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ANALYSIS

Revising down the rise of China

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MARCH 2022



REVISING DOWN THE RISE OF CHINA

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KEY FINDINGS

- China will likely experience a substantial long-term growth slowdown owing to demographic decline, the limits of capital-intensive growth, and a gradual deceleration in productivity growth.
- Even with continued broad policy success, our baseline projections suggest annual economic growth will slow to about 3% by 2030 and 2% by 2040, while averaging 2–3% overall from now until 2050.
- China would still become the world’s largest economy, but it would never enjoy a meaningful lead over the US and would remain far less prosperous and productive per person even by mid-century.

EXECUTIVE SUMMARY

The future of China's ongoing global rise is of great importance to both China and the rest of the world. Predicting long-term economic performance is inherently difficult and open to debate. Nonetheless, we show that substantial long-term growth deceleration is the likely future for China given the legacy effects of its uniquely draconian past population policies, reliance on investment-driven growth, and slowing productivity growth. Even assuming continued broad policy success, our projections suggest growth will slow sharply to roughly 3% a year by 2030 and 2–3% a year on average over the three decades to 2050. Growing faster, up to say 5% a year to 2050, is notionally possible given China remains well below the global productivity frontier. However, we also show that the prospect of doing so is well beyond China's track record in delivering productivity-enhancing reform, and therefore well beyond its likely trajectory. China also faces considerable downside risks.

Our projections imply a vastly different future compared to the dominant narrative of China's ongoing global rise. Expectations regarding the rise of China should be substantially revised down compared to most existing economic studies and especially the expectations of those assessing the broader implications of China's rise for global politics. If China were on track to grow at 4–5% a year to 2050, as many seem to hold, it follows that China would be on course to become the world's most dominant economy by far. With 2–3% growth, China's future looks very different. China would still likely become the world's largest economy. But it would never establish a meaningful lead over the United States and would remain far less prosperous and productive per person than America, even by mid-century.

INTRODUCTION

China's ongoing rise will clearly carry enormous implications for both the country itself and the rest of the world.

The rise of China is amongst the most globally significant developments of recent decades. China's economic transformation means there are around 800 million fewer Chinese citizens living in poverty today than would otherwise be the case.¹ China's rise has also reshaped the global economy, planetary ecosystem, and world politics. China is now the largest economy in the world at purchasing power parity, which corrects for price differences across countries, and the second largest at market exchange rates. It accounts for almost a fifth of global production and more than a quarter of world carbon emissions. Geopolitically, China's rise has brought America's "unipolar moment"² to an end, giving way to a new era of geostrategic rivalry that looks set to define international relations and global politics for decades.

China's ongoing rise will clearly carry enormous implications for both the country itself and the rest of the world. China's economic prospects are therefore a topic of intense debate. On the one hand, it is well accepted that double-digit growth is a thing of the past and that China faces considerable downside economic risks, including that reform might be stalling and that brewing financial fragilities could eventually trigger a crisis. Several studies argue that China's economy could soon slow considerably. Nonetheless, most existing studies suggest China can continue to sustain robust growth averaging around 5% a year or higher to 2030. Among studies that attempt to look further ahead, most suggest China could average growth of about 3.5–4% a year over the decades to 2050.

Interestingly, expectations amongst those considering the broader implications of China's rise for global politics tend to be notably higher at around 5–6% a year sustained to 2050. As the deep determinants of rapid economic growth are both poorly understood and highly dependent on policy and politics, many analysts evidently put a significant weight on recent performance when thinking about China's future trajectory, essentially extrapolating the trend.

This Analysis focuses on China's long-term economic outlook to 2030 and further out to 2050. It contends that despite the considerable uncertainties in projecting long-term economic performance, focusing on the basic building blocks or "proximate sources" of future economic growth is sufficient to show that China very likely faces a future of significant structural deceleration, even using relatively optimistic

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assumptions. Expectations regarding the rise of China should therefore be substantially revised down compared to most existing studies and especially those considering the broader geopolitical implications of China's global rise.

China's past population policies mean substantial demographic decline is essentially locked in over the coming decades, with little ability for policy to materially alter the outlook. Economic growth has also been incredibly reliant on capital investment — a model that has become increasingly unsustainable. By our estimate, the growth contribution of capital accumulation will roughly halve over the coming decades compared to that preceding the Covid-19 pandemic. Housing investment is entering structural decline, as urban population growth and increases in average household income both slow. Similarly, China's ability to rely on infrastructure for growth is close to reaching its limits, after decades of remarkably high investment. While China has more room to rely on business investment to drive future growth, this too has been high and can be expected to run into diminishing returns. Since capital accumulation has accounted for three-quarters of China's growth in recent years, this has major implications for China's future economic prospects.

Whether China can sustain rapid economic growth will largely be determined by what happens with productivity growth. Yet Chinese productivity growth has been decelerating, and there are strong reasons to think it will continue to do so — reflecting economic theory, the international evidence, China's own track record, and the prospect of intensifying "decoupling" from the West. Most contemporary assessments also conclude that overall progress with key economic reforms has been mixed at best. Moreover, even if China can reverse its decelerating productivity trend, history suggests there are limits as to what can realistically be achieved, and therefore limits as to how fast China's economy can sustainably grow even in a best-case scenario.

Pulling these pieces together using several alternative growth accounting approaches, we show that annual average Chinese economic growth can be expected to decelerate sharply to roughly 3% by 2030 and 2% by 2040, compared to the pre-Covid trend of a little over 6%. Over the almost three decades from 2021 to 2050, economic growth would average about 2–3% a year. Growing faster, up to say 5% a year, is notionally possible given China remains well below the global productivity frontier. Nonetheless, we also show that the prospect of doing so is well beyond China's track record of delivering productivity-enhancing reform, and therefore well beyond its likely trajectory.

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The growth slowdown we predict could also prove highly destabilising, given the financial vulnerabilities China has accumulated after more than a decade of rapid credit growth.

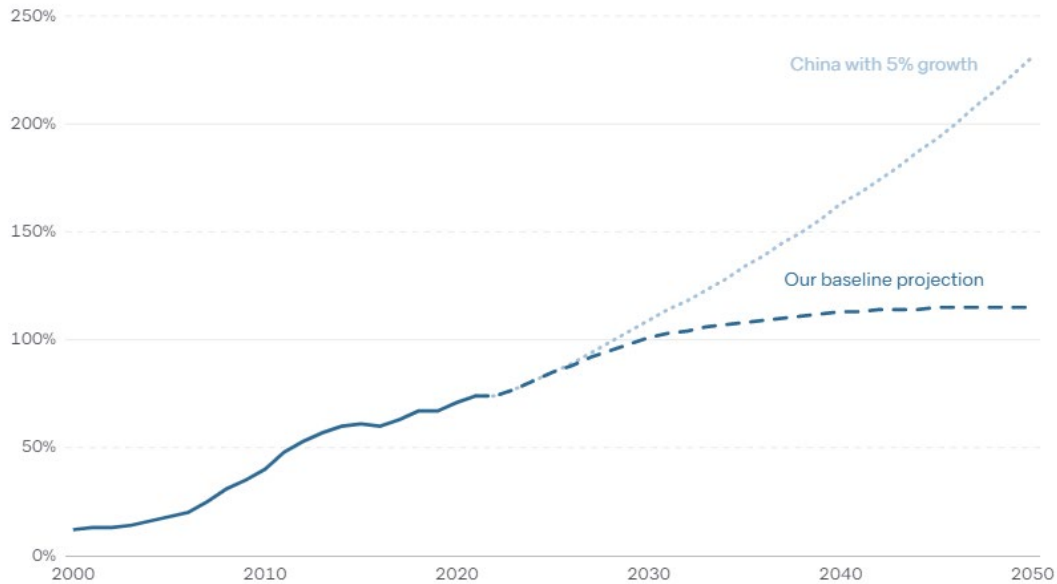
Importantly, our argument is not based on China “failing”. Rather, a substantial growth slowdown is likely even if China continues to see a good degree of “success” in terms of productivity growth, education, business investment, containing financial risks, and generally sustaining strong increases in average living standards. In this sense, our argument is qualitatively different to those of other China growth pessimists who predict a substantial slowdown due to increasingly deficient policy, mounting financial vulnerabilities, or the simple statistical improbability of China sustaining its growth exceptionalism forever.

One can of course readily imagine more negative scenarios along these lines. It is too early to judge where China’s emerging policy doctrines such as “common prosperity” might ultimately lead. It could well prove successful. But there are also ways it could prove deleterious to continued economic success, for instance if Chinese policy institutions struggle to evolve to meet the demand for higher quality growth and instead give way to an intensifying clampdown on China’s dynamic private sector.³ The growth slowdown we predict could also prove highly destabilising, given the financial vulnerabilities China has accumulated after more than a decade of rapid credit growth. The Bank for International Settlements reports total credit to China’s non-financial sector had reached around 285% of GDP by mid-2021, compared to about 140% just before the 2008–09 crisis.⁴ It is also possible that China’s official GDP statistics are simply overstated.⁵ The downside risks are therefore high, suggesting our baseline projection of substantial structural deceleration nevertheless remains a somewhat optimistic assessment.

Our projections imply a vastly different future compared to the dominant narrative of China’s ongoing global rise (Figure 1). For instance, if China were likely to sustain long-term growth of 4–5% a year, it would be on track to eventually become far and away the world’s largest economy and a massive economic bloc unto itself. In such a world, it would be reasonable to expect that China’s economic gravity would continue to draw in many other countries, that the Chinese yuan could displace the financial hegemony of the US dollar, that China might dominate key future technologies, and that its military expenditure could feasibly overtake the combined defence outlays of the United States and its allies. In other words, Chinese global hegemony would be a real possibility.

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Figure 1: Revising down the rise of China
CHINA'S PROJECTED GDP RELATIVE TO US, NOMINAL USD



Source: authors' projections, IMF World Economic Outlook October 2021, and OECD Long-Term Growth Forecasts (2018)

With long-term average economic growth of 2–3%, expectations for the future look completely different. China would still likely become the largest economy in the world in US dollar terms. But its advantage over the United States would be modest and not enough to confer any significant general competitive advantage, at least not on the basis of its economic size alone. Moreover, China would lack the economic heft needed to compete with major Western economies as a group, for example in terms of its ability to devote resources to science and innovation, military spending, or financing overseas infrastructure projects. Finally, although the average person in China would be vastly better off economically than today, China would remain far less prosperous and productive per person than the United States and other rich countries, even by mid-century.

This paper presents these arguments across eight sections. The first section discusses existing views of China's long-term economic future and the authors' analytical approach. The following sections then examine the outlook for demographics, housing investment, public investment, and productivity growth as sources of future growth deceleration. We then bring this together to assess China's future growth prospects if it continues along its current trajectory as well as the realism of more bullish economic predictions. Finally, we consider the implications for the narrative around China's global rise, particularly compared to long-term growth expectations for the rest of the world.

PREDICTING CHINA'S ECONOMIC FUTURE

Some believe that China has the potential to grow even faster, in which case its economy could reach a staggering 4–5 times America's by 2050.

