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A comparative look at the economic and environmental performances of India and China

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The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Finland.

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Abstract

We compare the economic and environmental performances of India and China over the past decade against the Euro Area, Japan, and the USA. India has emerged as the world's fastest growing large economy, but closer scrutiny suggests this impressive economic performance derives largely from structural factors such as labor force growth and the Balassa-Samuelson effect. Indeed, notwithstanding its superior level of economic development relative to India, China still posts stronger economic gains from investment and total factor productivity growth. While the two economies have grown markedly faster than the three developed economies against which we compare them, both Indian and Chinese growth has come with huge increases in greenhouse gas emissions. Our findings underscore the importance of Chinese and Indian participation in efforts to avoid the more dire impacts of climate change.

Keywords: India, China, economic growth, CO_2 emissions

1. Introduction

The leaders of India and China, the world's most populous nations, have now governed for a decade. China's Communist Party chose President Xi Jinping to lead the country in October 2012. India's Prime Minister Narendra Modi was appointed in 2014 after the Bharatiya Janata Party won the general elections for the parliament's lower-house Lokh Sabha.

From a macroeconomic perspective, ten years encroaches on the long-term realm. During the administrations of Prime Minister Modi and President Xi, the global economy has navigated at least one full economic cycle. Notable cyclical highlights include the slow recoveries from the global financial crisis, the dramatic collapse and recovery of economies as the Covid-19 pandemic progressed, as well as the ongoing ubiquitous turmoil caused by Russia's war in Ukraine.

Amidst such global challenges, the Modi and Xi governments have confronted pressure to increase economic growth potential while addressing environmental concerns. These pressures have tested both governments, revealing different patterns in their circumstances and political approaches.

In the following discussion, we look for such revealing patterns in the macroeconomic and environmental data. We use three large developed economies – the Euro Area, Japan, and the USA – as benchmarks for India and China. We start with a discussion of "Big Five" economic development and finish with observations about environmental impact. The brief comparison integrates previous discussion about economic growth and environmental protection in the two large Asian economies.

Unsurprisingly, the analysis shows that the economies of India and China continue to expand at faster rates than the three more advanced economies. After half a century of record-breaking economic expansion in China, India took the lead among the Big Five during the past decade. During Prime Minister Modi's two terms in power, India's economy doubled in USD terms. However, a decomposition approach suggests that India's newly established lead over China mainly reflects structural factors such as population growth and the Balassa-Samuelson effect. India still lags China in terms of capital accumulation and productivity growth.

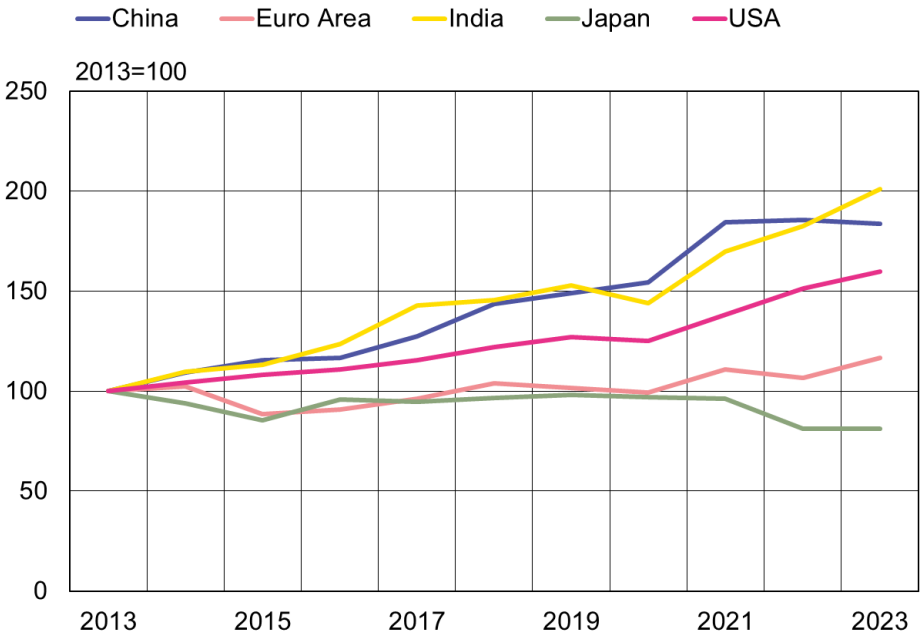
The flipside of the rapid economic rise of the two Asian giants is the increase in greenhouse gas emissions that contribute to global warming. While emissions per person are still low compared to many developed economies, overall CO_2 emissions from the two are already more than twice as large as those from the Euro Area, Japan, and the US combined.

