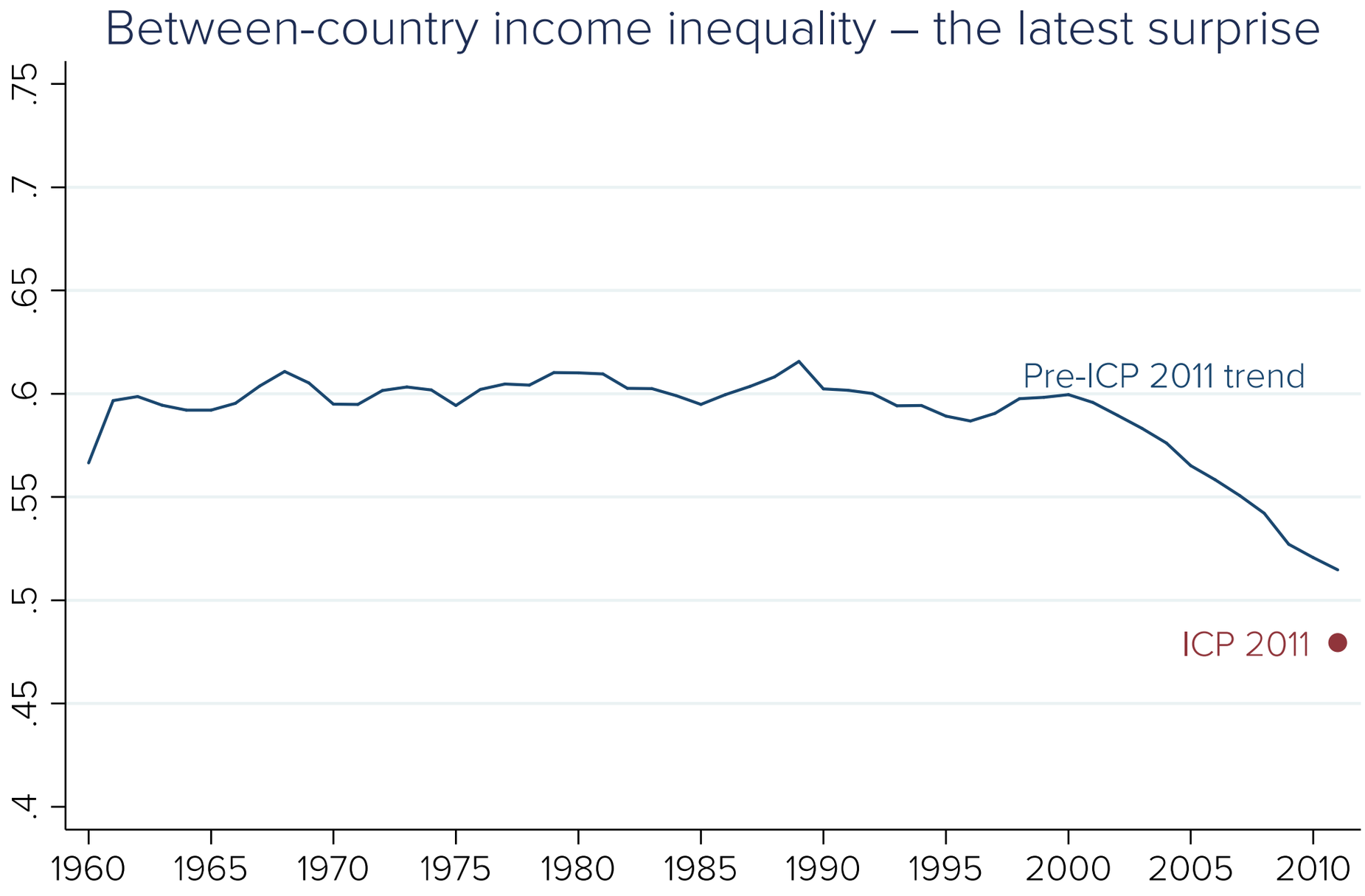
… and the next surprise



Source: computations based on PWT 8.0 and PWT 9.0, Feenstra, Inklaar and Timmer (*AER*, 2015)
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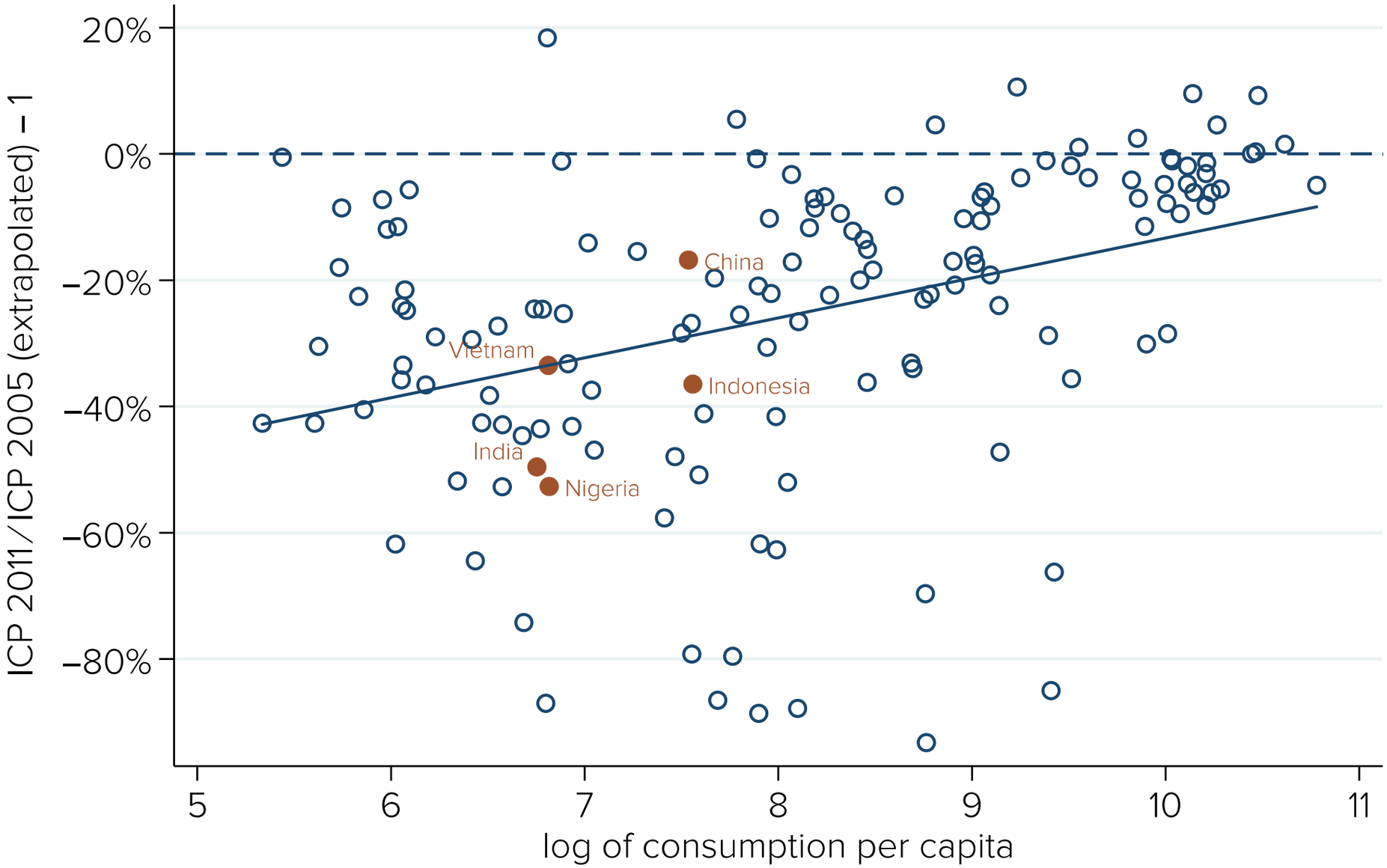
Major systematic differences

