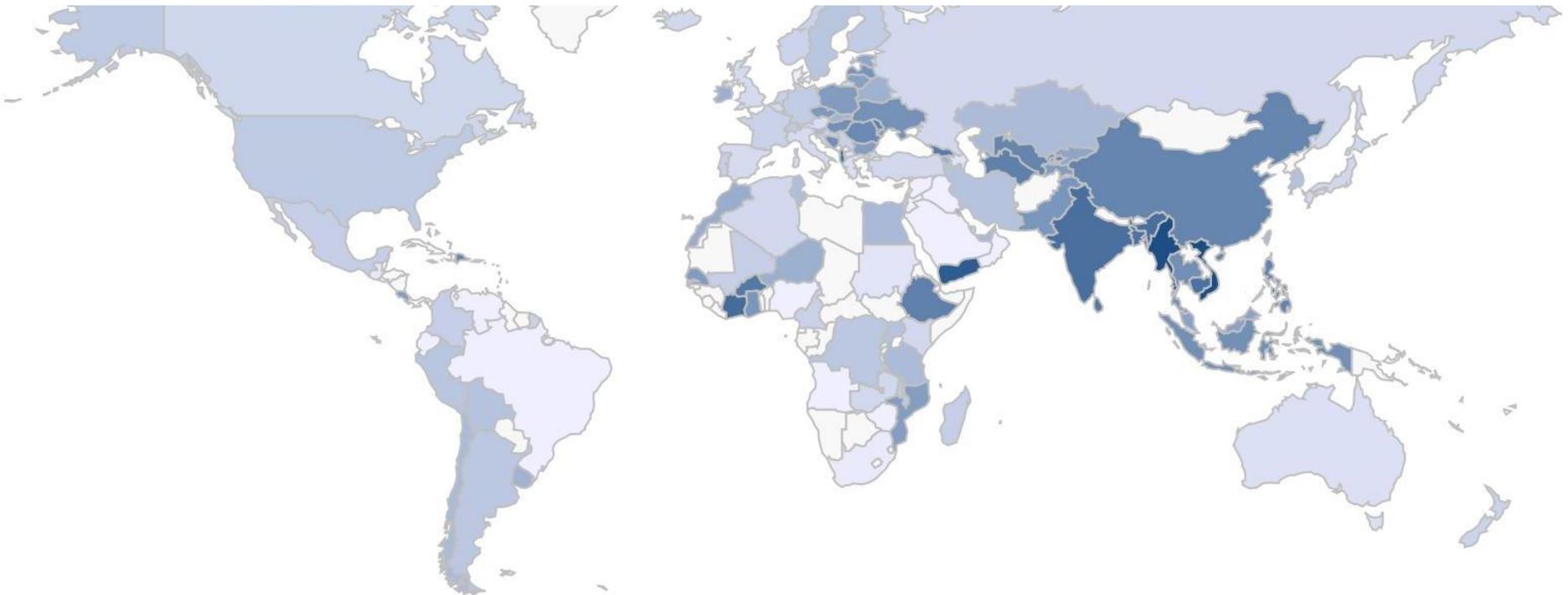




Productivity and Income Growth: Applications of the Total Economy Database

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Total Economy Database

- Originally developed in the early 90s at Groningen Growth and Development Center as an extension of Maddison historical database
- Uniqueness of Maddison database:
 - ✓ Correcting for issues with official data
 - ✓ Bringing together long timeseries of GDP data from many studies
 - ✓ Greatly improved economists' understanding of long-run economic development
- Transferred to The Conference Board in 2007 which has maintained the annual updates ever since
- GDP, labor productivity and growth accounting for 123 countries, covering the period 1950-2018
- What TED adds:
 - ✓ Annual labor productivity and growth accounting data
 - ✓ Continue Maddison's approach of correcting official data using appropriate assumptions



Total Economy Database: sources and methods

- GDP: Historical series mostly from Maddison, data for recent years from official sources
- Employment: Official sources, supplemented by estimates from others
- Labor quality:
 - ✓ Whenever available: Official data on employment and wages by education
 - ✓ Otherwise: Educational attainment of the population, wages are estimated using regression on returns to schooling
- Investment (to calculate capital services):
 - ✓ Whenever available: Official GFCF data by ICT (hardware, software and communication) and non-ICT (buildings, machinery and transportation) assets
 - ✓ Otherwise: Alternative sources (such as KLEMS) and estimation using Commodity Flow approach in collaboration with Penn World Tables team



Total Economy Database: data issues

- Reliability of official GDP estimates (e.g. China)
 - ✓ Country specific adjustments when appropriate
- Taking account of the impact of rapid declines in ICT prices
 - ✓ Provide an adjusted GDP series using alternative ICT deflators (see next slide)
- Calendar year vs. financial year
 - ✓ Adjust official GDP data calendar year using quarterly data (Australia, New Zealand, India, etc.) or averages of annual data (Pakistan, Ethiopia, etc.)
- Outstanding issues
 - Measurement of labor income share in GDP
 - Hours worked
 - Estimates of employment for emerging markets
 - General issues with GDP (for example measurement of services sector)



GDP adjustment using alternative prices of ICT goods

- The issue: Official prices are not capturing the rapid price decline of ICT goods adequately, causing an underestimation of real GDP