China's economy is currently the largest in the world when measured at purchasing power parity (PPP), which corrects for price differences across countries. This is most relevant for understanding average living standards, productivity, and overall economic production. However, for other purposes such as understanding China's impact on global markets or the relative economic strength of nations, measuring economic size at prevailing market exchange rates is more relevant. On this measure, China's economy places second, at almost three-quarters the size of America's. However, the International Monetary Fund (IMF) forecasts that figure will be almost 90% by 2026. If that trend continued, China would overtake the United States before 2030. If China remained on a commensurate trajectory over the following decades, its economy could be more than twice the size of America's by mid-century when measured in US dollars. Some believe that China has the potential to grow even faster, in which case its economy could reach a staggering 4–5 times America's by 2050.⁶

Predicting long-term economic growth is a fraught exercise, not least because the precise determinants of growth are not well understood and much depends on emergent phenomena, such as politics and technology, which are inherently difficult to predict.⁷ It is often impossible to say with much certainty what the precise growth effects of specific policies might be, while studies suggest that even measurable economic reform has empirically proven a weak explainer of sustained changes in the pace of economic growth.⁸ Finally, while all countries are unique, China is particularly so — given its immense size, particular history and institutions, and geopolitical standing. Importantly, while no country has been able to keep progressing economically from where China is today without eventually democratising, the group of available comparators is small.

These difficulties notwithstanding, a range of long-term predictions exists. Among economists, at the most bullish end of the spectrum is former World Bank chief economist Justin Lin who argues that China could potentially sustain growth at 7–8% a year for decades, basing this on the performance of the earlier East Asian “miracle” economies of Japan, South Korea, Taiwan, Hong Kong, and Singapore.⁹ Leading China scholar Nicholas Lardy is more pessimistic about the country's current trajectory but nonetheless thinks, with the right policies, it has the potential to grow much faster than 6–7% a year for some time.¹⁰ At

the other end of the spectrum, Lant Pritchett and former US treasury secretary Larry Summers famously predicted in 2014 that, based on the cross-country evidence, China would likely suffer “reversion to the mean”, with growth slowing to a little less than 4% a year, and possibly as low as 2%.¹¹ In between these extremes are numerous other predictions. Overall, among 20 recent studies, the majority suggest China’s economic growth could average around 5% a year or higher to 2030 and about 3.5–4% a year from 2020–2050.¹²

Despite the wide range of predictions from the economics profession, analysts considering the broader implications of China’s global rise tend to employ growth assumptions leaning heavily towards the more bullish end of the spectrum, centring on growth of about 5–6% a year to 2050. For instance, in assessing the future of China’s relations with the rest of the world, leading China expert David Shambaugh assumes growth of 4–6% a year over the coming decades.¹³ In analysing how China’s rise is affecting the rest of the world, other analysts implicitly assume China might grow at about 6% a year or more, to reach an economy three times the size of the United States by mid-century.¹⁴ In assessing the contest between the United States and China for global systemic leadership, Fred Bergsten of the Peterson Institute assumes China might grow at anywhere between 4–7% a year for decades.¹⁵ The billionaire investor Ray Dalio suggests China’s economy will become twice the size of America’s, which would require growth of around 5% a year sustained over decades.¹⁶

Evidently, much of the discussion around the global rise of China tends to preference extrapolating the trend, placing more weight on observed performance rather than deterministic models based on cross-country statistical relationships, at least where these differ significantly with recent economic performance. Given uncertainty about the deep determinants of economic growth and wildly conflicting views from economists, extrapolating recently observed performance may seem a reasonable strategy. The arguments of the China growth pessimists are also somewhat unsatisfying, as these often fail to explain why the growth of China’s economy has been so fast for so long.

While economists struggle to identify the deep determinants of economic growth, understanding the basic building blocks or “proximate sources” of growth is more feasible and can help narrow down the range of possible economic futures significantly. We utilise this approach, assessing China’s growth prospects using a growth accounting framework where economic growth broadly comes from changes in the number of workers, human capital (education),

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investment in physical capital — from buildings to business equipment and public infrastructure — and increases in what economists refer to as “total factor productivity”, or simply “productivity” as it will be referred to here. A key feature of such models is that individual factors of production (notably capital) exhibit diminishing returns if increased in isolation or out of proportion with other factors, unless this is accompanied by faster productivity growth.

In China's case, growth has been particularly capital-intensive. Despite efforts to rebalance its economy towards consumption, investment remains extremely high at about 43% of GDP. Capital-intensive growth immediately suggests that China's growth will eventually run out of steam. However, a key limitation of the conventional growth accounting approach is that this usually does not distinguish between different types of capital. This is especially problematic in the case of China, where unsustainable investment in housing and infrastructure is a major feature. Since investment in these areas is widely expected to decline, but also has lower direct returns than business investment, a standard growth accounting approach risks underestimating China's future growth prospects.

We therefore consider multiple growth accounting approaches, using several different capital stock estimates drawn from credible sources (technical details are presented in the appendix):

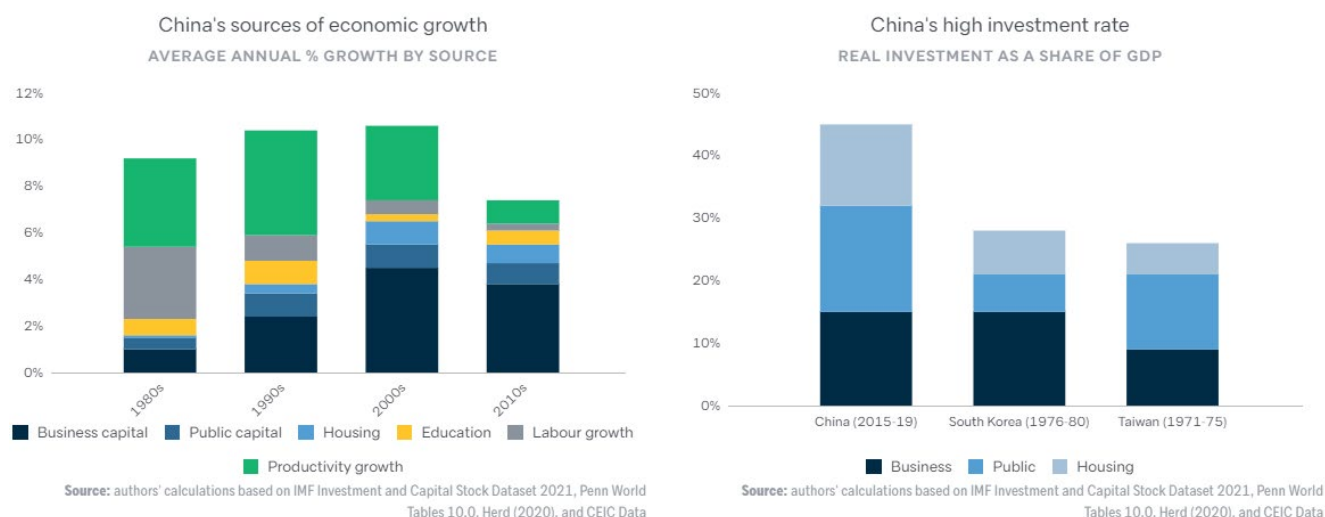
1. A conventional model with a single type of capital, drawing upon the widely used capital stock estimates of the Penn World Table.
2. A model differentiating between public and private capital, using capital stock estimates compiled by the IMF.
3. A model differentiating between business, housing, and public capital drawing upon China-specific capital stock estimates used by the World Bank.
4. Finally, two additional models that blend the China-specific estimates for different types of capital with the internationally comparable estimates produced by the Penn World Table and IMF respectively.

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We adopt the last model, blending China-specific and internationally comparable capital stock estimates from the IMF, as our baseline approach, in part because it produces results at the middle of the range. Despite the differences across the models, China’s projected growth falls within a narrow range averaging 2–3% a year to 2050. This suggests our overall conclusion of a substantial impending growth slowdown is robust.

Figure 2 uses our baseline growth accounting approach to examine the proximate sources of China’s economic growth over the preceding decades. Economic growth slowed from around 10% a year over 1980–2010 to just under 7% during the past decade. An expanding workforce was a major source of economic growth during the 1980s, but its contribution shrank as China’s one-child policy greatly reduced the number of new workers entering the workforce. Productivity growth was a major source of growth during the first three decades of China’s reform and opening up period, but at a slowing pace especially in the past decade. Meanwhile, rising levels of education have made a consistent modest contribution to economic growth.

Figure 2: China’s investment-driven growth model



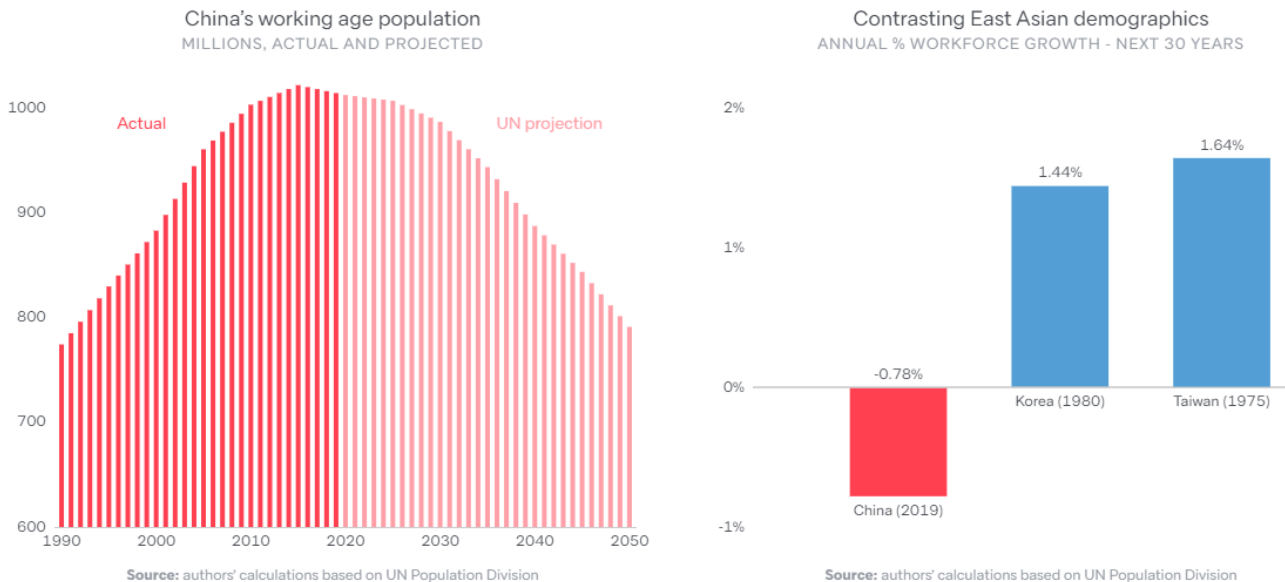
The biggest source of China’s growth by far in recent times has been capital accumulation, accounting for three-quarters of growth during the last decade. Notably, while investment in housing and public capital account for the lion’s share of investment (Figure 2, right panel), business capital (including by state-owned firms) is estimated to have been the far larger source of growth (Figure 2, left panel), reflecting its higher economic returns.

This has two major implications for thinking about China's growth potential that we explore further in the paper. First, a future reduction in China's extremely high investment rate due to lower housing and infrastructure investment would have much less severe growth implications compared to a reduction in business investment. And second, business investment has nonetheless also been relatively high, indicating that this too can be expected to increasingly suffer from diminishing returns.

CHINA’S DEMOGRAPHIC CONSTRAINT

The most straightforward aspect of China’s long-term growth outlook is its stark demographics. The legacy of China’s draconian past population policies and its rapid demographic transition mean China’s population is set to shrink and age rapidly over the coming decades. China’s working age population has been shrinking since the middle of last decade. The latest national census indicates that the fertility rate has fallen rapidly over the past decade to just 1.3 births per woman in 2020 — well below the replacement rate of 2.1. This is broadly in line with the lower-case projections of the United Nations, which suggest that by 2050 China’s working age population will have shrunk by roughly 220 million people (Figure 3, left panel) — about one-fifth of its current level — while rapid ageing will see its demographic profile quickly converge on that in Europe, which is itself ageing. Over-65s will constitute more than a quarter of the Chinese population by 2050.