From a global perspective, the two Asian economies are already large both economically and in terms of environmental impact – and both are still growing rapidly. While the economic rise of the developing world is lifting people out of poverty, it is also adding to environmental degradation. The increased fragmentation and opacity of the global economy creates a growing challenge in global governance.

2. India takes the lead

China's multi-decade leadership in global economic growth ended as India emerged during Prime Minister Modi's terms in power as the new growth champion of the largest economies. Figure 1 highlights the stark differences in how the value of GDP (in USD) of the Big Five economies developed in 2013–2023 relative to a 2013 starting point normalized to a value of 100. The top performer, India, breaks into the lead at 200 in 2023, indicating that the value of its GDP doubled in dollar terms in just a decade.

Figure 1. GDP comparisons (current USD, 2013=100).



Notes: Forecast figures for 2023.
Source: IMF WEO Database, Oct. 2023.

Table 1. Selected characteristics of the five economic areas, average over 2013-2023.

	GDP, USD trillion	GDP per capita, USD	Working age (15-64) population, million	CO_2, million tons
China	13.7	9,806	983	10,261
Euro Area	13.5	39,291	223	2,236
India	2.7	1,949	904	2,233
Japan	4.8	38,167	75	1,147
USA	20.9	63,740	214	4,877

Notes: The table shows averages over 2013-2023, except that the end year is 2022 for working age population and 2020 for CO_2 emissions.

Data sources: GDP and GDP per capita are from the IMF WEO Database; Working age population and CO_2 emissions are from the World Bank Development Indicators Database.

Given India's relatively low level of development, its emergence as the growth champion among large economies is welcome. Indian per capita GDP in current USD is about a fifth of China's, and a mere one-thirtieth of the US level (Table 1). The differences are less pronounced in purchasing power corrected data, but India nevertheless emerges as the poorest of the Big Five by a large margin.

India's relative poverty mainly reflects its past attachment to a centralized government-directed production system. India eventually introduced market-economy reforms in the early 1990s, a decade after China. While the slow pace India's reforms were sometimes the focus criticism (Irwin, 2021), India today has not only achieved over three decades of strong economic performance and catching up with the leading economies, but its economic rise is expected to continue. India's low level of development also implies that, unlike China, there is still plenty more low-hanging fruit available in the spheres of productivity increase and economic growth.

In President Xi's first term in office, the Chinese economy competed neck-and-neck with India. Chinese growth today has slowed markedly (Figure 1). Indeed, over the past three years, the value of China's GDP has not grown at all in USD terms. After four decades of exceptional performance, the notable growth slowdown suggests that economic gains are harder to come by for China. One contributing factor may be shift in emphasis of president Xi's adminstrations to political rather than economic goals, a shift that broke with policies of previous Chinese administrations (Petri, 2023; Pettis, 2023a and b; Herrala, 2021). Current projections still see China's economy catching up with the Western world, but compared to the recent past when China's rapid economic development seemed inevitable, there are now significant uncertainties clouding the country's economic prospects.

While our three developed economies are laggards in growth terms, the USA still performs surprisingly well considering its high level of development. Indeed, it seems like the USA is working overtime to defend its status of the world's largest economy against China's challenge. The Euro Area, and Japan even more so, are the economic growth stragglers in our comparison.

3. Decomposing economic growth

Further insight can be gained by decomposing economic growth into contributing factors. By definition, the value of GDP measured in current USD is the product of the volume of GDP (Y), the GDP price index (P), and the exchange rate of the home currency vis-à-vis the dollar (E): $GDP = Y * P * E$. To further decompose GDP volume, we assume a simple Cobb-Douglas production function $Y = AK^{0.33}L^{0.67}$, where L is labor, K is the capital stock, and A is total factor productivity. This production function specification builds on standard assumptions, i.e. that capital elasticity is around one-third (Vollrath, 2024) and that there are constant returns to scale. Under the latter assumption, capital and labor elasticities sum to one, implying labor elasticity of about two-thirds.