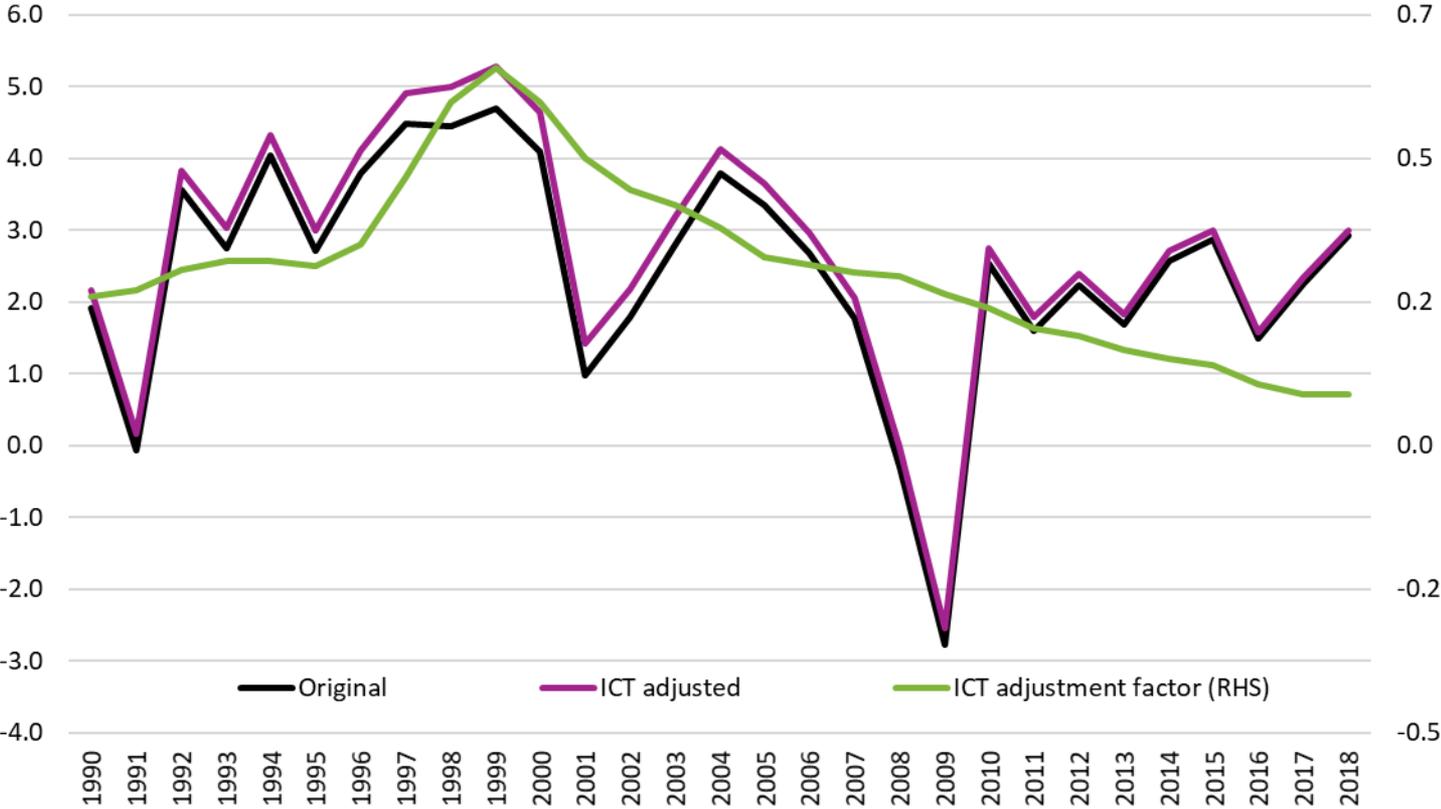
$$GDP = C + I + X - M \quad (\phi_i = \phi_i^{ict} + \phi_i^{n-ict}; i = C, I, X \text{ and } M)$$

- Correct GDP partially to take account of price declines in ICT assets
 - ✓ $\Delta \ln P_{GDP}^{adj} = (i + x - m)\Delta \ln P_{ICT} + [1 - (i + x - m)]\Delta \ln P_{GDP}^{na}$
 - ✓ P_{ICT} denotes alternative ICT prices for US from Byrne and Corrado (2016)
 - ✓ The Tornquist weight $i + x - m$ consists of the share of investment (i), export (x) and import (m) of ICT assets in nominal GDP
 - Adjustment made only to largest ICT producing and exporting countries, Japan, US and China, assuming that ICT price impact on GDP in ICT importing countries will be *minimal* as the net impact of the investment correction will be cancelled out when imports of ICT are subtracted
 - Four-year moving average of adjustment factor to account for noise in the data
 - ✓ For other countries, harmonized US ICT deflators adjusted for domestic inflation (Schreyer, 2002)



ICT adjustment factor was large in the 1990s

GDP growth in the United States, official data vs. ICT adjusted (% changes)