Figure 3: China’s disadvantageous demographic outlook



Importantly, China’s ability to materially offset this demographic outlook is limited. Beijing has been relaxing family planning restrictions over the past decade — most recently introducing a three-child policy — but so far to minimal effect.¹⁷ With Chinese family preferences having seemingly shifted towards smaller sizes, lifting fertility will at

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minimum take time, with success in any case requiring around two decades to translate into an increase in available workers.

Similarly, efforts aimed at lifting labour force participation will likely only make a marginal difference in the scheme of things. By our estimate, easing mandatory retirement rules, for instance, might only add around 14–17 million extra workers to China's total labour force.¹⁸ That would only be enough to offset the decline in overall participation in the labour force that we estimate can be expected anyway as China's population ages — as older workers are more likely to stop working (or reduce their hours) even before reaching retirement age. Meanwhile, other policy options such as improving access to child and aged care services to encourage women to stay in the workforce must contend with the fact that China's female labour force participation rate is already abnormally high, suggesting further substantial increase may be difficult, while government policy efforts to lift fertility would simultaneously be pushing in the opposite direction.

Comparing China's demographic outlook with that of South Korea and Taiwan historically (Figure 3, right panel), makes clear how significant the implications are for China's future growth prospects and why it is virtually impossible for China to match the headline growth rates of its East Asian miracle predecessors. South Korea and Taiwan are generally seen as the most relevant benchmarks for China's future growth potential, whereas Japan's performance was boosted by post-war recovery, while Hong Kong and Singapore are city-states. South Korea and Taiwan were each at a similar level of relative economic development as China today in 1980 and 1975 respectively. Back then, both were in the middle of their demographic dividends, with workforces expanding by about 1.5% a year for the next three decades. By contrast, China's workforce is expected to contract by an average of 0.8% a year — a more than two percentage point difference.

Population ageing will, however, likely sap China's future growth prospects by even more. As already mentioned, easing retirement age rules would be required simply to offset declining labour force participation with population ageing. Demographic decline will also reduce the need for additional investment — especially in housing and infrastructure, but also business assets — as well as contributing to productivity headwinds, as economic activity shifts towards domestic services (e.g. aged care) with lower productivity growth, as discussed in the following sections.

HOUSING INVESTMENT FACES STRUCTURAL DECLINE

China's demographic decline means there will be fewer people needing houses to live in than otherwise. This suggests that China's housing market now faces structural decline. Major repercussions are likely as a result, with the Chinese housing market already going through a difficult regulatory-driven financial shake out following decades of rapid growth and investment. Over the past two decades, housing investment is estimated to have doubled to 14% of GDP, accounting for about half of all private fixed investment.¹⁹ By comparison, total real estate investment was 6% of GDP in the United States at the height of its own construction boom in the mid-2000s.

Concerns about oversupply, excessive leverage, speculative investment, and rapid price increases are longstanding. China's policymakers have recently begun to rein in the housing market more decisively as a result, through tightening regulatory controls, slowing mortgage growth, and imposing new rules limiting the ability of property development companies to borrow if they fail to meet "three red lines" governing key financial ratios. China Evergrande — a massive conglomerate with total liabilities amounting to 3% of China's GDP — was the first major casualty and sparked concerns about broader economic contagion.²⁰ Evergrande ran afoul of all three financial red lines, pushing the developer into a liquidity crunch that could lead to bankruptcy.

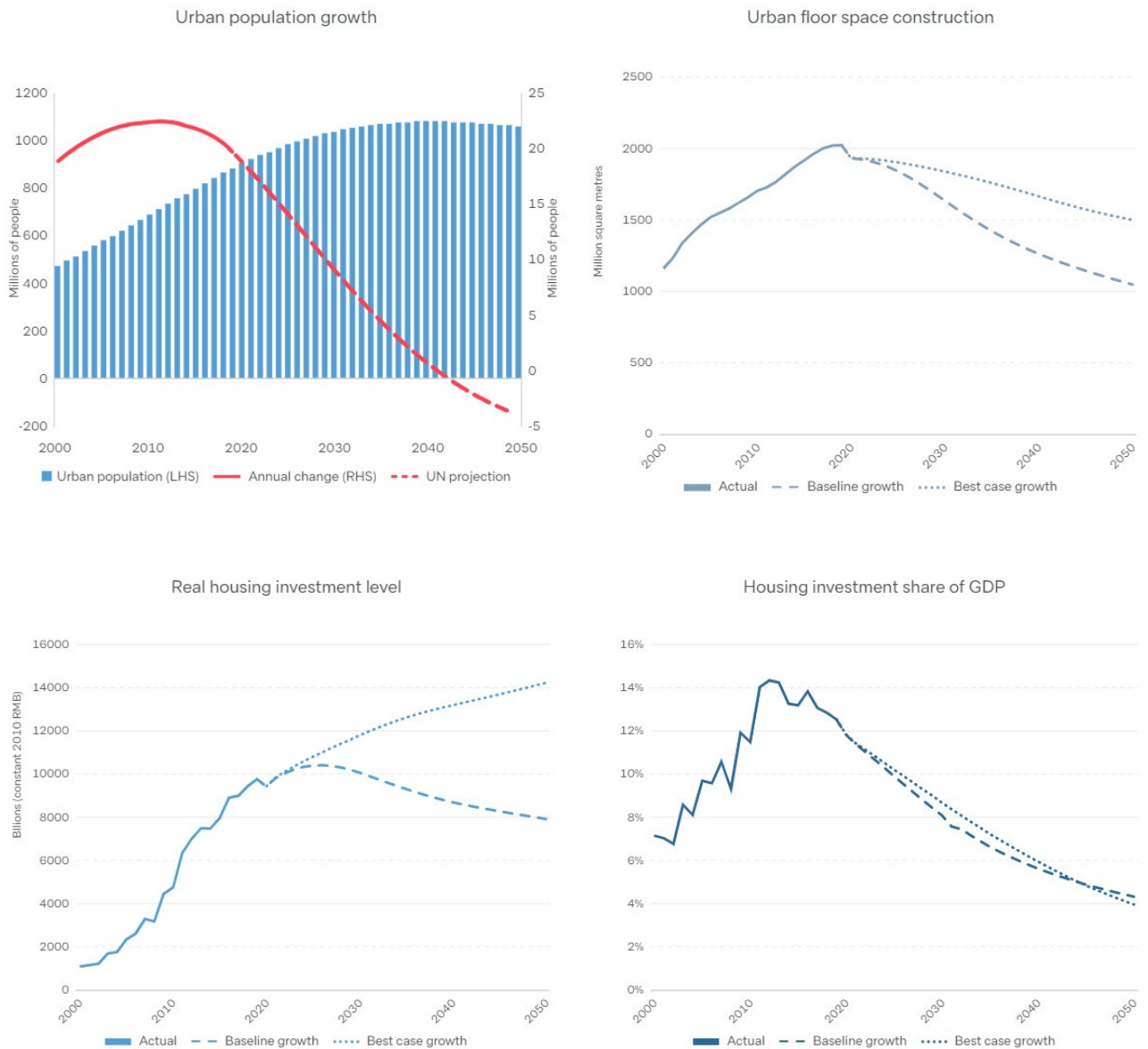
How Beijing manages these near-term risks to contain any broader economic damage remains to be seen. On the one hand, the government has managed similar problems in recent years at other large, troubled corporates without triggering wider financial issues.²¹ On the other hand, many large property development companies appear financially vulnerable and market conditions will likely become more difficult, as detailed below.²²

The fundamental issue from a long-term growth perspective is that the housing sector faces structural, not only cyclical, decline. This is driven by China's uniquely stark demographic outlook as well as a slowing economy. Figure 4 projects the future of urban housing investment in China to 2050.²³ China's urban population is expected to rise until the 2040s, but at a sharply decelerating rate compared to previous decades — following UN projections for ongoing rapid urbanisation, but with a shrinking overall population (Figure 4, top left panel). As a result,

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China will go from an increase of about 20 million additional people living in urban areas each year today to just 10 million additional people each year by 2030. By the 2040s, the number of people living in urban areas will be *falling* by a few million people each year.

Figure 4: China's housing sector faces structural decline



Total demand for urban floor space can be expected to grow a little faster than the urban population itself, as rising incomes lift per capita demand, though at a slower pace than previously due to slower economic growth. Nonetheless, this income effect pales in comparison to decelerating urban population growth, implying a dramatic decline in annual urban housing construction (Figure 4, top right panel). By the 2040s, urban floor space construction will be sustained entirely by the need to maintain the existing housing stock.

Demand for higher quality housing as per capita incomes rise would keep housing investment elevated in real terms until around the end of the 2020s, but this too eventually enters structural decline (Figure 4, bottom left panel). Housing investment will therefore become a drag on the overall Chinese economy, falling from a peak of 14% of GDP a few years ago to eventually just 4% of GDP by 2050 (Figure 4, bottom right panel). Importantly, even in the best-case scenario where China can sustain economic growth at 5% a year to 2050, housing investment declines sharply in importance as other parts of the economy grow more rapidly.

Considering additional factors mostly renders the outlook for China's urban housing market even more negative. While demand for housing in China may be especially strong due to social norms favouring home ownership and limited alternative investment options, housing demand for these purposes looks increasingly satiated — with around 90% of urban registered households²⁴ reportedly owning their own home and most homebuyers already owning at least one other house.²⁵ Combined with longstanding signs of oversupply, this suggests that the historical relationship between rising income and housing demand could if anything weaken going forward. Finally, weaker future economic growth would likely reduce urban employment opportunities and potentially therefore the pace of rural-urban migration. Faster reform of China's *hukou* system of internal migration controls, conversely, could provide a significant new source of fundamental housing demand.²⁶

The implications for China's economy from the end of the housing boom will be far-reaching, and potentially destabilising. Local government budgets would come under strain, as land transfer fees make up a third of local fiscal revenue. Financial system fragilities related to real estate have also grown substantially. As noted, many property development companies are financially fragile. Real estate also now accounts for 30% of outstanding bank loans and the household leverage ratio has tripled over the past decade to 60% of

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GDP. In addition, Chinese house prices are amongst the most expensive in the world relative to local incomes — and thus exposed to a potential sharp price correction.²⁷

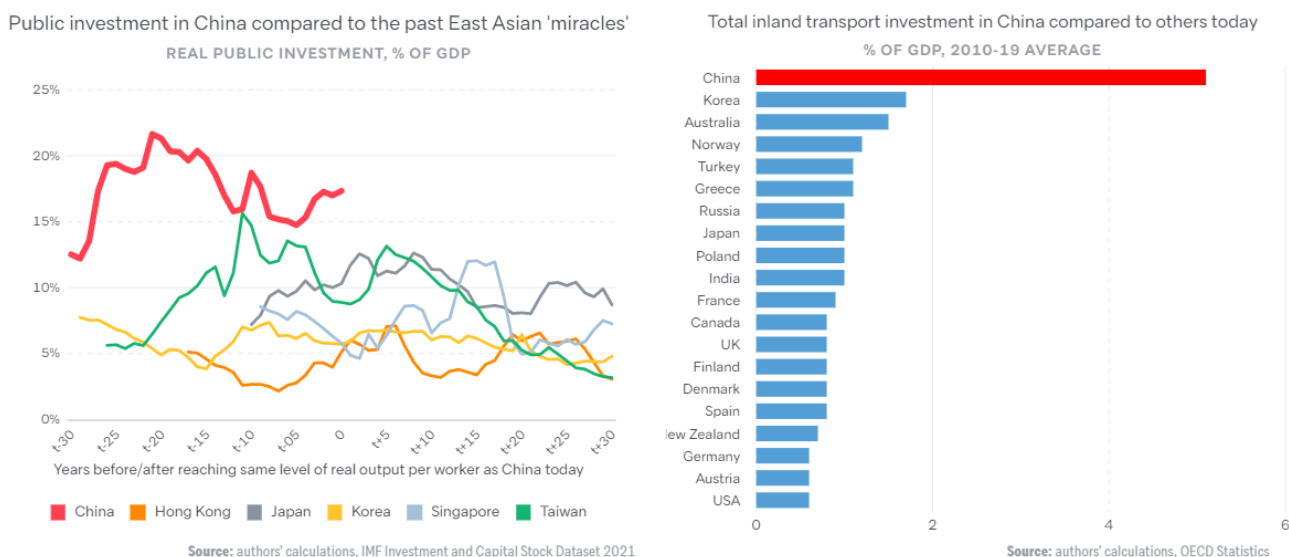
Because the decline of housing investment is structural, policy attempts to resist this and keep investment artificially elevated would only risk generating even more problematic oversupply issues. How challenging this proves will in considerable part depend on the broader macroeconomic growth environment. As the bottom left panel in Figure 4 highlights, this will determine whether China's housing sector enters absolute or relative decline.