Under these assumptions, GDP is the product of five terms: $GDP = AK^{0.33}L^{0.67} * P * E$, of which three (L, P, and E) are observed. Taking natural logarithms and differencing, we get a four-part decomposition of economic growth:

$$(1)\quad \Delta lnGDP = \Delta lnAK^{0.33} + 0.67 * \Delta lnL + \Delta lnP + \Delta lnE$$

In the growth decomposition (1), the left-hand side and the three rightmost terms can be quantified from data. The unobserved term $\Delta lnAK^{0.33}$ can then be computed as a residual. The results of this calculation are presented in Table 2 for the Big Five economies.

Table 2. The growth decomposition.

Factor	Formula	China	Euro Area	India	Japan	USA
(1) Capital and total factor productivity	(5)-(4)-(3)-(2)	59 %	15 %	46 %	10 %	19 %
(2) Labor	$0.67 * \Delta lnL$	-1 %	-1 %	9 %	-5 %	2 %
(3) Prices	ΔlnP	17 %	21 %	43 %	9 %	26 %
(4) Exchange rates	ΔlnE	-13 %	-20 %	-29 %	-35 %	0 %
(5) Total	$\Delta lnGDP$	61 %	16 %	70 %	-21 %	47 %

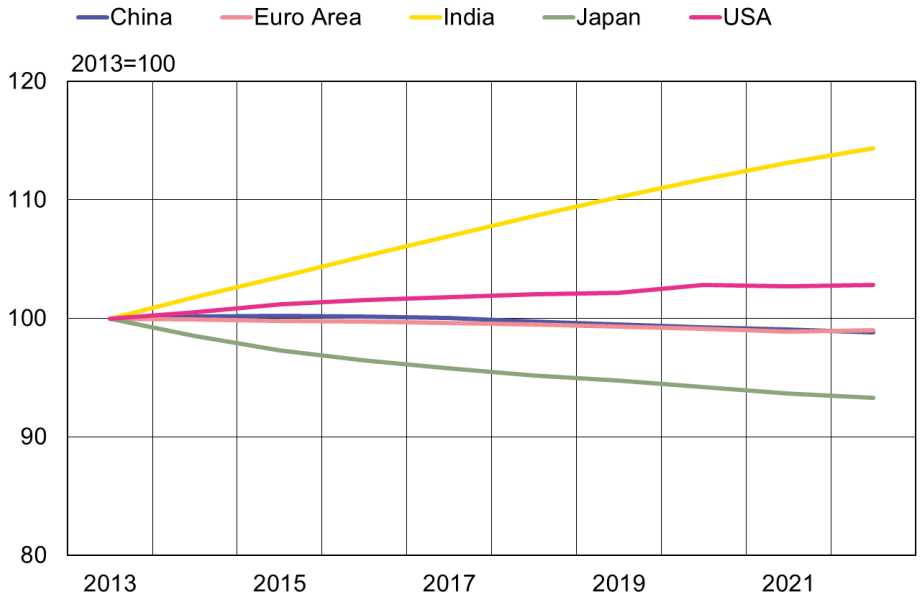
Notes: the numbers indicate in percentage points of the contributing factors to growth of GDP value in USD. Growth rates are measured in natural logarithms. Data source: author's calculations.

Looking at the last row of Table 2, we observe that between 2013 and 2023 India's logarithmic economic growth, measured in USD, rose by 70 % while China's was up by 61 %. The substantial contribution of capital and total factor productivity characterizes the economic growth of both countries relative to the three more developed economies in our comparison. Both countries invest a much higher share of their GDP than the three developed economies: China's investment rate regularly tops 40 % and India's 30 %, whereas the US, Japan and the Euro Area typically invest 20–30 % of GDP.

The decomposition also reveals notable differences between the two large Asian economies. In China, capital and total factor productivity are the dominant growth factors, accounting for 59 pp of its 61 % growth. In contrast, India's economic growth was boosted markedly by its expanding labor force, as well as the combined effect of price and exchange-rate developments. Taken together, labor, prices, and exchange rates accounted for 23 pp, or approximately a third of the 70 % growth of India's GDP.