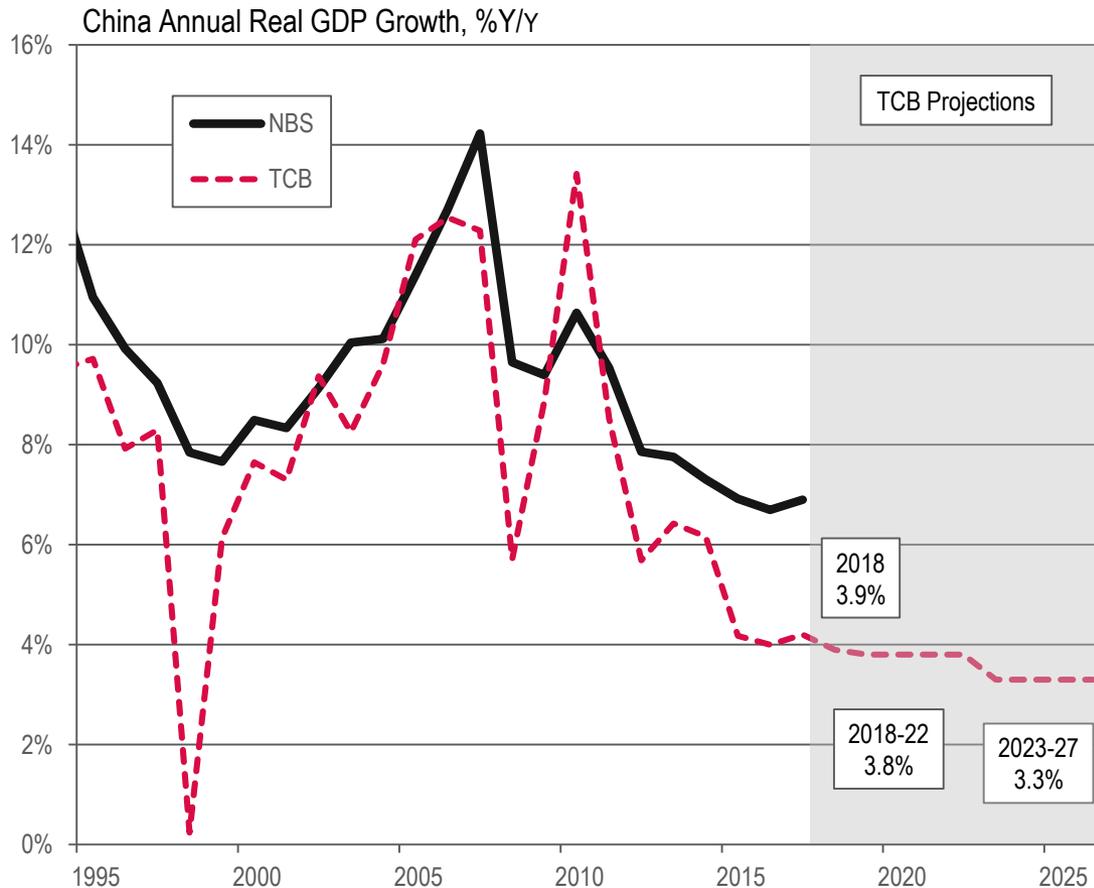


Source: The Conference Board Total Economy Database



China's Economic Growth – The Long Soft Fall

Official GDP Data, vs. TCB Estimates & Projections



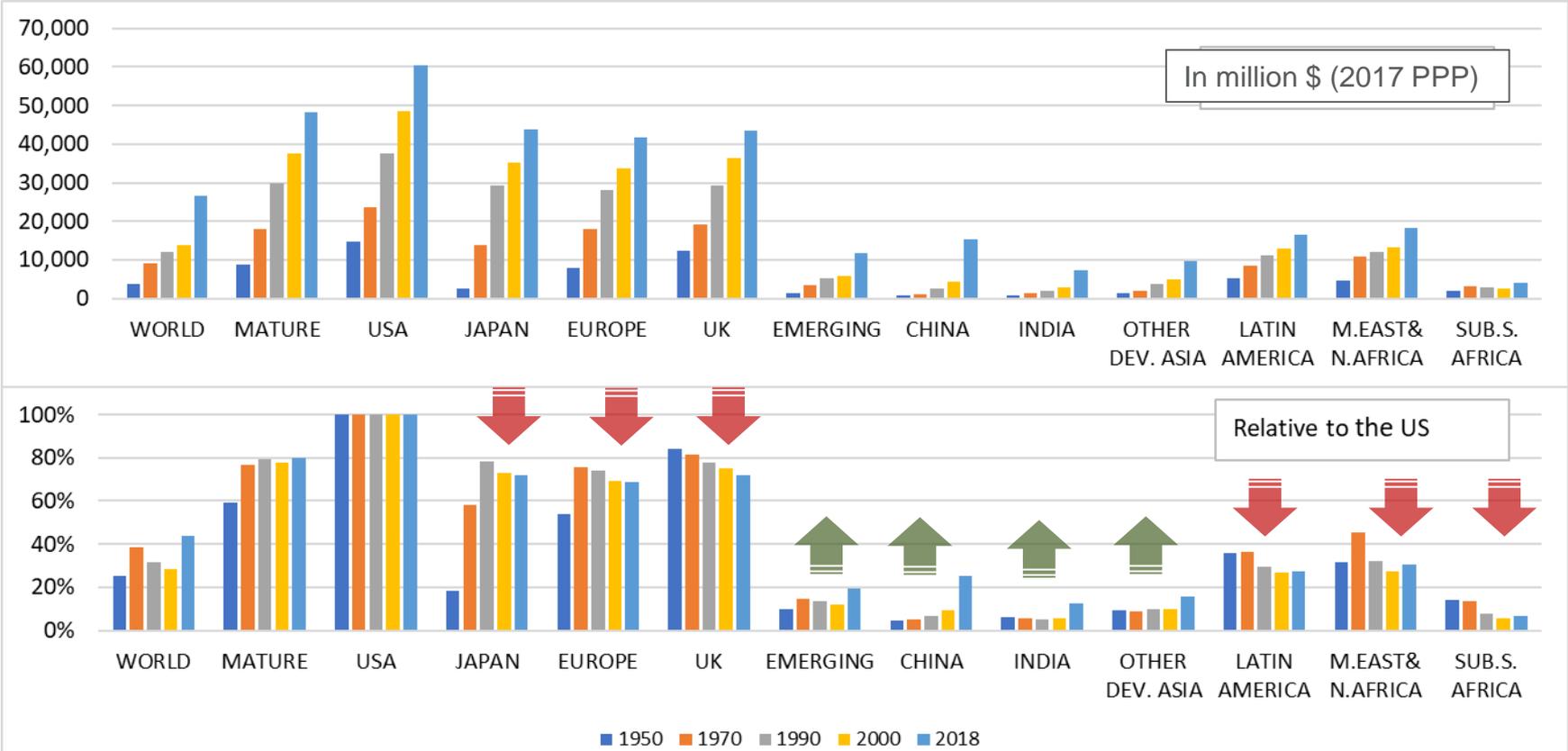
- TCB GDP series suggest an upward bias in official series:
 - ✓ For industry: production series based on produced quantities with multi-level and multi-year pricing and using input-output table weights
 - ✓ For non-material services: assume more modest productivity improvements (1% in 1980s and 2% since 1990s)