Differences in household consumption PPPs

ICP 2011 vs. extrapolated ICP 2005



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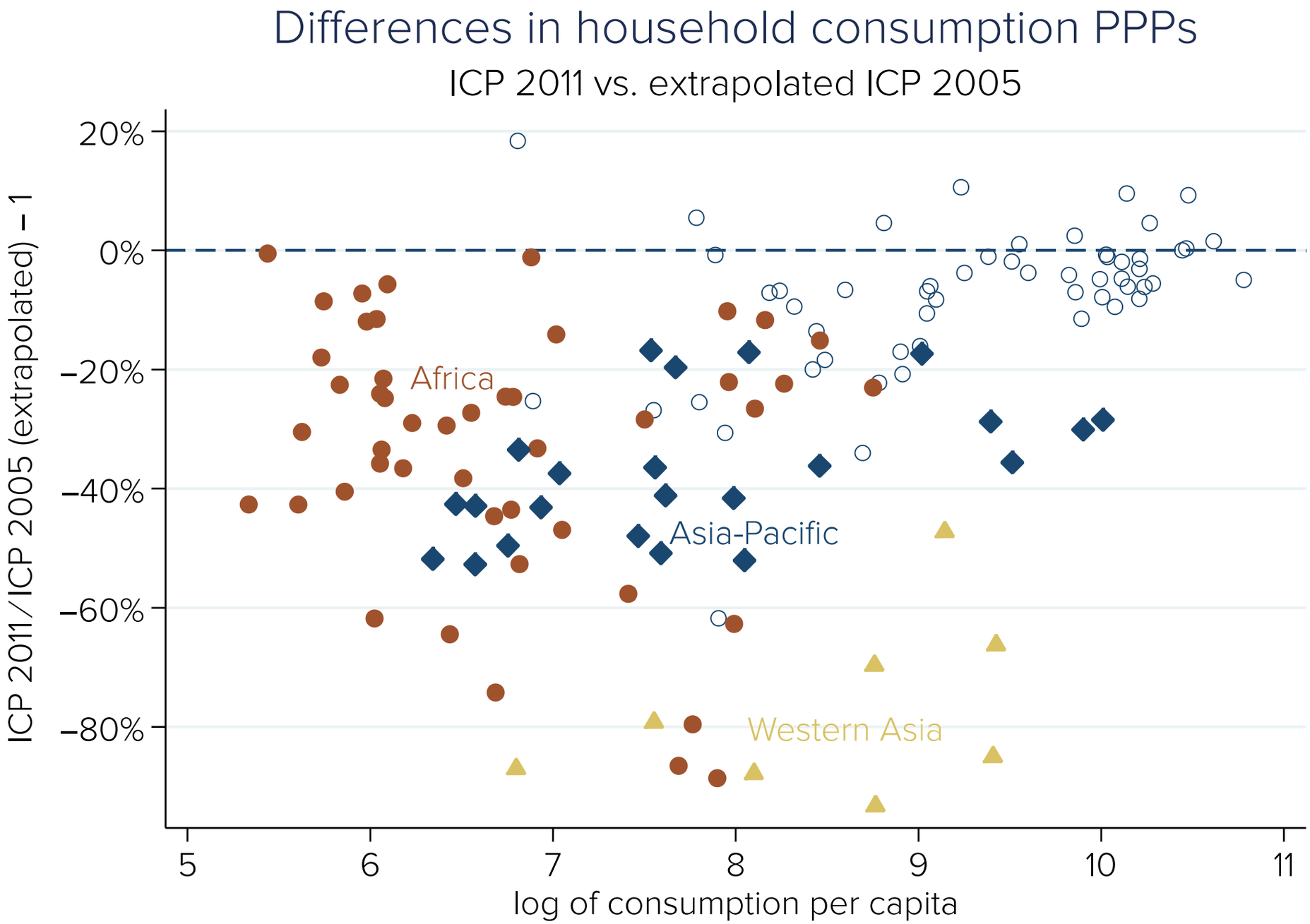
Major regional differences



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Forensic statistics

- World Bank (2014): major methodological changes from ICP 2005 and ICP 2011
  - Especially in linking of regions, ICP's answer to the comparability vs. representativity discussion

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ICP’s regional organization

- Administrative partition of the world
  - Regional bodies coordinate national agencies’ price collection activities
  - Eurostat and OECD have well-established activities
  - CIS Stat, African and Asian Development Banks, ECLAC and ESCWA have more recent activities