Our argument that growth is likely to slow substantially over the coming decade should therefore be of particular concern. China's policymakers will face a difficult task of managing down the housing boom. But even assuming these challenges can be successfully navigated, lower housing investment will nonetheless be an important drag on future Chinese economic growth.

THE LIMITS OF OVER-INVESTMENT IN PUBLIC INFRASTRUCTURE

According to estimates compiled by the IMF, China’s public investment rate (a rough proxy for infrastructure investment) is about 16% of GDP or a little over a third of total fixed investment. While high infrastructure investment was an important ingredient in the experience of the East Asian miracle economies of the past, public investment in China has been substantially higher than in any of these cases (Figure 5, left panel). Looking at an alternative measure compiled by the Organisation for Economic Co-operation and Development (OECD) for inland transport investment, China again stands out, investing vastly more than any other major economy today (Figure 5, right panel).

Figure 5: China invests far more in public infrastructure than others

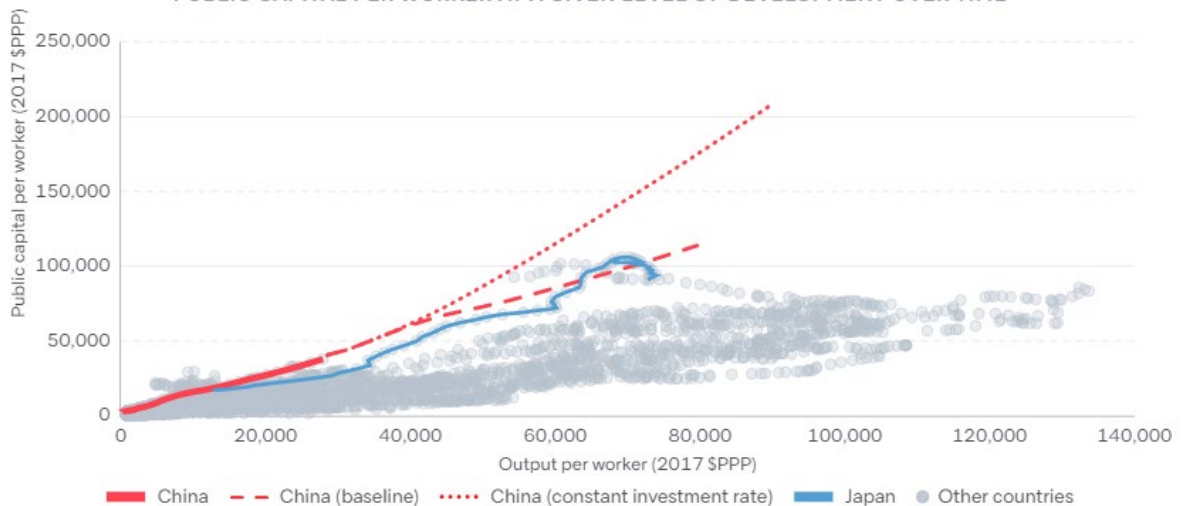


The merits of China’s over-investment model have been debated for some time. Critics have long argued that it is inefficient and wasteful, while others have often responded by pointing to China’s low stock of capital per worker as evidence that this can be economically justified.²⁸ China’s high-speed rail (HSR) network epitomises its high infrastructure investment strategy and the debate surrounding it. A 2019 World Bank report notes that China was the first country at such a relatively low-income level to begin developing an HSR network.²⁹ Nonetheless, since 2008, it had installed over 25 000 kilometres of dedicated high-speed

railway lines, vastly more than in the rest of the world combined. Critics point to China’s HSR network as a key example of wasteful over-investment. Yet the World Bank report concludes that the HSR network appears not only financially viable, but also to be delivering strong economic benefits on net.

Whatever the merits of China’s past high infrastructure investment strategy, the country’s circumstances have now changed dramatically. After decades of heavy investment, China’s public capital per worker ratio is no longer so low. Figure 6 displays the level of public capital per worker across countries and time for a given level of output per worker. Public capital per worker in China is now much higher than that seen in most other emerging economies when they were at a similar level of economic development — including the East Asian miracle economies in the past — and already comparable to some advanced economies. This picture is confirmed looking at indicators of infrastructure quality. For instance, according to the Global Competitiveness Report, China is ranked either first or second in the world on measures of airport connectivity, shipping connectivity, and electricity access and tenth in terms of road connectivity.³⁰ As mentioned, China already has the world’s largest HSR network. HSR now makes up over 40% of China’s total rail network — more than double the share in Korea, Spain, or Japan as the nearest competitors.³¹

Figure 6: China’s public capital trajectory in global perspective
PUBLIC CAPITAL PER WORKER AT A GIVEN LEVEL OF DEVELOPMENT OVER TIME



Source: authors' calculations based on IMF Investment and Capital Stock 2021 Database and Penn World Tables 10.0
Notes: * excludes outlier observations including small states, resource rich economies, and post-WWII recovery years in Europe

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China's already elevated level of public capital per worker means it is running out of scope to use public investment as a driver of rapid economic growth. For one, Chinese public investment will suffer from much sharper diminishing returns going forward compared to both its own recent experience and that of the past East Asian miracle economies, which at a similar point of development had more room left to benefit from additional infrastructure spending.

In addition, comparing China to the international historical record suggests that it cannot continue with such a high rate of public investment for much longer. If China continues to invest in public capital at the current rate as shown in the projection in Figure 6, public capital per worker would quickly begin to reach absurd levels.³² By 2030, public capital per worker would be about US\$80 000, a level similar to some of the richest countries in the world today, despite China still having vastly lower average worker productivity — indicating substantial inefficiency. By 2040, public capital per worker in China would be US\$120 000 — about 50% higher than most rich economies, well beyond even Japan's abnormal experience, and heading towards a level more than twice as high as that in any other country by 2050.

Unless one wants to entertain fantastical notions of Chinese infrastructure exceptionalism, maintaining the current pace of public infrastructure investment seems implausible without running into some sort of secular limit, or crisis — with investment descending into ever greater excess capacity, inefficiency, and outright waste. In our growth projections, we therefore assume a more reasonable path where public investment falls to about 8% of GDP, about half the current rate, and is kept at that level. This would, for instance, deliver a trajectory similar to Japan's experience over the past few decades.

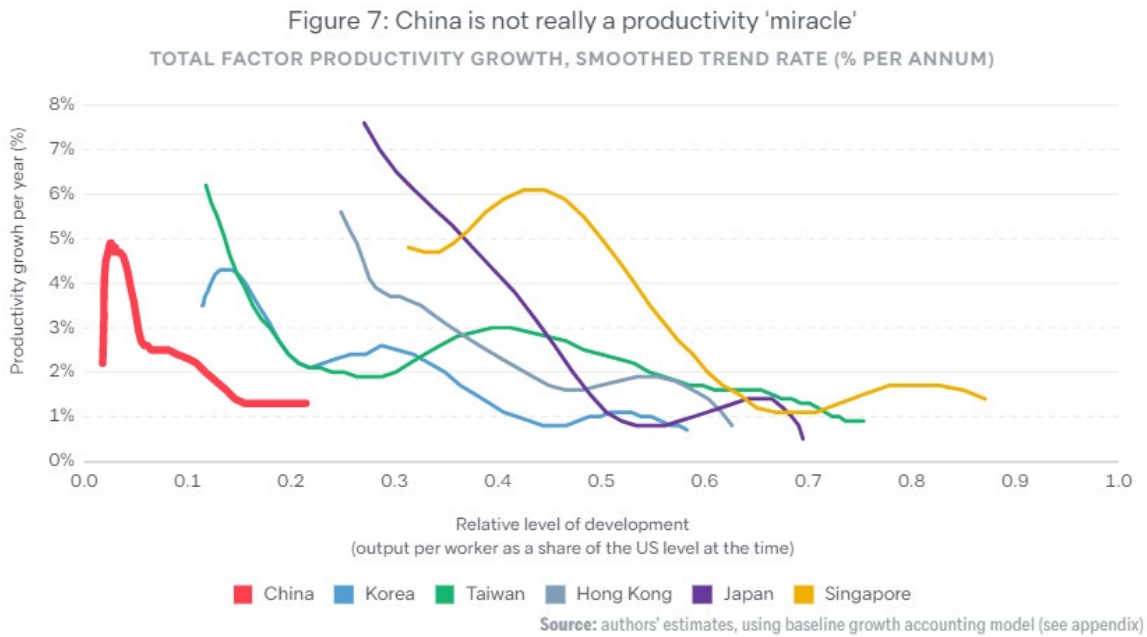
NO PRODUCTIVITY MIRACLE

China has many factors in its favour that should augur well for future productivity growth — including a relatively well-educated workforce, good infrastructure, clear innovative capabilities, and a large internal market.

Future Chinese economic progress will increasingly be determined by the future of Chinese productivity growth. As noted in *The Economist*, China’s leaders have become “obsessed with how to boost productivity” and have set out wide-ranging policy initiatives to achieve this, focused on industrial modernisation, better urbanisation, and various reforms aimed at lifting efficiency.³³ China has many factors in its favour that should augur well for future productivity growth — including a relatively well-educated workforce, good infrastructure, clear innovative capabilities, and a large internal market. The key question however is: what pace of productivity performance can China realistically achieve?

China has achieved significant productivity gains over the past four decades since reform began, with productivity growth averaging 3.9% a year over the entire period by our estimate. However, placed in proper context, China’s performance looks less impressive. China is not really a “miracle” economy when it comes to productivity. Instead, China’s historically strong productivity performance appears more a reflection of its incredibly low starting point, the deep inefficiencies plaguing the planned economy of Maoist China, and the large catch-up dividends unleashed by gradual market-oriented reforms over the ensuing decades.³⁴

Figure 7 compares China’s productivity performance to that of the East Asian miracle economies when each was at a comparable level of development relative to the United States. This reveals that China’s performance has been “miracle-like” largely because it began its rapid catch-up-growth phase at a much lower starting point. When China began its reform and opening up period in the late 1970s, its output per worker was just 2% of that in America, compared to around 10–25% when each of the East Asian miracle economies generally began their own periods of super-fast growth. At comparable levels of development, Figure 7 shows that Chinese productivity growth appears to have underperformed by a wide margin.



What about the future? Chinese productivity growth has been slowing according to most estimates (and even turned negative according to some).³⁵ Looking ahead, while it is always difficult to judge where future Chinese policy directions might lead, there are good reasons to think that productivity growth will continue to slow over the long term — even if things go reasonably well.