- TCB GDP series for China, suggest growth slowdown started abruptly in 2011, now around four percent, vs. NBS growth of around seven percent
- Moving forward, we expect Chinese GDP growth to continue to slow

Source: NBS, The Conference Board Total Economy Database



Global income levels increased during last 7 decades, but mostly in absolute terms only?

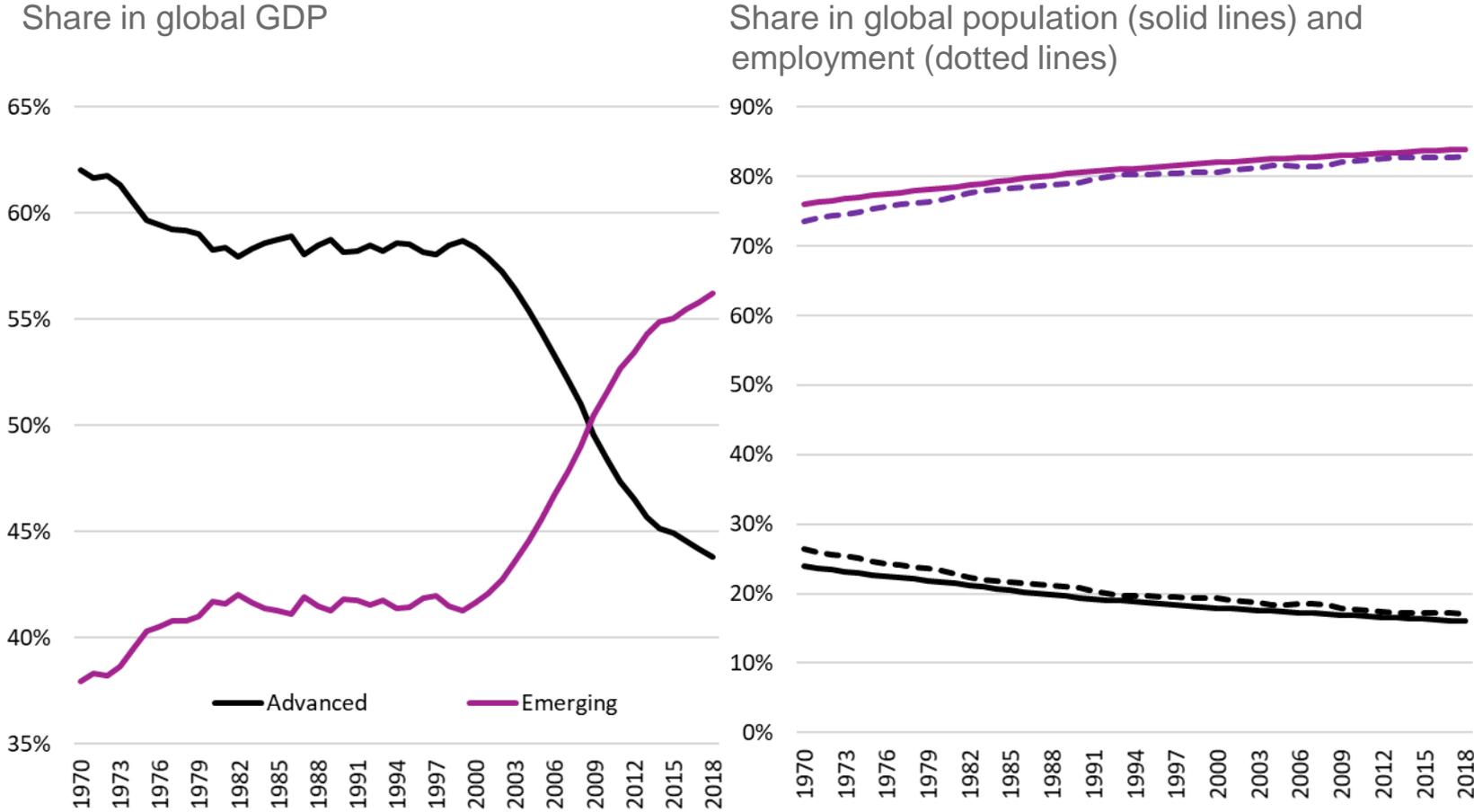
- Per capita income levels 1950-2018, absolute levels (upper panel) & relative to the US (lower panel)