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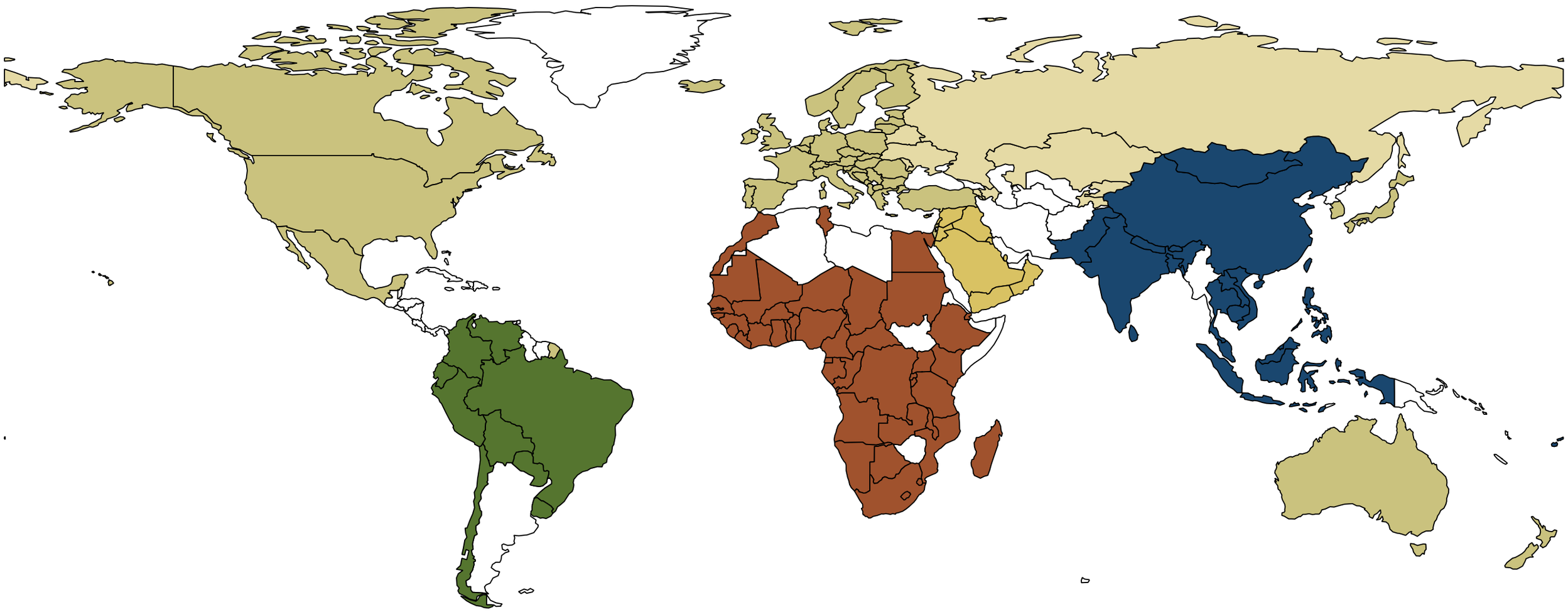
ICP 2005 regions



Notes: Argentina, Lebanon and Syria participated in ICP 2005, but not in ICP 2011 and are therefore omitted. Zimbabwe's 2005 PPP was severely influenced by the concurrent period of hyperinflation, so is also omitted.

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ICP's regional organization

- Economic rationale: consumption patterns differ around the world, so first compare like with like
  - Between-region comparison based on separate product list; *ICP 2005: ring product list*
- Political imperative: within-region comparisons should not be 'contaminated' by between-region comparisons
  - E.g. China-India PPP not affected by China-US and India-US price comparison; especially crucial within EU

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Forensic statistics

- World Bank (2014): major methodological changes from ICP 2005 and ICP 2011
  - Especially in linking of regions, ICP's answer to the comparability vs. representativity discussion
- Deaton (*AER*, 2010) and Deaton and Aten (*AEJ: Macro*, 2017): Regional linking in ICP 2005 was suspect
- Inklaar and Rao (*AEJ: Macro*, 2017): test and adjust

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Ring product selection bias

- Deaton (2010): ring country product list was a rich country product list
  - Bordeaux *supérieur*, with state certification of origin and quality, vintage 2003–2004
  - Peugeot 407 Berline with 2.0 liter 16v, ABS & automatic climate control
- Representative in Cameroon? Or Sri Lanka?
  - If not: likely upward bias in prices

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Ring product selection bias

- Exploit that:
  1. Each ring country was in the regional and in the ring comparison
  2. The lower-income regions also included a higher-income ring country

- ‘Rich country’ product selection? → Ring prices will be higher than regional prices in low-income ring countries, relative to the highest-income ring country
  - Difference-in-difference setup

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Ring product selection bias

Africa (South Africa)		*Asia-Pacific (Hong-Kong)*		*Eurostat-OECD (UK)*	
Cameroon	0.189***	Sri Lanka	0.198***	Estonia	0.036
	(0.038)		(0.054)		(0.023)
Egypt	–0.038	Malaysia	0.080**	Japan	0.037
	(0.047)		(0.036)		(0.030)
Kenya	0.044	Philippines	0.113**	Slovenia	0.050**
	(0.047)		(0.047)		(0.023)
Senegal	0.086*				
	(0.046)	*Latin America (Chile)*		*Western Asia (Oman)*	
Zambia	–0.054	Brazil	0.069**	Jordan	0.047
	(0.052)		(0.032)		(0.050)

Confirmed in Africa and (particularly) in Asia

Problem in ICP 2005, not in ICP 2011

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Major systematic differences