First, slowing productivity growth would be in line with standard economic thinking about the nature of catch-up growth. One of the central tenets of growth economics is that of “conditional convergence”: the idea that poorer countries tend to grow faster than richer ones after controlling for other key variables.³⁶ The corollary is that growth tends to slow as countries grow richer and the opportunities for easy catch-up gains dissipate. China’s decelerating long-term productivity trend demonstrates that it has been no exception to the general pattern.

Moreover, in China’s case, the biggest productivity wins — dismantling its planned economy, opening up to international trade, investment and ideas, and moving workers from low productivity agriculture into higher productivity industrial and urban service jobs — have largely already been realised. Future productivity gains will therefore likely be increasingly incremental and more reliant on building new institutional capabilities that inherently take time to develop — for example, a modern financial system that directs capital to the most productive

On the trade front, China was already forced to move away from export-driven growth after the 2008–09 financial crisis, a trend since reinforced as bilateral relations with the United States have deteriorated.

investments, capable regulatory institutions that can support higher quality growth, and a well-functioning legal system that provides a stronger foundation for private entrepreneurship and innovation.

A second (related) reason to expect slower future productivity growth is the idea of the “middle income trap”.³⁷ Whether or not a specific “trap” exists is debatable.³⁸ What is clear however is that the reform requirements for sustaining rapid growth get harder to successfully deliver as countries develop, at both a technical and political level. In line with this, most contemporary assessments of the overall pace of reform in China conclude that progress over the last decade has been mixed at best — with the explanation down to a combination of vested interests blocking reform (e.g. reform of state-owned enterprises) and the technical complexity of achieving the desired reforms (e.g. combating moral hazard in the financial system without triggering instability or further opening up the capital account without prompting excessive capital outflows).³⁹

The implication is that, even though there are many reforms that China might usefully undertake, whether these are successfully pursued, and at a sufficient pace, is a very different matter. Abolishing China’s *hukou* system, for example, is a longstanding and well-recognised growth priority that would likely deliver substantial economic (and social) benefits — supporting the manufacturing sector, reducing precautionary saving, encouraging stronger household consumption, and enabling a smoother adjustment in the housing market. Nonetheless, *hukou* reform continues to proceed slowly.⁴⁰

A third reason to expect productivity growth to slow is that China faces specific additional headwinds. Whereas the previous East Asian miracle economies benefitted substantially from relatively unfettered access to Western markets and technologies, geopolitics means China can no longer do so and instead faces the prospect of intensifying “decoupling” with the United States and potentially other advanced Western economies.⁴¹

Decoupling refers to government measures aimed at reducing economic interdependencies for geopolitical reasons — particularly in trade and technology. On the trade front, China was already forced to move away from export-driven growth after the 2008–09 financial crisis, a trend since reinforced as bilateral relations with the United States have deteriorated. China’s immense size and already very large position in global manufacturing exports also suggest limits as to its

ability to continue to rely on export-led growth the way the previous miracle economies were able to.⁴²

Technological restrictions will reduce China's access to the global technological frontier while also disrupting its own technological innovation by reducing the scope for cross-border collaboration.⁴³ The ultimate impact on China's growth is inherently difficult to predict and will depend on the extent of restrictions put in place, how markets reorganise, and China's success in plugging key points of vulnerability (such as advanced semiconductors). But the effects threaten to be significant. A recent IMF study, for instance, estimates that technological spillovers linked to research and development in the United States have contributed about 0.2 percentage points to annual productivity growth in China in recent years.⁴⁴ Adding in spillovers from Germany, Britain, France, and Japan takes the figure to 0.3 percentage points. Compounding a 0.2–0.3 loss in annual productivity growth would imply a cumulative 6–8% reduction in GDP by 2050 compared to otherwise.

In part due to deteriorating external circumstances, China is looking to become more inwardly focused, with the new “dual circulation” strategy deepening Beijing's emphasis on relying more on domestic consumption and indigenous innovation.⁴⁵ This may be a necessary response to put the economy on a more sustainable and resilient footing. But it is also a recipe for slower productivity growth. Greater domestic consumption implies a shift towards producing domestic services, which tend to exhibit relatively slow productivity growth, pulling down the economy's overall productivity performance.⁴⁶ Rapid population ageing will reinforce this effect, as health and aged care services also tend to exhibit slow productivity growth. Meanwhile, even successful domestic innovation efforts will likely deliver much smaller productivity gains compared to the standard catch-up strategy of absorbing and adapting knowledge and technologies from overseas.⁴⁷

Assuming China continues along its current trajectory therefore suggests that productivity growth will continue to slow, even assuming Chinese policy proves reasonably successful. What pace of productivity growth might China then realise over the coming decades? Starting at a broadly similar point of development to China today, productivity growth in the original East Asian miracle economies decelerated by roughly 30% over the next three decades. If China follows a similar pattern, productivity growth would average 1% a year to 2050. Implicitly, this assumes China is able to achieve a similar degree of success in sustaining past progress as seen in the original

Technological restrictions will reduce China's access to the global technological frontier while also disrupting its own technological innovation by reducing the scope for cross-border collaboration.

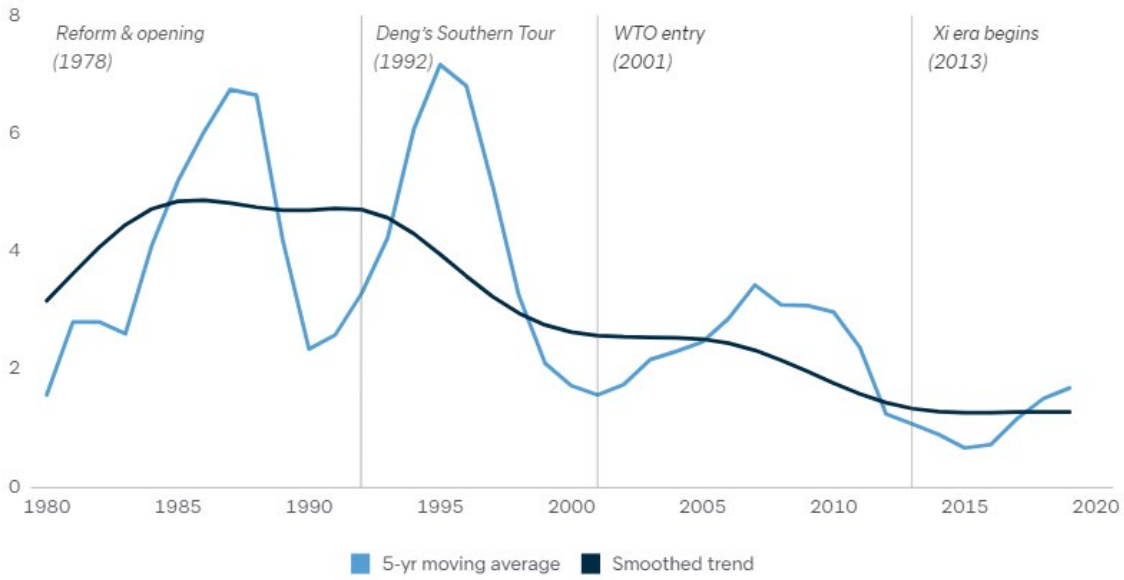
The political imperative to maintain economic legitimacy means China's policymakers have a successful track record of unleashing new waves of productivity-enhancing reforms in response to weakening economic prospects.

East Asian miracle economies, after correcting for China's weaker track record.

An alternative approach is to seek to link future productivity growth to potential improvements in China's policy and institutional settings, as several other studies of China's future growth prospects do.⁴⁸ While that approach is useful for making the case for economic reform, for the purposes of constructing baseline expectations of China's long-term growth it has important drawbacks compared to a more straightforward trend extrapolation. As previously noted, the link between observable reform and accelerations in economic growth is empirically murky. More important, critical assumptions must in any case be made about the pace of future policy and institutional improvement. Yet it is not clear what should guide any such assessment other than attempting to extrapolate China's reform track record to date. Our approach, therefore, is to simply let China's *productivity* track record speak for itself, rather than unnecessarily muddying the waters.

A final related consideration is the possibility that weakening economic growth will eventually prompt the adoption of more forceful economic reform. The political imperative to maintain economic legitimacy means China's policymakers have a successful track record of unleashing new waves of productivity-enhancing reforms in response to weakening economic prospects. Any baseline projection of China's long-term economic future needs to reflect this. Nonetheless, delivering long-term productivity growth is not simply about unleashing a new wave of productivity-enhancing reforms. Rather, it is about sustaining continual improvement over decades. Figure 8 shows that China's history is one of periodic reform waves in response to deteriorating economic performance, nonetheless occurring around a clear decelerating trend — partly reflecting deep structural forces, but also the reality that China's considerable reform capabilities are, ultimately, subject to limits. In other words, even allowing for an eventual acceleration in reform, there is no strong empirical reason why baseline expectations of China's long-term productivity performance should deviate from its gradually slowing long-term trend.

Figure 8: Unleashing versus sustaining productivity growth
CHINA % TFP GROWTH, 5 YEAR MOVING AVERAGE VS SMOOTHED TREND



Source: authors' estimates, using baseline growth accounting model (see appendix)

ESTABLISHING A BASELINE FOR CHINA'S LONG-TERM GROWTH

Looking at the proximate sources of where growth might come from suggests that China's economy should be expected to slow substantially over the coming years and decades ahead.

Looking at the proximate sources of where growth might come from suggests that China's economy should be expected to slow substantially over the coming years and decades ahead. An outlook for gradually slowing growth is standard for any rapid catch-up economy. But the twin legacies of China's uniquely draconian population policies and investment-heavy growth model mean China's future deceleration is likely to be much sharper.

We now pull together our assessments from the preceding sections to project future Chinese economic growth. The size of China's workforce is expected to shrink in line with the lower-case demographic projection of the United Nations. We assume China lifts retirement age rules. However, we estimate that this will merely offset the expected decline in labour force participation due to population ageing. For average worker education, we extrapolate recent trends, which show a slowly decelerating pace of human capital improvement. Owing to structural decline, housing investment is projected to fall from a peak of about 14% of GDP to 4% of GDP by 2050. Public investment is assumed to fall to 8% of GDP by 2030 and remain at that level thereafter, delivering a more sustainable, though still extreme, trajectory of public capital per worker.

Lower housing and public investment could potentially free resources for greater business investment.⁴⁹ However, a major lift in business investment seems unlikely. Progress with market-oriented reforms has been limited and, without this, decelerating growth would more likely see business investment deterred, rather than encouraged.⁵⁰ Nonetheless, we lean toward the optimistic side and allow for higher business investment to offset half of the decline in housing investment from 2030 onwards. Taking all this into account, total investment falls from the current 43% of GDP to 33% of GDP on average over the coming decades. This is again a somewhat optimistic assumption given several studies suggest that China's national savings rate will likely decline by an even greater margin.⁵¹

Finally, productivity growth is assumed to slow by 30% compared to its current trend pace to a long-term average of 1% a year, in line with the experience of the original East Asian miracle economies from a similar

point of development and again leaning towards the optimistic side by ignoring the additional headwinds from decoupling and a more inwardly oriented economy that China is likely to face.

Pulling together these projected building blocks of future growth suggests that China’s economic progress will slow appreciably over the coming decades from a trend pace of about 6% today to a projected range of 2–3% a year to 2050, depending on the specific growth model and data sources used. Using our baseline model, growth would average 2.5% a year to 2050. Much of the decline is projected to occur over the coming decade, with annual growth decelerating to around 3% a year by 2030 and further to about 2% a year by 2040.