Source: The Conference Board Total Economy Database

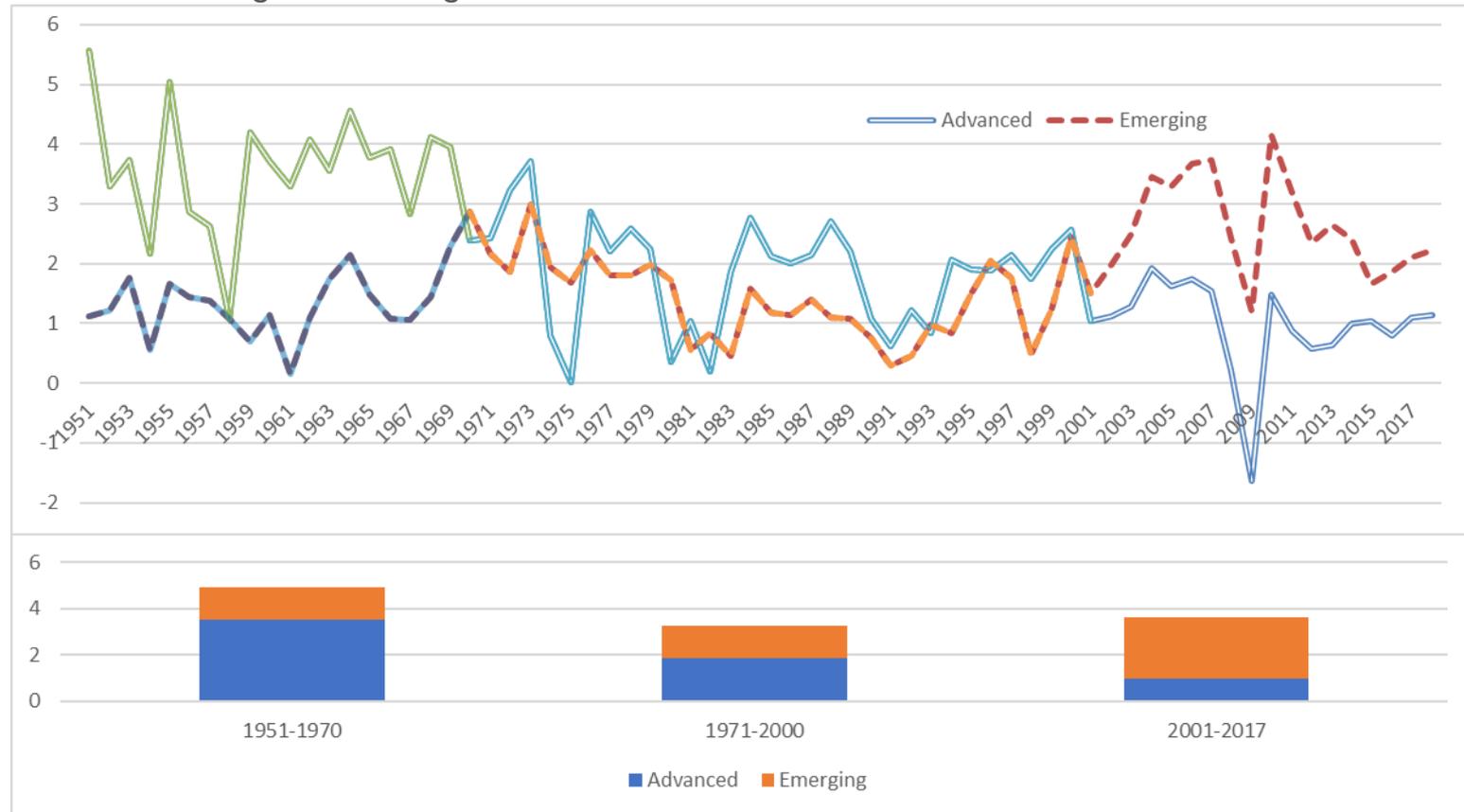


GDP shares have shifted to favor emerging economies



Changing role of emerging economies in global growth

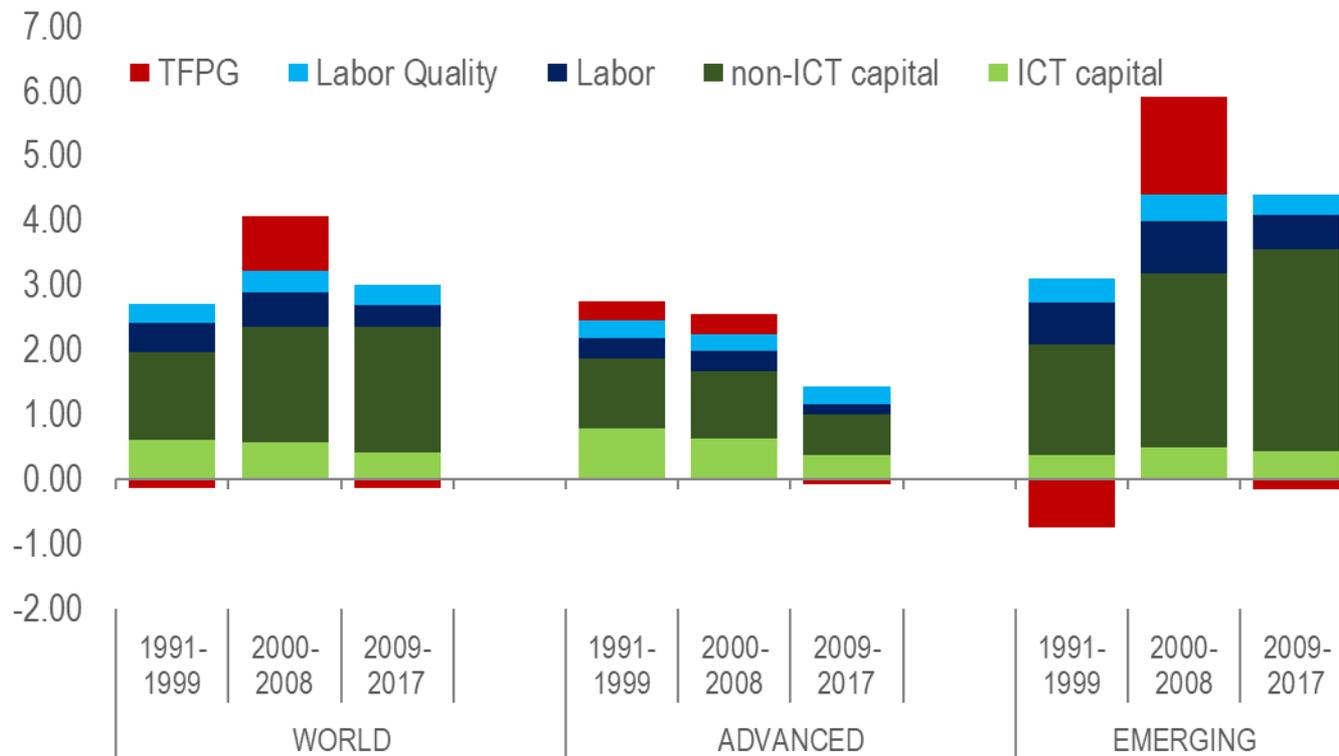
Contribution to global GDP growth



Source: The Conference Board Total Economy Database

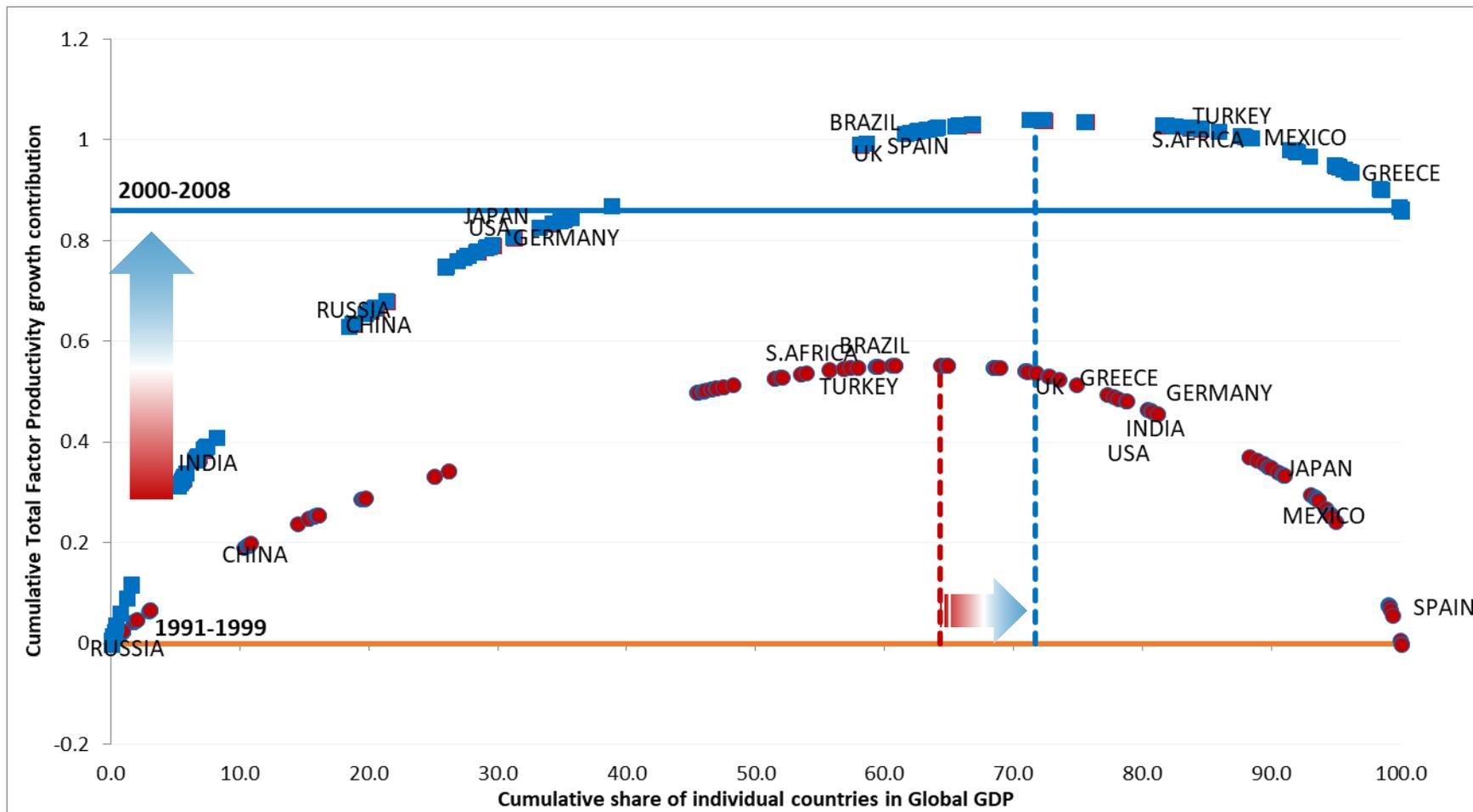
What drives global productivity growth since the 1990s – Accumulation or Assimilation