Differences in household consumption PPPs

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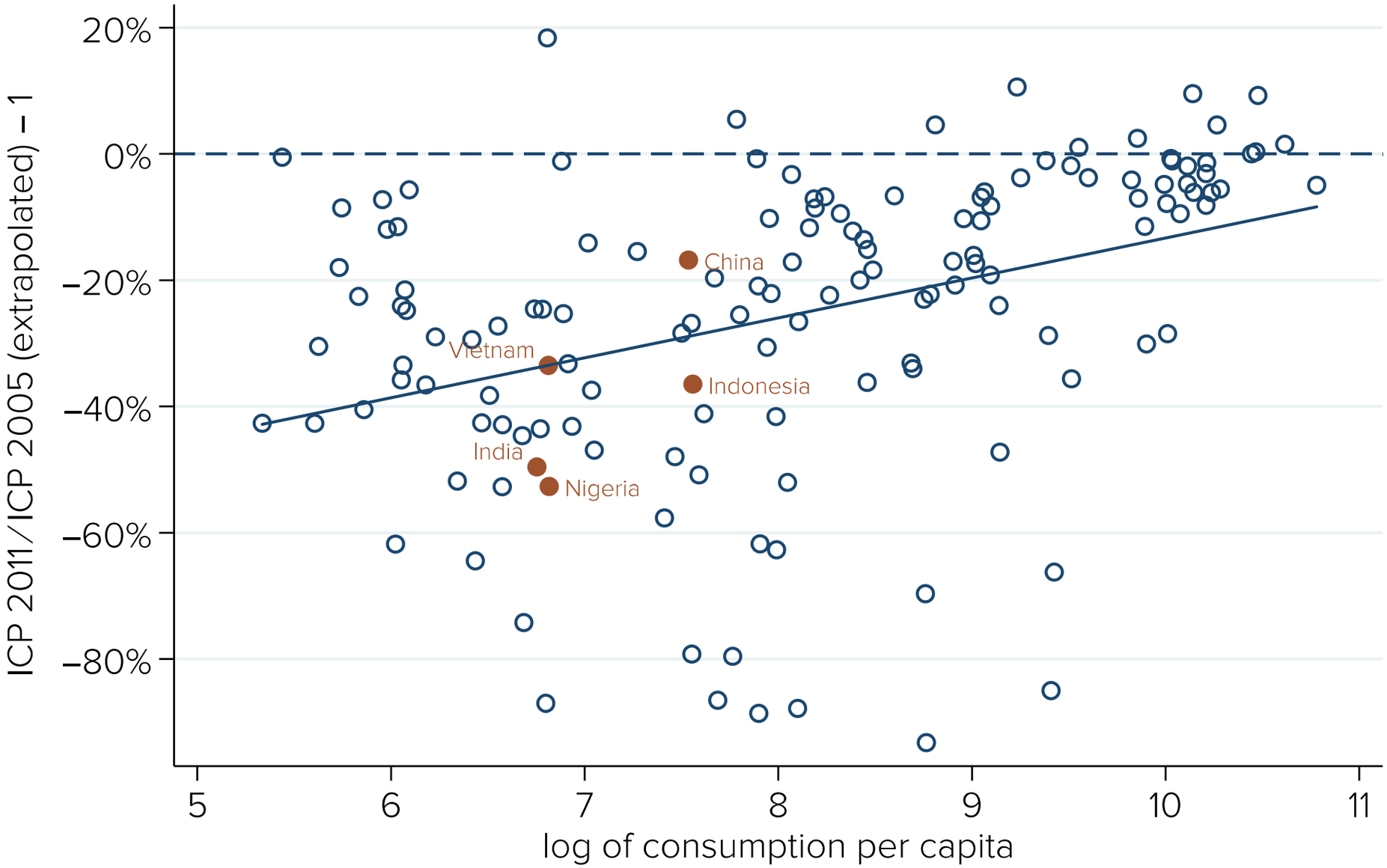

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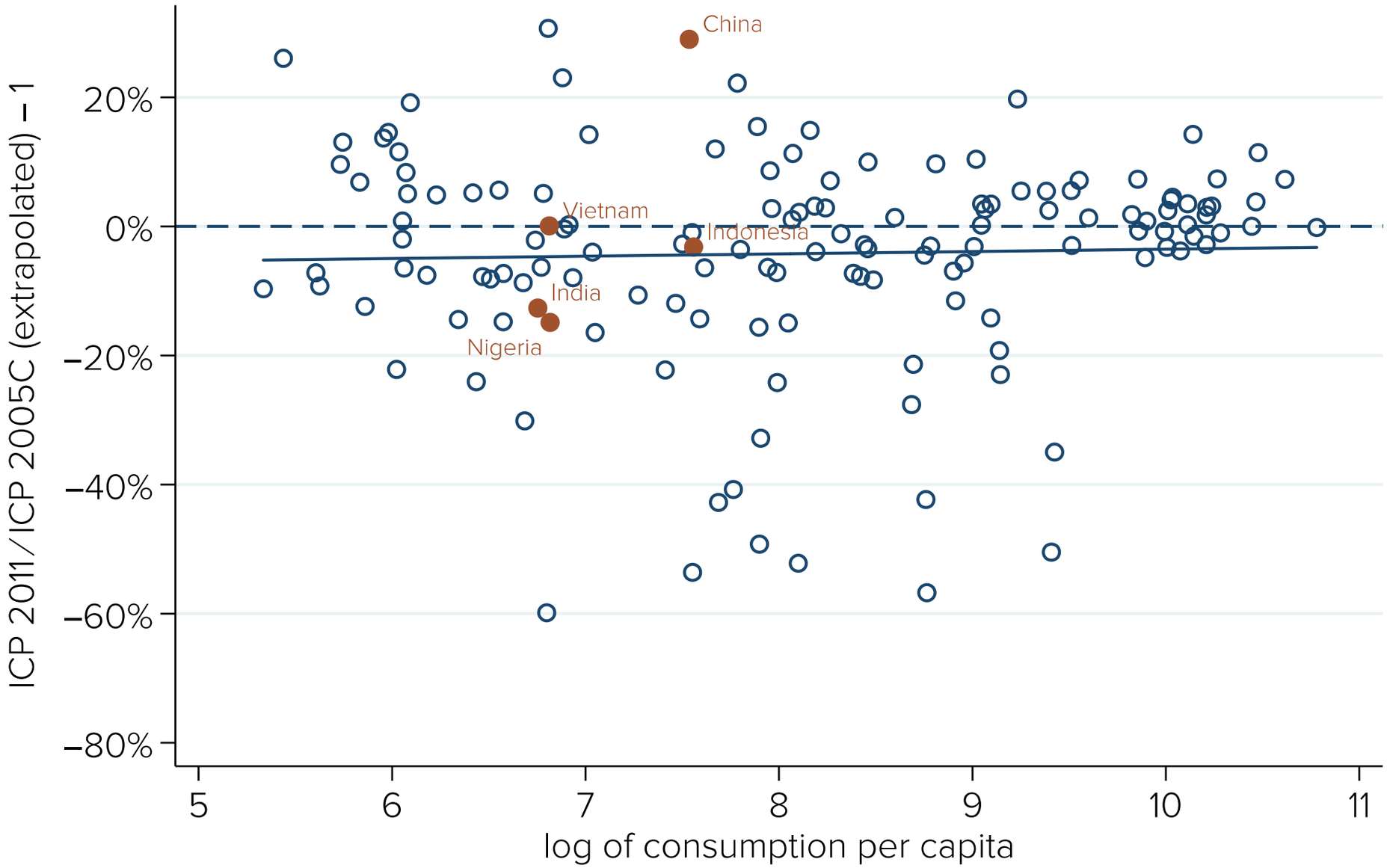
Disappear after bias correction