Figure 9: China's sources of economic growth
AVERAGE ANNUAL % GROWTH BY SOURCE

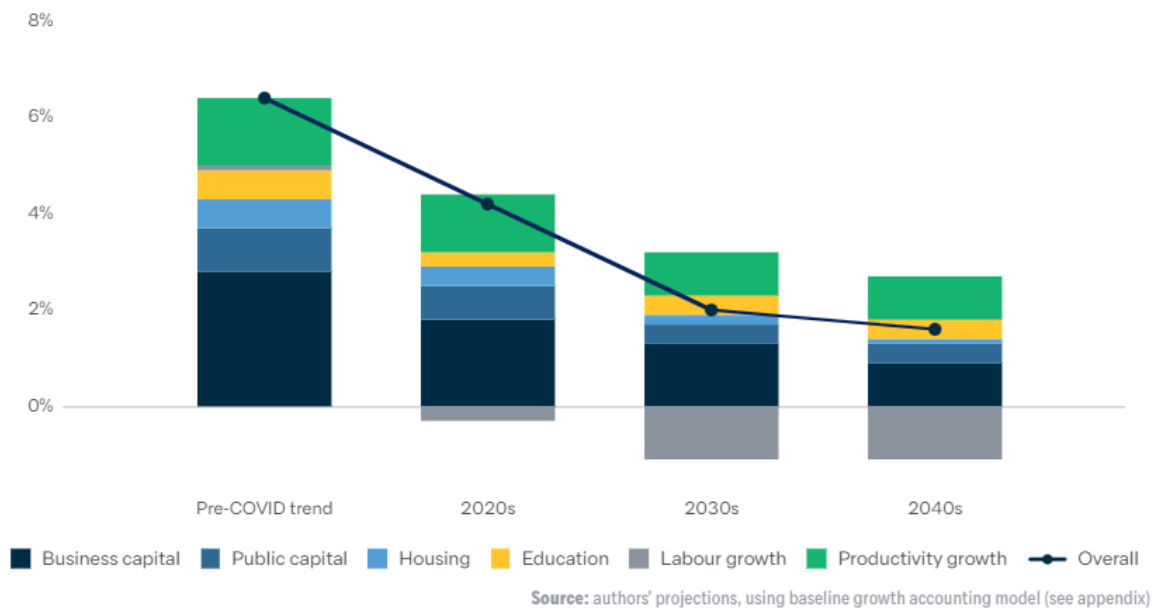
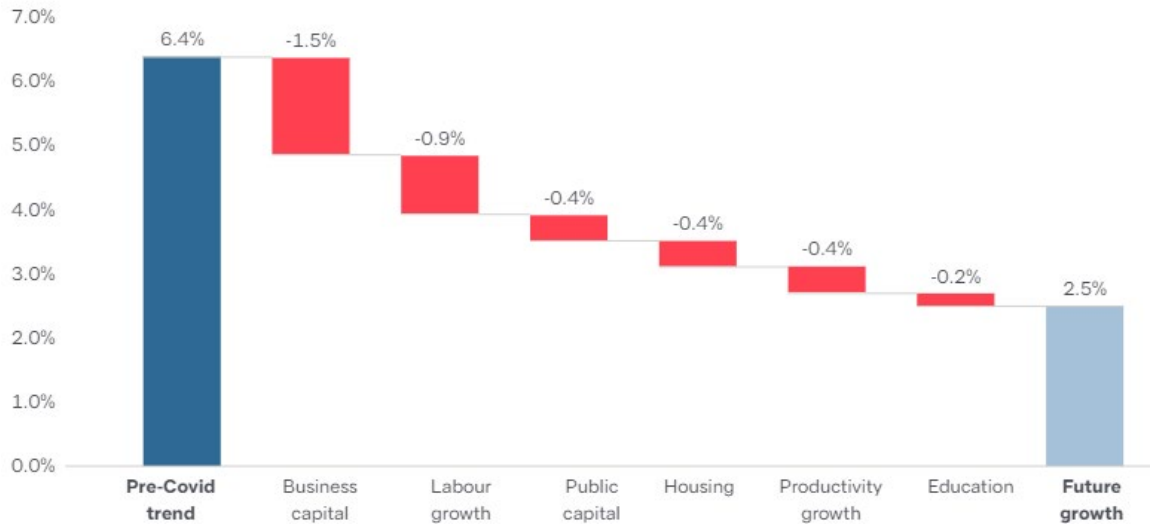


Figure 9 shows projected growth and its proximate sources over the coming decades. The majority of future economic growth would continue to come from business investment and productivity growth, while demographics will subtract substantially. Figure 10 focuses specifically on the sources of China’s growth deceleration compared to its trend pace prior to Covid-19. Interestingly, business investment is the largest single source of growth deceleration, reflecting diminishing returns, even as it remains the largest single source of future growth. Meanwhile, housing and public investment are much smaller sources of deceleration, reflecting the much smaller growth contribution made by these areas to begin with.

Figure 10: Sources of future growth deceleration to 2050
 BASELINE PROJECTION TO 2050 RELATIVE TO RECENT TREND GROWTH, % PER ANNUM



Source: authors' projections, using baseline growth accounting model (see appendix)

Although we project future Chinese economic growth to slow sharply, this is not predicated on China “failing”. Rather, the projections assume China continues to succeed. Investment would remain high by international standards and comparable to the pace seen in South Korea and Taiwan at an analogous point of development. Productivity growth would remain reasonably robust. Growth in output per worker, the most important measure of economic progress, would average 3–4% a year, similar to the pace seen in other upper middle income countries prior to the Covid-19 pandemic.

Rather than forecasting the failure of China, the core drivers of China’s projected slowdown are simply the legacy effects of China’s historical population policies and heavily investment-driven growth model. In this sense, our projection of substantially slower future growth is qualitatively different to those of many other China growth pessimists whose predictions are based on the idea that China will eventually cease to be “special”, that policy is becoming increasingly deficient, or that a financial crisis is almost inevitable. Without discounting these more pessimistic predictions, our argument is more straightforward in that the sources of future deceleration are readily identifiable, follow naturally from China’s particular growth history, and will occur even if economic policy remains broadly successful.

REVISING DOWN THE RISE OF CHINA

Nonetheless, our baseline projections are notably lower than the majority of existing studies, which predict growth averaging around 5% to 2030 and 3.5–4% overall to 2050 (and well below expectations amongst geopolitical analysts for growth of 5–6% a year to 2050). This is especially striking since we adopt relatively optimistic assumptions, including that business investment will rise, overall investment levels will remain relatively elevated despite downward pressure on national savings from an ageing population, and that productivity growth will only trend mildly lower in line with the experience in other East Asian success stories despite the additional headwinds China faces from decoupling. The key difference between our analysis and most existing studies is that the latter often either do not explicitly incorporate the degree to which China’s growth has been heavily capital-intensive, and therefore cannot be easily sustained, or they implicitly make overly optimistic assumptions about the pace of future productivity growth (as discussed in the next section).

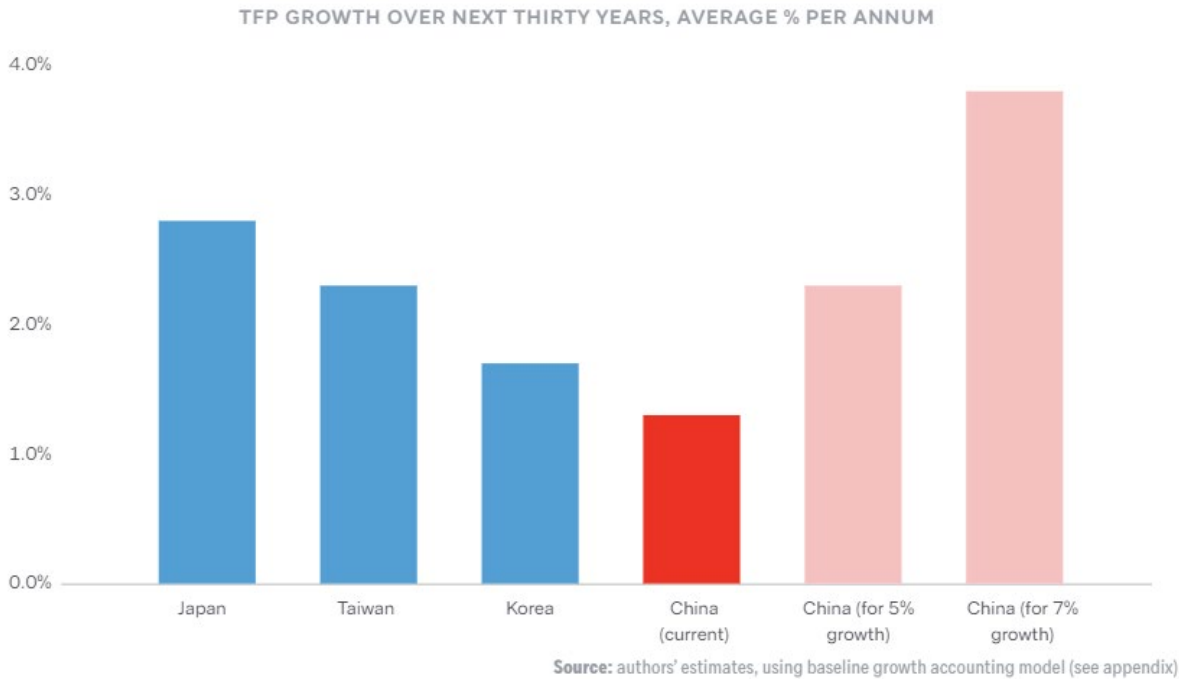
HOW REALISTIC ARE MORE BULLISH FORECASTS?

Given China's demographic outlook and limited scope for further growth through capital accumulation, achieving growth materially faster than our baseline range of 2–3 per cent a year would essentially require China to achieve much faster productivity growth.

China notionally has the potential to grow faster than our baseline projection. Given China's demographic outlook and limited scope for further growth through capital accumulation, achieving growth materially faster than our baseline range of 2–3% a year would essentially require China to achieve much faster productivity growth. A common line of argument is that China is still well below the global productivity frontier, implying it still has considerable scope for rapid catch-up growth. We have however already argued that, while this is possible, there are strong reasons to think it will be difficult for China to translate this potential into faster productivity growth, which is instead more likely to continue to slow. Nonetheless, the potential exists. The question then is, what pace of productivity growth and therefore overall economic growth might be realistic in a more bullish scenario?

Before we turn to productivity specifically, we first allow for more optimistic assumptions regarding business investment and human capital improvement. Specifically, we assume China is able to fully, rather than partially, redirect the projected reduction in housing investment into higher business investment from 2030 onwards. Diminishing returns, given China's business investment rate is already relatively high, means this however only adds another 0.2 percentage points to average annual economic growth to 2050. China can also try to do better in improving education rates. China's workforce is however already relatively well-educated given its per capita income level. And with fewer young workers entering the labour force, it will be difficult for China to dramatically raise the average education level of its workforce (unless China opened its borders to significant skilled immigration, which is unlikely). For argument's sake, we assume that China is able to accelerate the pace of human capital increase to twice the pace assumed in our baseline. This adds another 0.3 percentage points to annual economic growth.

Figure 11: Productivity growth in East Asia from a similar point of development to China today



Given this, what rate of productivity growth would it take for China to achieve average growth of 5–7% a year to 2050 as the more bullish predictions suggest is possible, and how feasible is this? Figure 11 provides an instructive answer. It shows the pace of productivity growth required to achieve economic growth of 5–7% a year to 2050 and compares this to both China’s own recent performance and that seen historically in Japan, Taiwan, and South Korea from an analogous point of development. Getting to 7% growth would require Chinese productivity growth of 3.8% a year — a proposition that seems almost infeasible.⁵² Doing so would require China not only to far exceed the productivity performance of the original East Asian miracle economies, but also return to a pace of productivity growth not achieved in China since the mid-1990s.