Proximate sources global GDP growth – Growth Accounting



Source: The Conference Board Total Economy Database

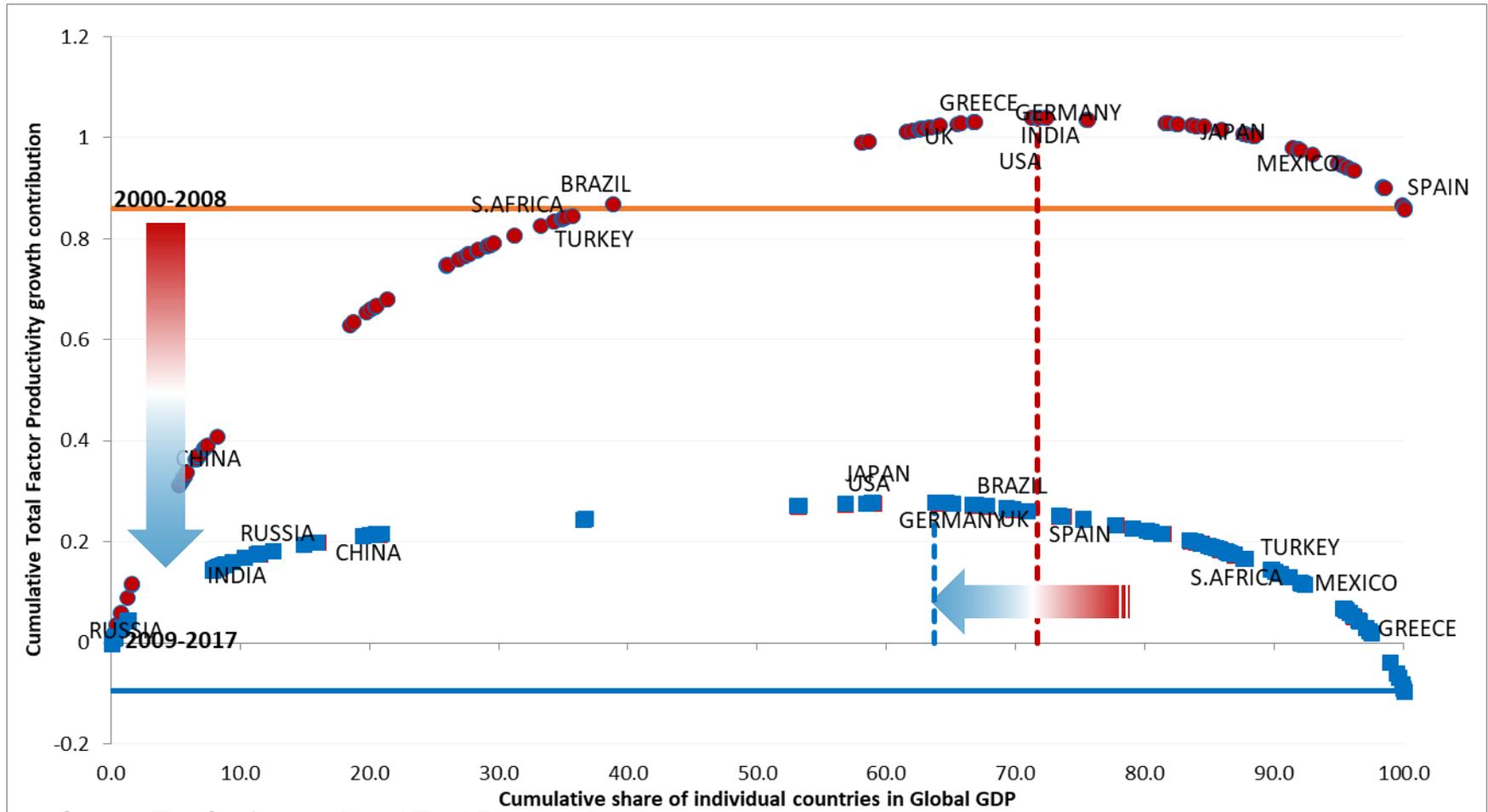
Global TFPG improvement in the 2000s, a period of accelerated trade and ICT use, was visible across the board



Source: The Conference Board Total Economy Database



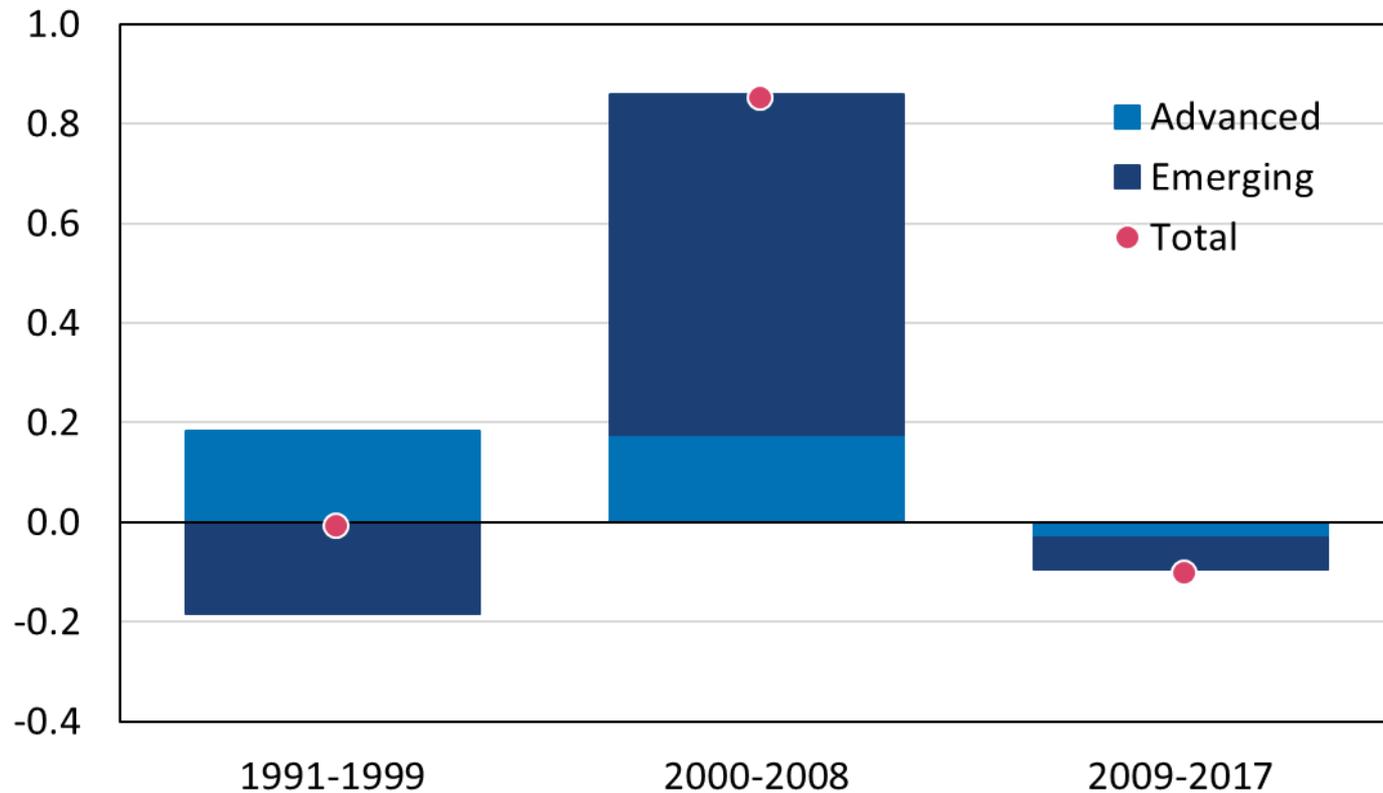
The slowing trend in TFPG since the 2000s is substantial, long-lasting, and across the board