Differences in household consumption PPPs

ICP 2011 vs. extrapolated **counterfactual** ICP 2005



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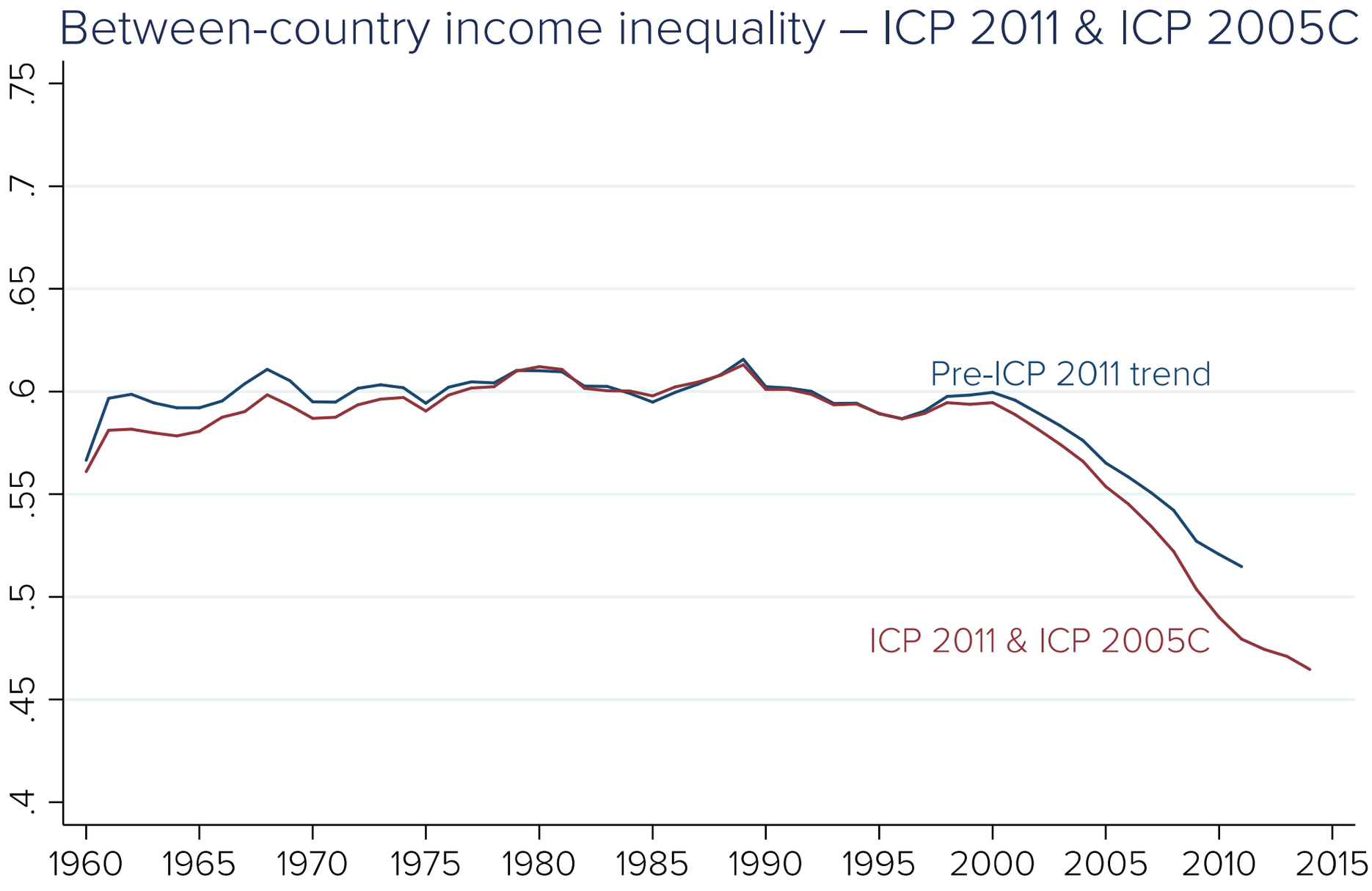
And a new trend is established



Source: computations based on PWT 8.0 and PWT 9.0, Feenstra, Inklaar and Timmer (*AER*, 2015)
Note: figure shows population-weighted Gini coefficient for GDP per capita in each year

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Cross-country income inequality over the very long run

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The era of modern economic growth

- Maddison Project Database
  - Continues the work of Angus Maddison
  - Incorporates historical work on growth in GDP/capita
  - Still relies on Maddison's 1990 PPP comparison

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Challenges to Maddison

- Prados de la Escosura (2000): PPPs vary systematically with the degree of openness
- Ward and Devereux (2016), Lindert/Williamson (2016), Lindert (2016): contemporaneous, historical price comparisons differ from extrapolated PPPs
  - Time series of (historical) National Accounts are not precise, e.g. World Wars