Achieving 5% economic growth appears more feasible, though still a task well beyond China’s current trajectory. This would require China not only to lift its current productivity performance substantially from 1.3% to 2.3% a year, but also to sustain this for decades, despite the fact that productivity growth is more likely to slow, as earlier discussed. The last time China was able to achieve productivity growth around that pace was before the 2008–09 financial crisis.

Moreover, Chinese productivity growth has to date underperformed the original East Asian miracles at comparable points of development by a sizeable margin. Yet, to deliver 5% economic growth, China would need to exceed the historical productivity performance of South Korea and match that of Taiwan from a similar point of development, despite the fact that China is likely to face additional obstacles from trade and technological decoupling.

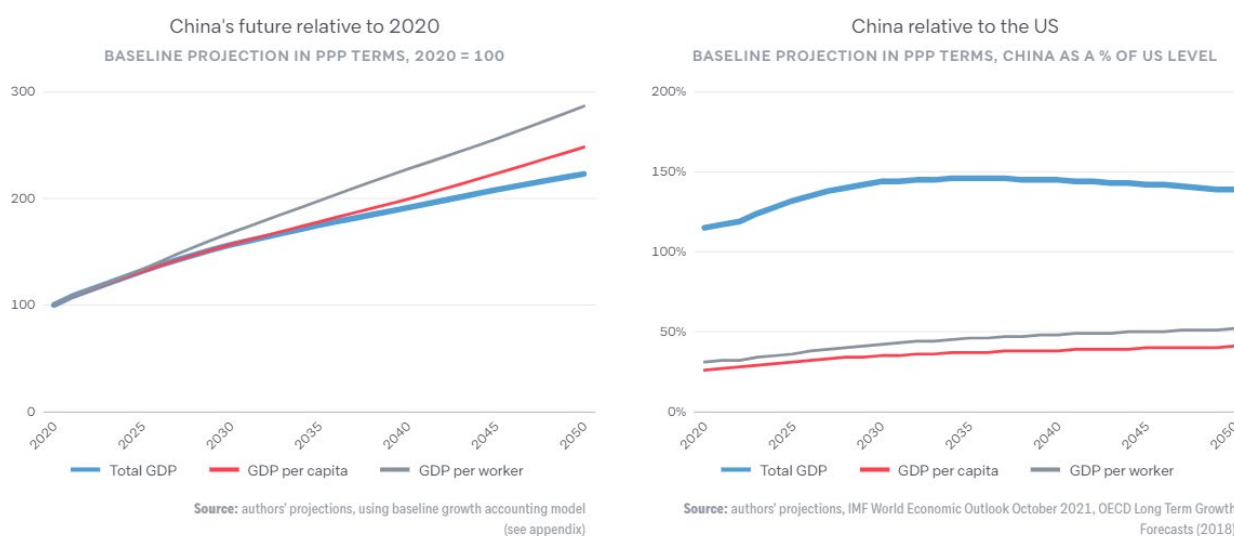
Emerging digital technologies are perhaps one way China might achieve faster productivity growth. Yet, the dividends of emerging digital technologies to date have been insufficient to lift aggregate productivity growth.⁵³ It is also worth noting that productivity growth in South Korea and Taiwan also benefitted historically from important digital dividends, through the rise of information and communication technologies and the fragmented global value chains and hyper-globalisation this enabled — of particular benefit to these economies.

REVISITING “THE RISE OF CHINA”

Our core argument is that the central expectation should be for Chinese economic growth to be around 2–3% a year to 2050, implying a significant downward revision in the narrative of a rising China. This section discusses some of the key implications if this assessment is correct. Because China’s rise is in significant part a relative issue, we construct growth projections for the rest of the world. To construct a set of forecasts reflective of the mainstream view, we blend together the latest medium-term projections of the IMF (to capture current thinking on the impact of the Covid-19 pandemic) with long-term forecasts published by the OECD in 2018.

The first question is framed in terms of what slower growth means for China’s own development. China has moved away from formal growth targets, however to the extent China retains implicit targets, our analysis suggests it will likely fall short (Figure 12, left panel). Official statements indicate that by 2035, China is aiming to double both real GDP per capita and the overall size of its economy relative to 2020 levels.⁵⁴ Hitting those targets would require both variables to grow by at least 4.7% a year over the next 15 years. Our baseline projections imply overall economic growth of 3.4–4.0% a year during 2020–2035 and per capita growth of 3.5–4.2% a year. China would therefore fall short on both counts.

Figure 12: China’s economic future measured in PPP terms



Of greatest importance for the rest of the world is simply how large and dominant the Chinese economy might ultimately become.

Another key implication is that, with slower growth, China's progress in catching up to rich country average living standards and productivity levels would remain significantly incomplete, even by mid-century (Figure 12, right panel). On the one hand, the average person in China would be 2–3 times richer by 2050 compared to today and 2.5–3.5 times more productive. Nonetheless, China would still be much poorer and less productive than the United States, based on current expectations of future US growth at around 1.6% a year on average. By 2050, the average person in China would be 40% as rich as the average person in the United States, while the average worker in China would only be about half as productive (in PPP terms).

Of greatest importance for the rest of the world is simply how large and dominant the Chinese economy might ultimately become. On our projections, by 2050, China's economy could be between 2.0–2.7 times larger than it is today in real terms. However, the implications for China's role in the global economy are less stark (Figure 13, left panel). Measured on a PPP basis, China's share of global output would rise modestly over the next decade in our baseline projection before declining to remain essentially unchanged by mid-century compared to today. Measured at market exchange rates, China's rise is somewhat stronger, owing to the fact that as economies develop and become richer, their domestic price levels tend to rise, implying we should expect China's official exchange rate to appreciate in inflation-adjusted terms.⁵⁵ Even then, China's share of global output measured in nominal US dollars would only rise modestly, from 17% today to a little over a fifth over the coming decades.

Predictably, our projections of slower growth imply that China's global rise would be considerably muted. This flows from two factors. First, China would suffer a considerable growth disadvantage compared to the rates of growth expected in other fast-growing emerging economies, most notably India and emerging Southeast Asia. Second, slower Chinese growth implies it would have a much smaller growth advantage over advanced Western economies, with this turning into a growth disadvantage from around 2040.

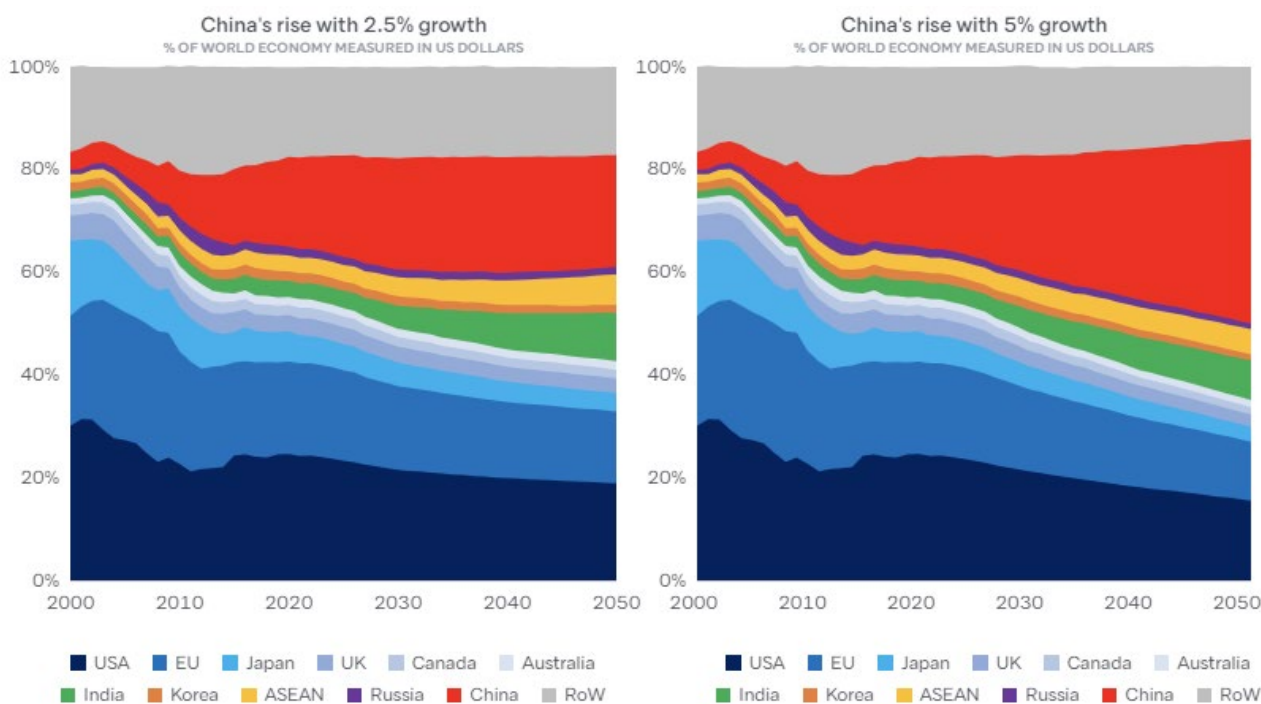
China would overtake the United States to become the world's largest economy in nominal US dollar terms by about 2030, but it would never establish a substantial lead. In our baseline scenario, China's economy would peak at about 15% larger than America's. By contrast, the US economy in 2020 was still about 40% larger than China's. This result also depends on the assumption that China's exchange rate will appreciate in inflation adjusted terms against the US dollar, in line with

REVISING DOWN THE RISE OF CHINA

the long-term projections of the OECD. Alternatively, if one assumes no change in the market exchange rate or relative price levels between China and the United States, China might never overtake America when measured in US dollar terms — only reaching about 90% of the US size in the early 2030s.

The outlook implied by our projections is another world compared to that implied by the conventional “rise of China” narrative. For instance, many economists suggest China could average growth of about 4% a year to 2050, while expectations are even higher at 5–6% amongst geopolitical analysts. As we have argued, China sustaining growth at up to 5% a year is notionally possible, but would require an enormous degree of success well beyond what China has achieved to date and out of line with the path that China is currently on.

Figure 13: China’s rise and the future world economy



Source: authors' projections, IMF World Economic Outlook October 2021, OECD Long Term Growth Forecasts (2018)

If China truly were on track to sustaining long term growth of say 4–5% a year, it naturally follows that China should be expected to become far and away the world’s most dominant economy (Figure 13, right panel). China would account for around a third of the world economy — in either PPP or nominal US dollar terms — a level similar to that of America at the peak of its own “unipolar moment” two decades ago.

China's economy would also be around twice the size of America's and would match or exceed the collective heft of the Group of Seven countries. With 5% annual growth, China's economy would be about equal to that of the entire West combined.⁵⁶

If China sustained growth of 4–5% a year, it would become a veritable economic bloc unto itself. In such a world, it would be reasonable to expect China's rising economic gravity to draw many more countries into closer alignment, that the Chinese yuan could one day displace the financial hegemony of the US dollar, that China might potentially dominate key future technologies, and that its military expenditures could conceivably overtake that of the United States and its allies. Chinese global hegemony would then be a real possibility.