Source: The Conference Board Total Economy Database



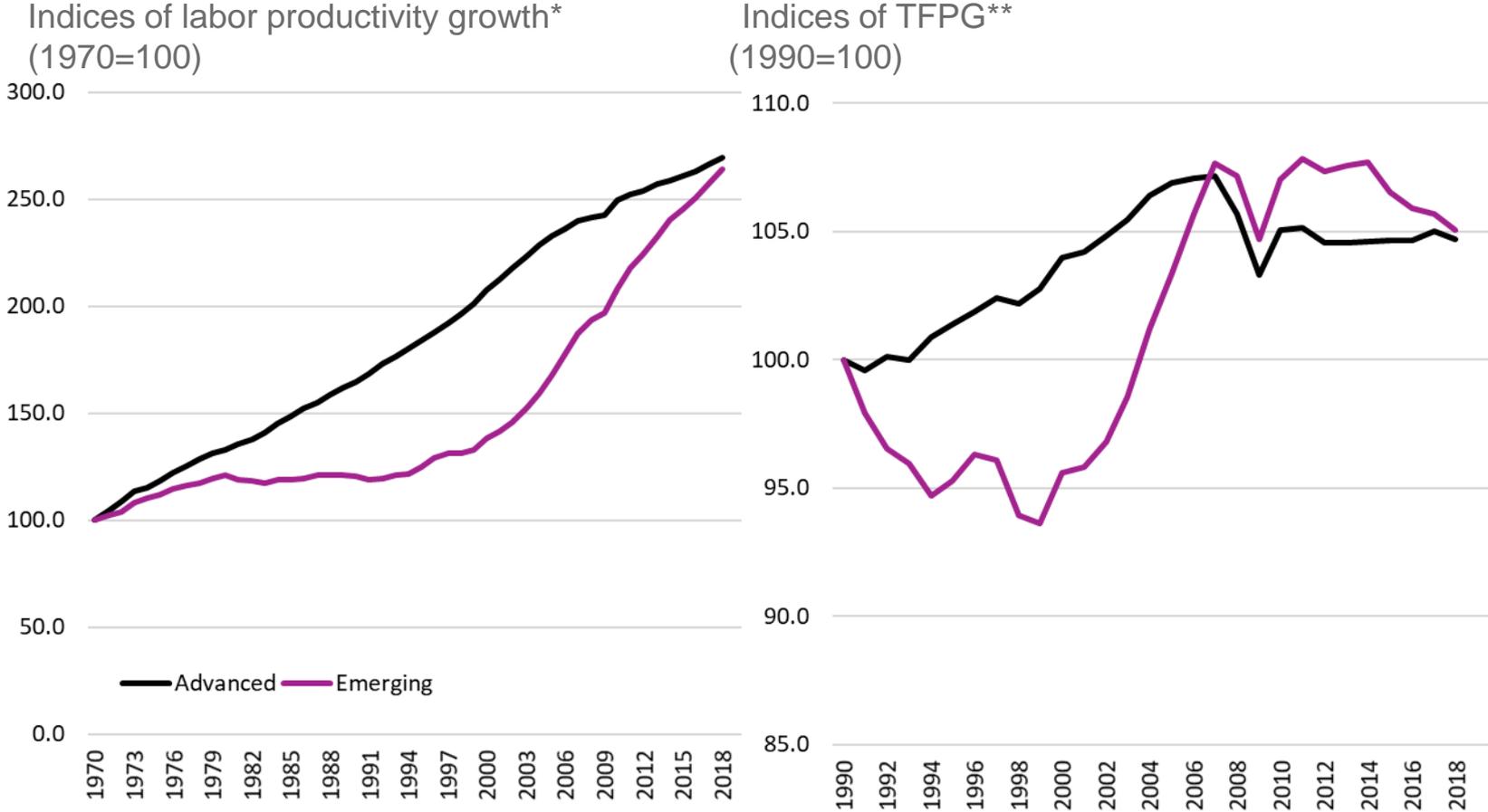
Emerging markets played an important role in driving global TFPG in the 2000s, but they lost that momentum in the current decade.



Source: The Conference Board Total Economy Database



Labor productivity and TFP in emerging markets grew quite rapidly in the 2000s, but TFPG has come to a halt

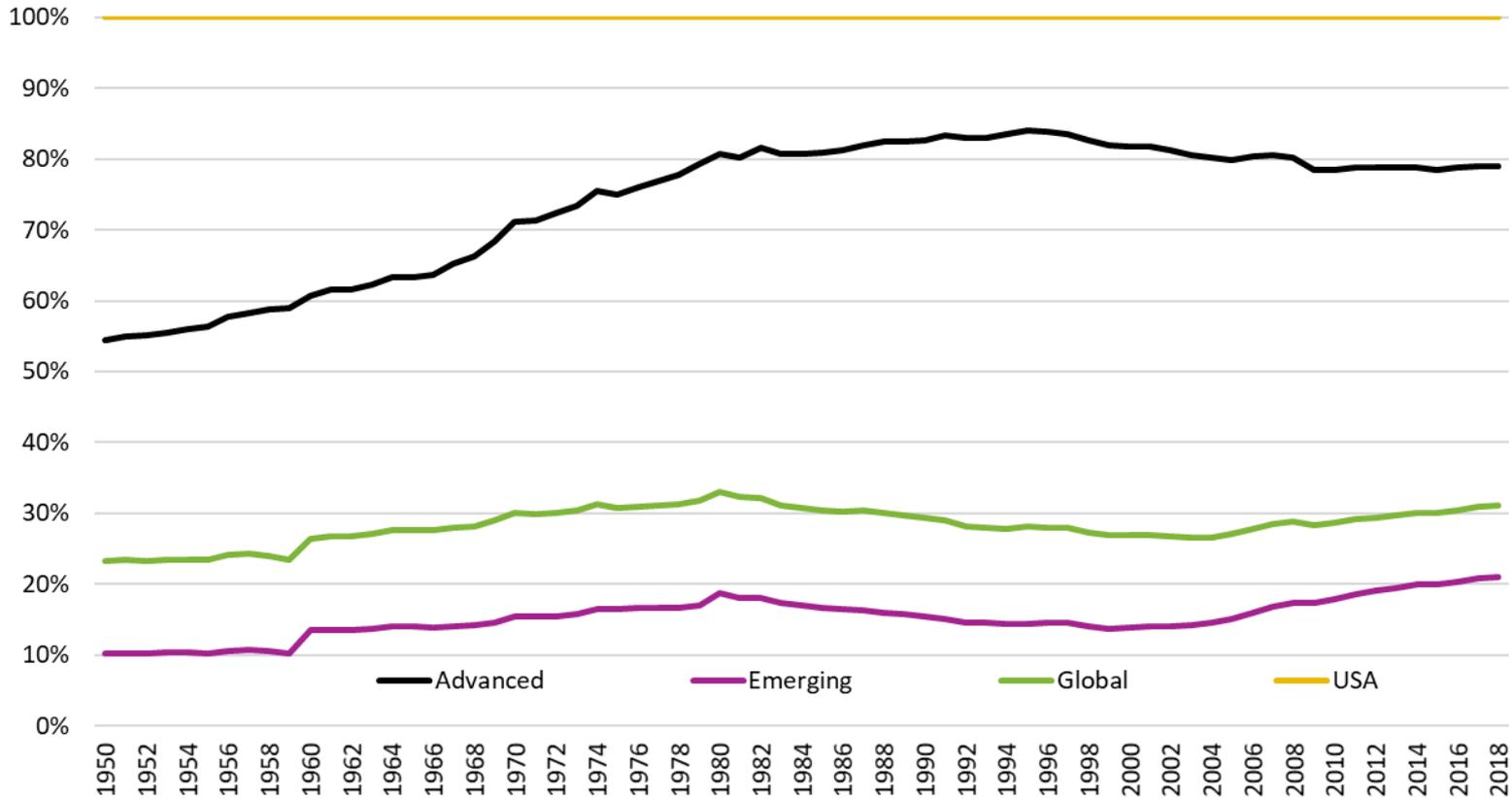


Source: *The Conference Board Total Economy Database (adjusted version), March 2018; **The Conference Board Total Economy Database (adjusted version), November 2017