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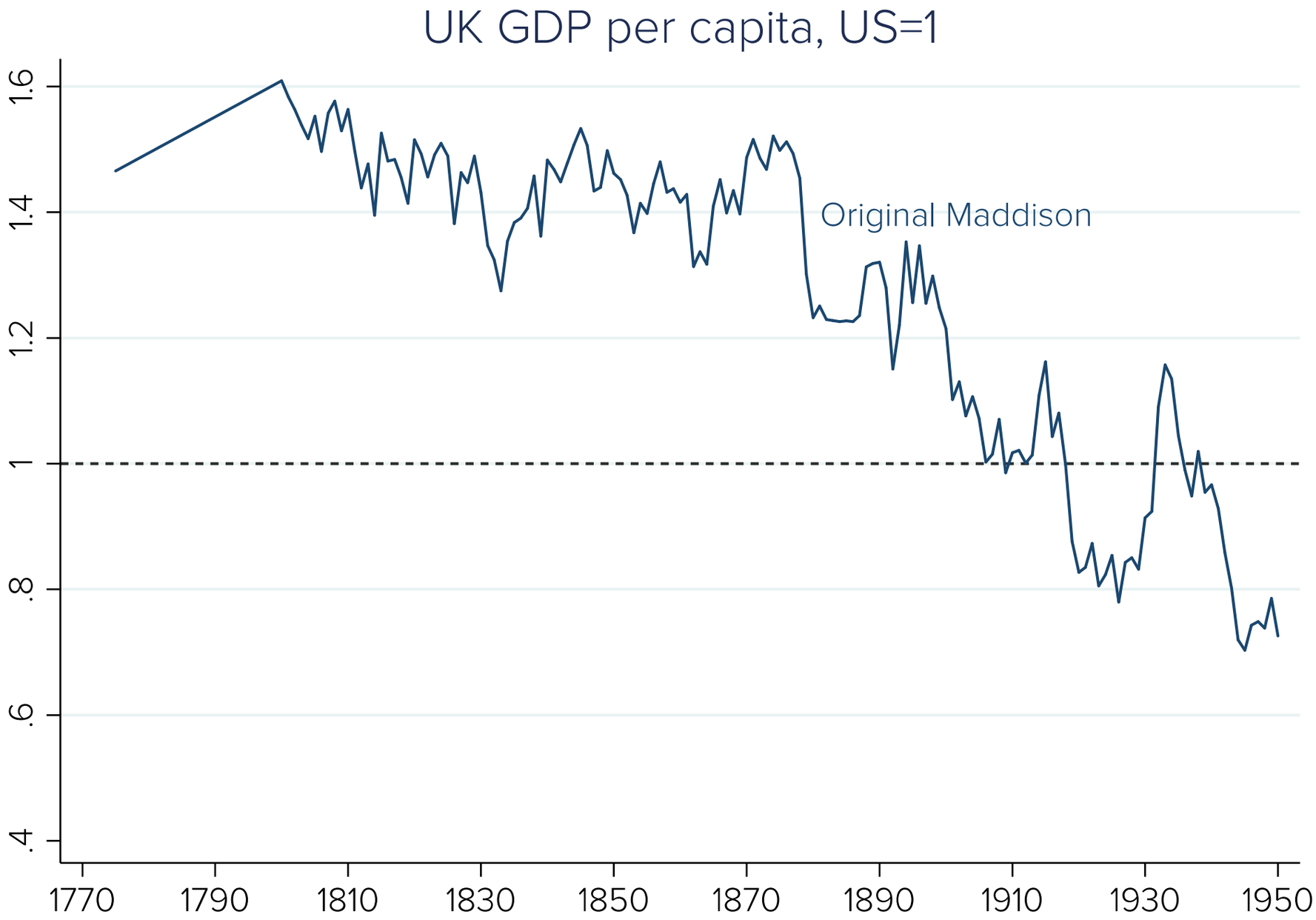
Case: economic leadership of UK or US?



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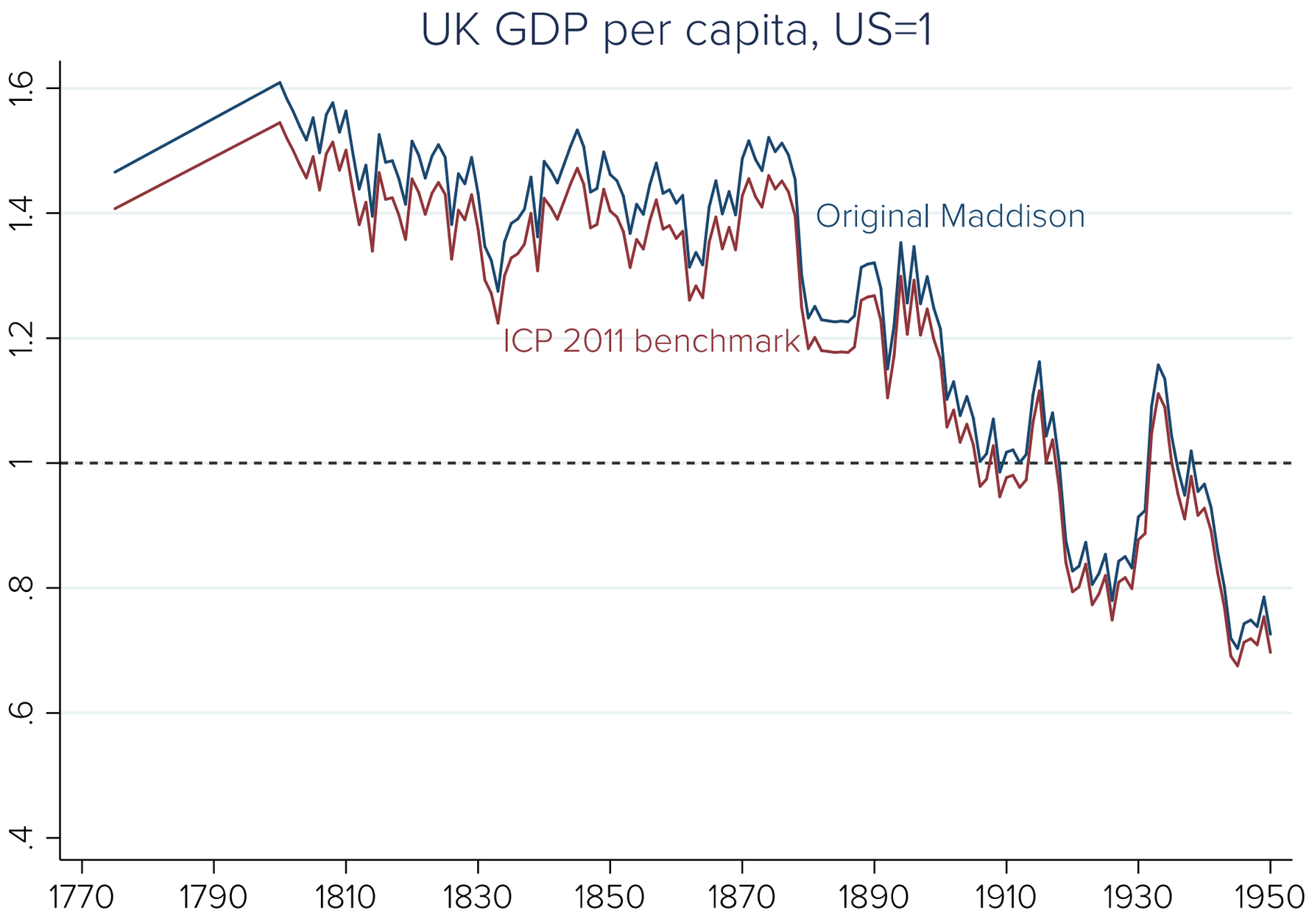