All in all, the data indicate that India's lead over China is mainly due to structural factors. The growth of India's work force is much higher than in the other economies (Figure 2), reflecting higher birth rates and substantial improvements in healthcare that have decreased mortality rates. The fact that the high contribution from price changes is not fully compensated for by exchange-rate trends, hint at the role of a Balassa-Samuelson effect in India, i.e. an ongoing uptick in prices as some sectors gradually adjust to global prices. Absent labor force growth and the Balassa-Samuelson effect, India's growth performance would have fallen behind China's by a considerable margin. While India has experienced rapid economic growth, these findings support the view that the Modi government's growth policy record is somewhat mixed (Sen, 2024; Dhar, 2024; Rajan, 2023).

Figure 2. Working age population, 2013=100.



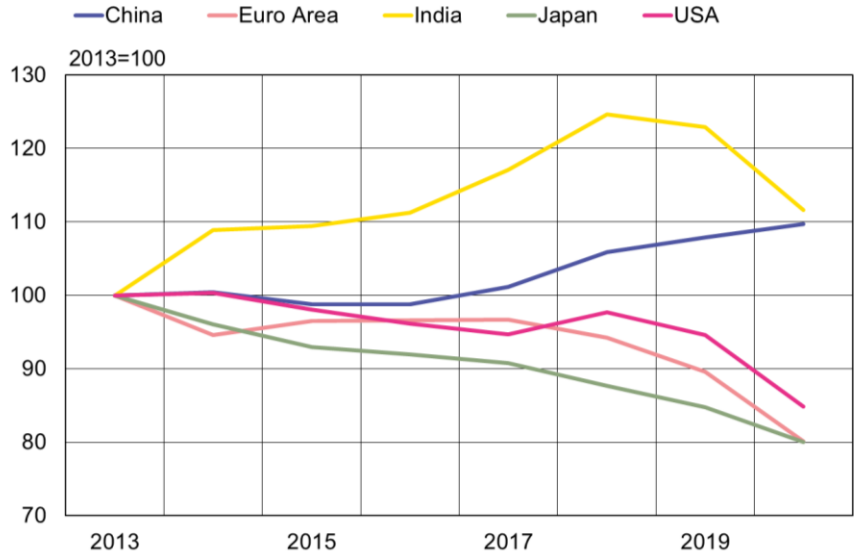
Notes: The chart shows the number of 15- to 64-year-olds relative to 2013.
Source: World Bank Development Indicators.

4. Greenhouse gas emissions on the rise

Economic growth is not the only outcome that matters for welfare. Reducing environmental damage is also crucial. Euro Area's and Japan's lower economic growth has helped the two economies take the lead in emission reduction (Figure 3). During the past decade, both economies managed to shave off about a fifth of their CO_2 emissions. The US also comes in close to these two environmental champions.

In contrast, the CO_2 emissions of China and India rise by about 10 % over our ten-year observation period. At the start of Modi's first term, India's emissions rose rapidly. A promising reversal materialized around the turn of the decade, but this was mostly due to temporary factors, reflecting India's tight lockdowns during the Covid-19 pandemic. Even with progress in renewable capacity installation and active efforts to encourage renewable energy use, the Modi government is still planning further increases in coal power production to support India's rapid economic growth (Deb & Roy, 2023).

Figure 3. CO_2 emissions, volume, 2013=100.



Source: World Bank Development Indicators

China's CO_2 emissions show a sharp increase during President Xi's second term. China has recently been on a coal-burning spree, bringing many coal-burning plants on line to boost its energy generation capacity. Observers hold out hope that the much-needed downturn in China's emissions could start materializing by the end of this decade. China is investing heavily in environmentally friendly technologies, and is already a global leader in some of these technologies. It has pledged to start reducing its consumption of coal during the second half of this decade and start reducing its greenhouse gas emissions around 2030 (Prytherch et al., 2023; Climate Action Tracker, 2024).

China is currently responsible for about a third of all global CO_2 emissions. China and India together emit more than twice as much CO_2 as our three developed economies combined. From a global perspective, progress to contain global warming rests heavily on the environmental policies adopted and implemented by China and India.

5. Concluding remarks

India emerged in the past decade as the fastest growing economy among the Big Five economies globally. A decomposition of the GDP data indicates, however, that India's strong performance largly reflects structural factors such as population growth and the Balassa-Samuelson effect, rather than successful growth policies. Despite India's much lower level of economic development, China still generates more value from capital accumulation and total factor productivity growth. The data therefore do little to negate India's reputation as a slow reformer. The two Asian giants continue to catch up with the Western world in terms of economic welfare. The massive carbon footprints of China and India, which now dwarf those of Western economies, are the flipside of their success.

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