Yet, emerging markets still are quite below their mature counter parts

Levels of labor productivity relative to USA

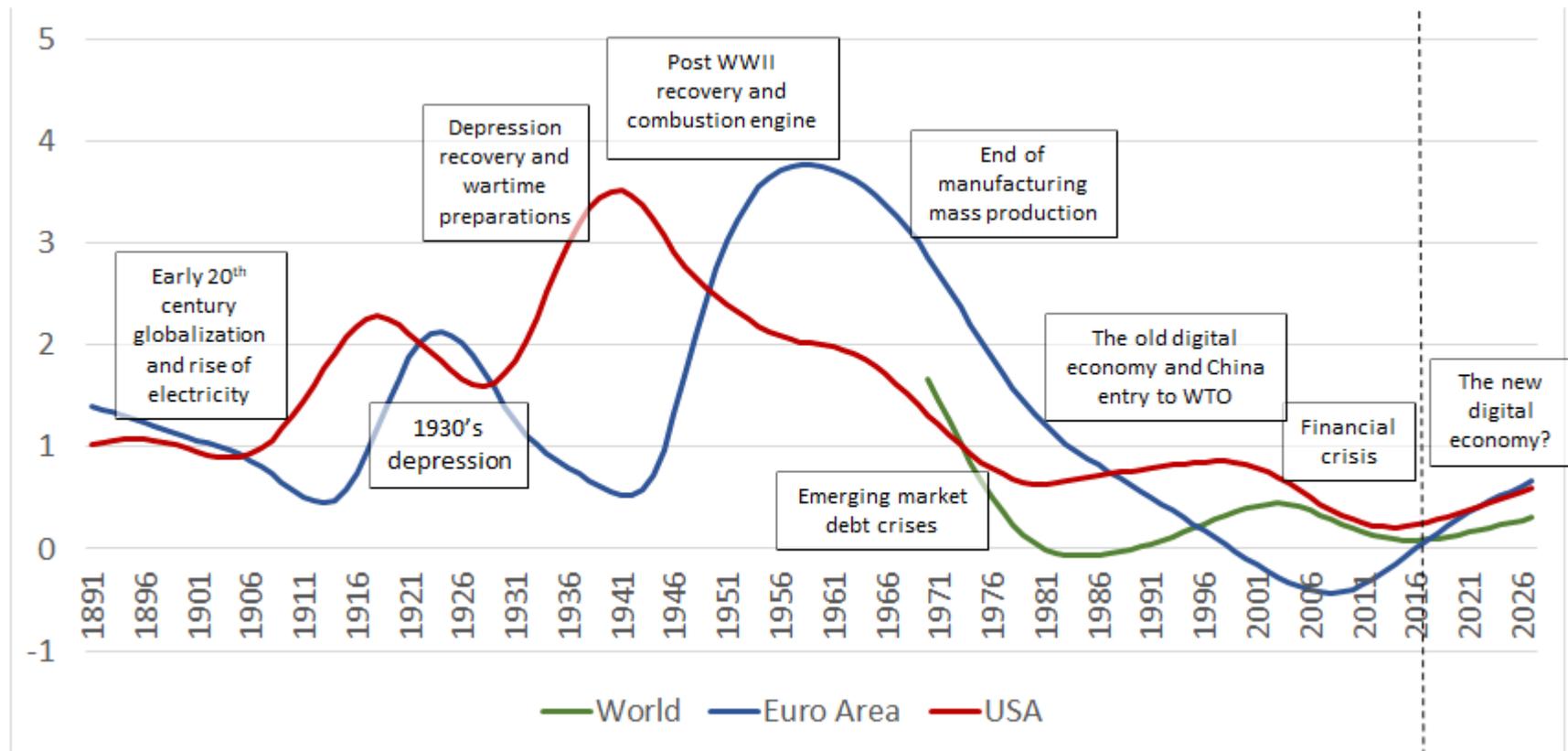


Source: The Conference Board Total Economy Database



Productivity growth is difficult to predict, but even a modest impact from digital transformation could change the trend

Total Factor Productivity Growth, smoothed trend lines, 1891-2016 and projections to 2017-27



Sources: Sources: Bergeaud, Cette and Lecat, Banque de France; The Conference Board Total Economy Database, November 2017; The Conference Board Global Economic Outlook 2018.



Future output and productivity growth has to come from increases in technology and innovation.

	Emerging markets		Mature Economies		World	
	2008-2016	2017-2026	2008-2016	2017-2026	2008-2016	2017-2026
GDP	4.5	3.5	1.2	1.9	2.9	2.8
Labor Productivity	3.2	2.8	1.0	1.7	2.1	2.3
Capital	3.2	2.2	1.0	1.0	2.2	1.7
Labor Composition	0.3	0.1	0.3	0.2	0.3	0.2
TFPG	-0.4	0.4	-0.3	0.6	-0.4	0.5



Source: The Conference Board Total Economy Database, The Conference Board Global Economic Outlook, November 2018

Thank you!



Financial crisis contributed to productivity growth decline, but that's not the whole story

Global financial crisis slowed TFPG

Slow investment

Slow Demand

Larger loss in output compared to employment and investment

Erosion of catch-up potential in large emerging markets slowed TFPG

The soft fall of China

Transition to domestic-consumption led model

Erosion of labor cost advantage, skill challenges; and other supply side bottlenecks

Factor misallocations and regulatory environment might have played a role as well

Low interest rate

Inefficient capital allocations

Regulatory environment may have stifled efficiency

New financial sector reforms in the United States

Failure to complete a single market for goods and services across the EU

Rigid labor markets and presence and expansion of informal sector in some emerging markets.

Changing trend in globalization

Stagnation / saturation of globalization and decline in global trade

Secular stagnation and measurement issues are important

The secular stagnation hypothesis in mature economies (Summers, 2014)

Slow growth in labor supply and low inflation

Ongoing slowdown in demand

Weak investment in physical and human capital and other intangible assets

Measurement issues

Mismeasurement of ICT prices (Byrne and Corrado, 2016)

Consumer surplus