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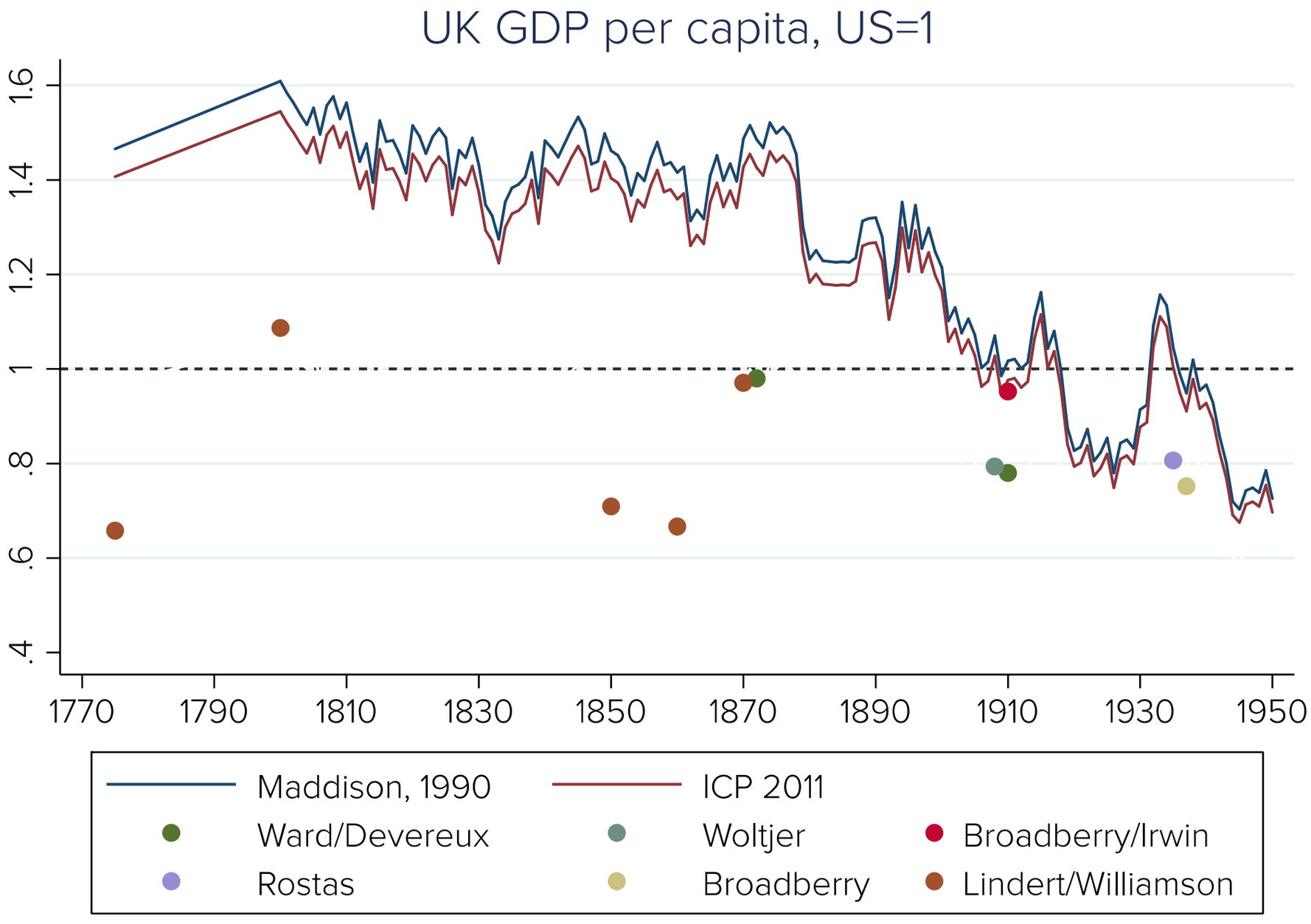
Constant-PPP vs. historical price comparisons



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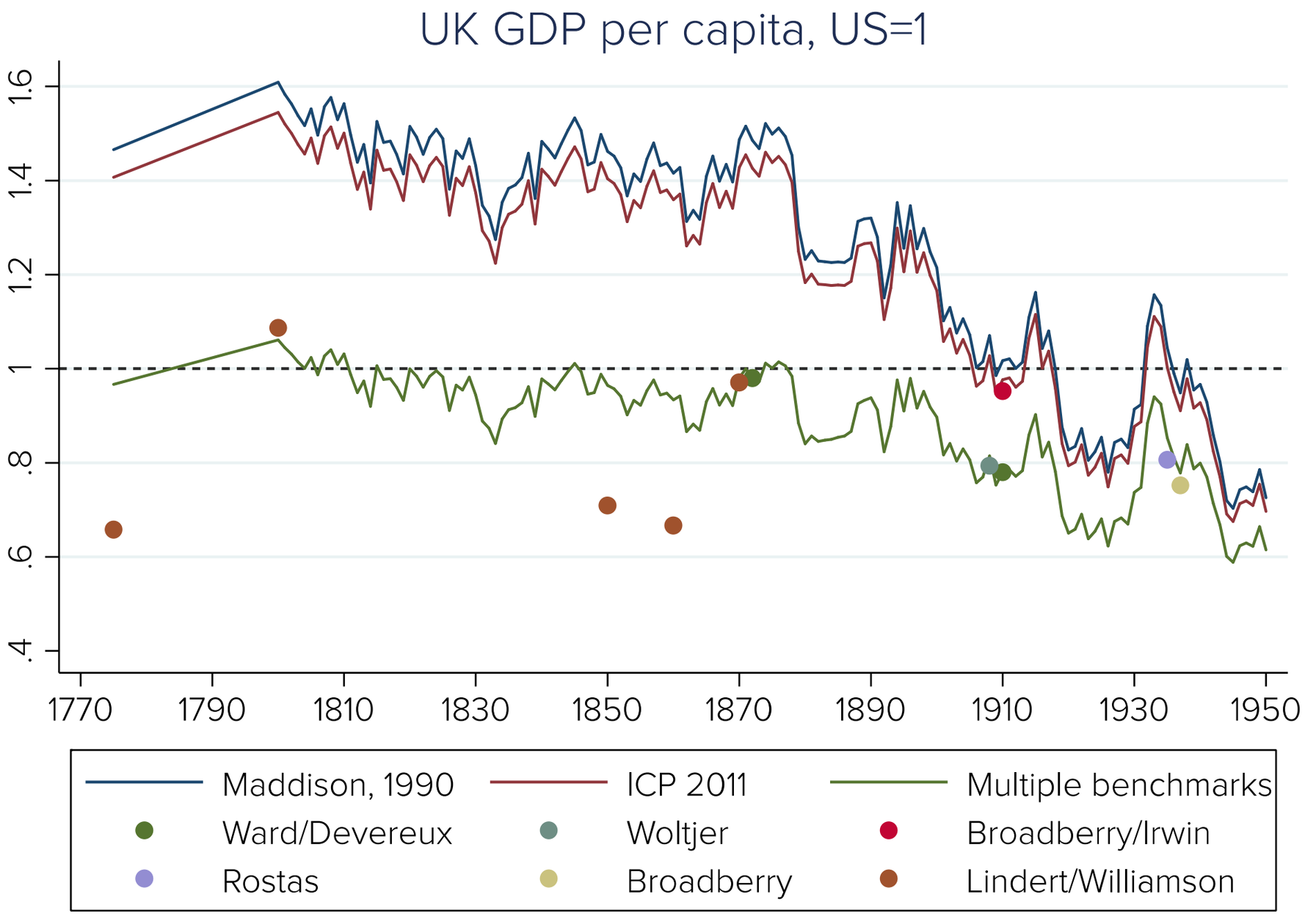
Next Generation approach



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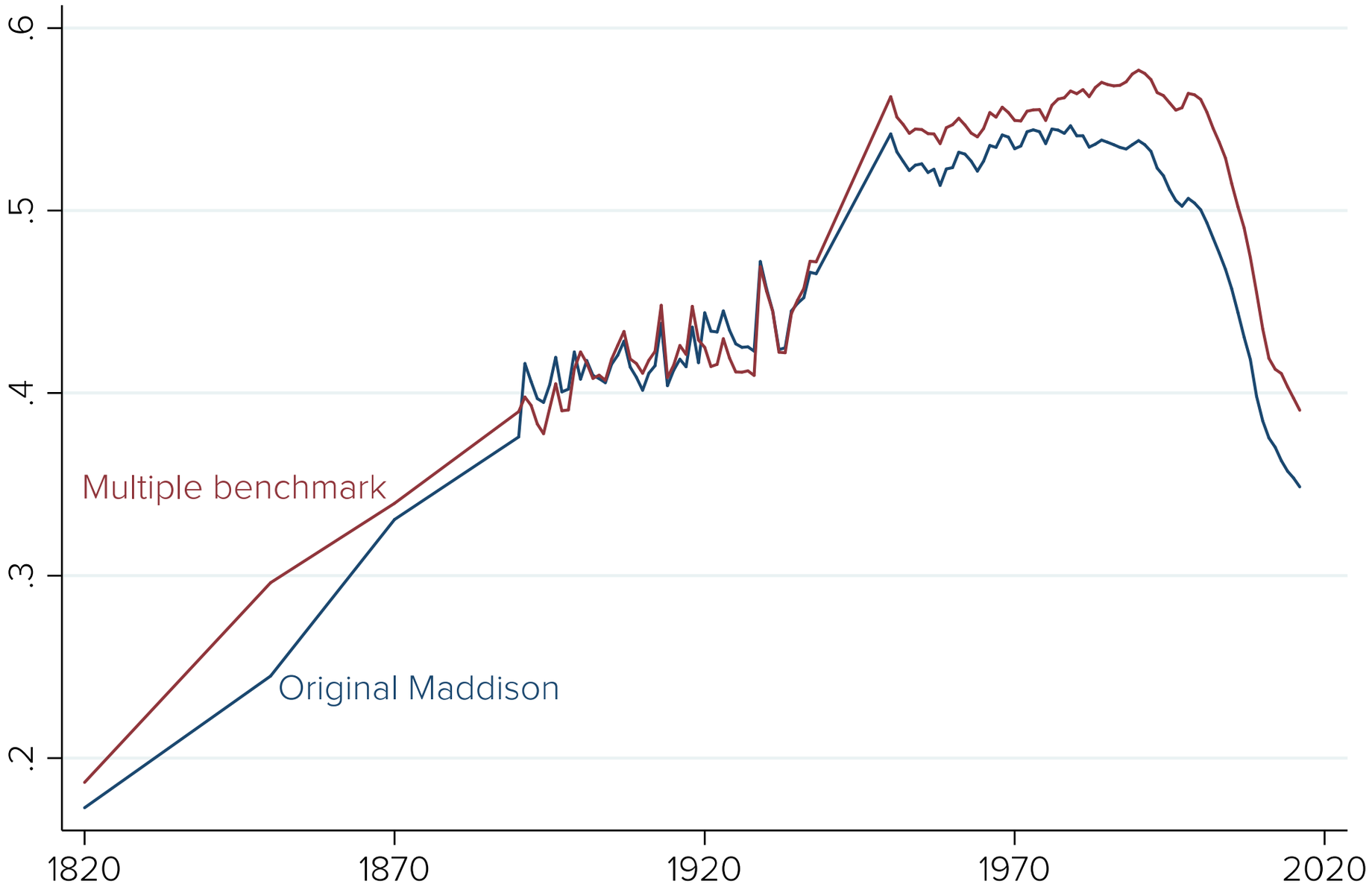
Inequality implications



Note: Country coverage varies between 27 and 40 countries, covering most of the world population
Source: Bolt, Inklaar, van Zanden and de Jong (2016), in progress

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Broader considerations

- Price comparisons are sparse
  - 2/3 of observations (PWT or Maddison) relies on constant-PPP assumption
  - Pre-1950 shift based on 39 price comparison observations
- Precision of price comparisons is limited
  - For conceptual and practical reasons
  - But with severe consequences

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Moving backwards & forwards

1. Next Generation approach cries out for more historical price comparisons

   – Especially in Latin America

2. With more frequent contemporaneous price comparisons, how to understand differences over time

   – Classical measurement error vs. systematic biases

Thank you!