By contrast, with 2–3% growth, China's rise would look completely different. China would still have risen, and indeed succeeded. But the implications for the rest of the world would be significantly less daunting. China would essentially become an equal to the United States. But at a fundamental level, a smaller economy than otherwise would make it very difficult for China to compete on anything close to an equal footing with the West more broadly — economically, technologically, or militarily. And without the aid of a booming economy, China would find it much harder to attract more of its own partners. China's ability to compete with the United States and Western nations more generally would therefore need to depend on much more than just China's rising economic heft alone.

CONCLUSION

Our analysis suggests that expectations regarding the rise of China should be substantially revised down compared to most existing studies and especially expectations amongst those considering the broader implications of China's rise for global politics. Of course, given its population size and notional scope for productivity catch-up, a future world economy dominated by China cannot be completely ruled out. But it would require an enormous degree of success with productivity-enhancing reforms well beyond China's track record to date. It should not be the baseline expectation.

The legacy effects of China's uniquely draconian population policies and heavily investment-driven growth model imply substantial structural growth deceleration is likely, even assuming a significant degree of broad policy success. Moreover, China faces substantial downside risks not formally incorporated into our baseline analysis, especially the potential for negative feedback loops between decelerating growth and underlying financial vulnerabilities. Our projection of substantially slower future growth therefore remains a somewhat optimistic assessment. Overall, our analysis suggests China will still most likely become the world's largest economy by any measure by around 2030. But its size advantage over America would be slim and it would remain far less prosperous and productive per person than the United States and other rich countries, even by mid-century.

TECHNICAL APPENDIX

A1: Comparison of existing studies

	2020–2030	2020–2050	Comment/clarification
<u>Lin (2019)</u>	9.0%	7.8%	Replicate East Asian growth
<u>Lardy (2019)</u>	7.0%	–	Current potential is >6–7% (with reform)
<u>Wang (2020)</u>	6.6%	5.1%	Medium estimate
<u>World Bank (2020), East Asia Pacific Update</u>	6.0%	–	
<u>Bailliu et al (2016)</u>	5.5%	–	
<u>Lu & Cai (2016)⁵⁷</u>	5.3%	4.2%	
<u>Bai & Zhang (2017)</u>	5.2%	4.0%	
<u>Sasaki et al (2021)</u>	5.2%	–	
<u>International Energy Agency (2021)</u>	5.2%	3.6%	
<u>World Bank <i>Innovative China</i> (2019)</u>	5.1%	3.4%	Medium estimate
<u>Bloomberg (2021)</u>	5.0%	3.7%	Medium estimate
<u>Lee (2017)</u>	5.0%	3.5%	5–6% over coming decade, fall to 3–4% in the long run
<u>Roberts & Russell (2019)</u>	4.5%	–	>4% on average to 2030

REVISING DOWN THE RISE OF CHINA

<u>Zhu et al (2019)</u>	4.5%	–	>4% on average to 2030
<u>PwC (2017)</u>	4.2%	3.0%	2016–2030 and 2016–2050 respectively
This Lowy Institute study (2022)	4.2%	2.5%	Central baseline
<u>OECD (2018)</u>	4.0%	2.6%	
<u>Orsmond (2019)</u>	4.0%	–	Growth falls to 3.5% by 2030
<u>Higgins (2020)</u>	3.8%	–	Medium estimate
<u>Barro (2016)</u>	3.5%	3.5%	China's growth will fall to 3–4% sustained over decades
<u>Pritchett and Summers (2014)</u>	3.0%	3.0%	Mean reversion to 2–4%

A2: Growth accounting models

We use a neoclassical growth accounting approach to project China's future economic growth based on several model specifications and data sources. In the neoclassical approach, economic growth depends on changes in the number of workers, how educated they are, how much capital they have to work with, and total factor productivity (TFP) — with this last term measured as the residual of economic growth unexplained by the other factors.

The conventional neoclassical approach contains only one type of capital. This is problematic for analysing China's future trajectory, since housing and infrastructure investment have played such an outsized role in Chinese capital accumulation. Failing to distinguish between different types of capital and investment therefore risks underestimating China's future growth potential for two reasons.

First, although housing and infrastructure investment are expected to decline, business investment is expected to at least remain steady or increase. Since the return on business investment is generally higher than that of housing and infrastructure, a reduction in investment concentrated in these latter categories rather than the business sector is much less detrimental to China's long term-growth prospects. For related reasons, the conventional approach also likely overstates the contribution of capital accumulation to past growth, causing trend productivity growth to be underestimated, since this is simply measured as a residual.

For these reasons, we therefore consider multiple growth accounting approaches using several different capital stock estimates drawn from credible sources. The standard Penn World Table (PWT) 10.0 database provides capital stock estimates based on a single type of capital. The IMF provides estimates of public and private capital stocks, where public capital includes all government investment (including infrastructure) and private investment presumably includes most housing and business investment. Finally, Richard Herd provides estimates of capital stocks and investment for the business, housing, infrastructure, and government sectors.⁵⁸ The estimates by Herd are based on detailed analysis of Chinese statistical sources. However, the advantage of the PWT and IMF estimates is that these provide internationally consistent data — which is particularly important for assessing China's historical productivity performance and determining its future trend. For these reasons, we also construct two sets of blended capital stock series by proportionally applying the China-specific sectoral capital stock estimates of Herd (2020) with those of the PWT and IMF.

The above gives us five alternative model and data combinations:

Model 1: A conventional model with a single type of capital, drawing upon the capital stock estimates contained in the Penn World Table 10.0 database.

Model 2: A model differentiating between public and private capital, using capital stock estimates drawn from the IMF Investment and Capital Stock 2021 database.

Model 3: A model differentiating between business, housing, and public capital drawing upon China-specific capital stock estimates prepared by Herd (2020) for the World Bank.

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Model 4: A model blending the China-specific estimates by Herd (2020) for different types of capital with the internationally comparable estimates produced by the Penn World Table.

Model 5: A model blending the China-specific estimates by Herd (2020) for different types of capital with the internationally comparable estimates produced by the IMF.

We adopt Model 5 as our baseline approach. One reason is that Model 5 produces growth projections in the middle of the range. Model 5 also allows for more types of capital compared to Models 1 and 2 while being more internationally comparable than Models 3 and 4.

The generic production function equation underpinning these models can be expressed as:

$$Y_t = A_t \cdot \left(\prod_{i=1}^N (K_t^i)^{\alpha^i} \right) \cdot (h_t \cdot L_t)^\beta$$

Where: at a given year (t), Y_t is real output; K_t^i is the capital stock of type i (there being one, two, or three different types of capital corresponding to various models listed above); h_t is human capital per worker; L_t is the number of workers; A_t is total factor productivity; β is the elasticity of output to labour; and α^i is the elasticity of output to capital type i . Note that K_t^i evolves according to the perpetual inventory method and the model assumes constant returns to scale.

The above can be transformed into a generic growth accounting equation of the form:

$$g_Y = g_A + \left(\sum_{i=1}^N \alpha^i \cdot g_{K^i} \right) + \beta \cdot g_h + \beta \cdot g_L$$

Where: g denotes the growth rate of the respective subscript variables.

More specifically for our baseline approach (Model 5):

$$Y_t = A_t \cdot (K_t^{public})^\varphi \cdot (K_t^{housing})^\gamma \cdot (K_t^{business})^{1-\varphi-\gamma-\beta} \cdot (h_t \cdot L_t)^\beta$$

$$g_Y = g_A + \varphi \cdot g_{K_{public}} + \gamma \cdot g_{K_{housing}} + (1 - \varphi - \gamma - \beta) \cdot g_{K_{business}} + \beta \cdot g_h + \beta \cdot g_L$$

Figure A2 displays the growth projections according to the five models along with the sources of growth under each projection. Table A2 summarises all key model inputs and assumptions.

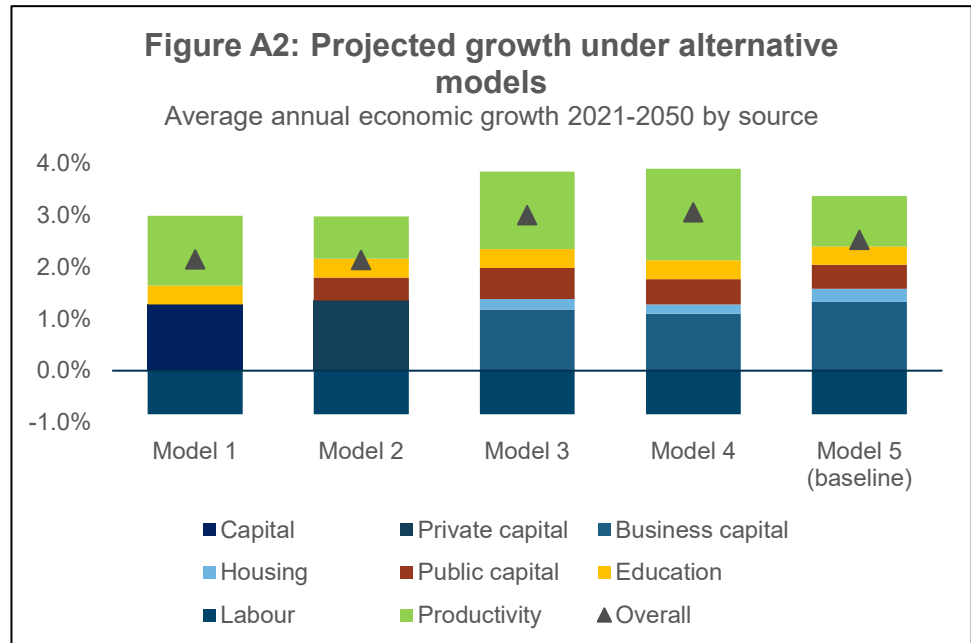


Table 2: Key model inputs and assumptions

Model input	Input value	Source/explanation
Elasticity of output to labour	59%	PWT 10.0
Elasticity of output to public capital (Models 2–5)	14%	Meta-analyses contained in Devadas and Pennings (2018) ⁵⁹
Elasticity of output to private capital (Model 2 only)	28%	$1 - \beta - \varphi$
Elasticity of output to housing capital (Models 3–5 only)	5%	Authors' assumption, set similar to average US housing income share

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Elasticity of output to business capital (Models 3–5 only)	23%	$1 - \beta - \varphi - \gamma$
Depreciation of capital (Model 1)	5%	PWT 10.0
Depreciation of public capital (Models 2–5)	4%	IMF (2021)
Depreciation of private capital (Model 2)	6%	IMF (2021)
Depreciation of housing capital (Models 3–5)	2%	Herd (2020)
Depreciation of business capital	8%	Herd (2020)
Investment (Model 1)	Steadily declines from 43% of GDP (2019) to 30% of GDP by 2050	Based on sum of public, housing, and business investment assumptions below
Public investment (Models 2–5)	Steadily declines from 16% of GDP (2019) to a constant 8% of GDP from 2030	Authors' analysis as per main text
Private investment (Model 2)	Steadily declines from 30% (2019) to 22% of GDP	Based on sum of housing and investment assumptions below
Housing investment (Models 2–5)	Steadily declines from 14% (2019) to	Authors' projections. See Section A3 for detail

	4.5% of GDP by 2050	
Business investment (Models 2–5)	Constant 2019 level (16.2% of GDP) to 2030 before rising at 0.5 x decrease in housing investment rate	Authors’ assumptions
Human capital growth	+0.6% a year	PWT 10.0, trend analysis by authors
Productivity (TFP) growth	0.7 x current trend rate	Based on experience of previous East Asian miracle economies
Workforce growth	-0.8% a year	UN low variant projection with authors’ adjustment for higher retirement age. See Section A2 for detail
GDP deflator inflation (for nominal projection)		OECD (2018)
Change in market exchange rate vs USD (for nominal projection)		OECD (2018)

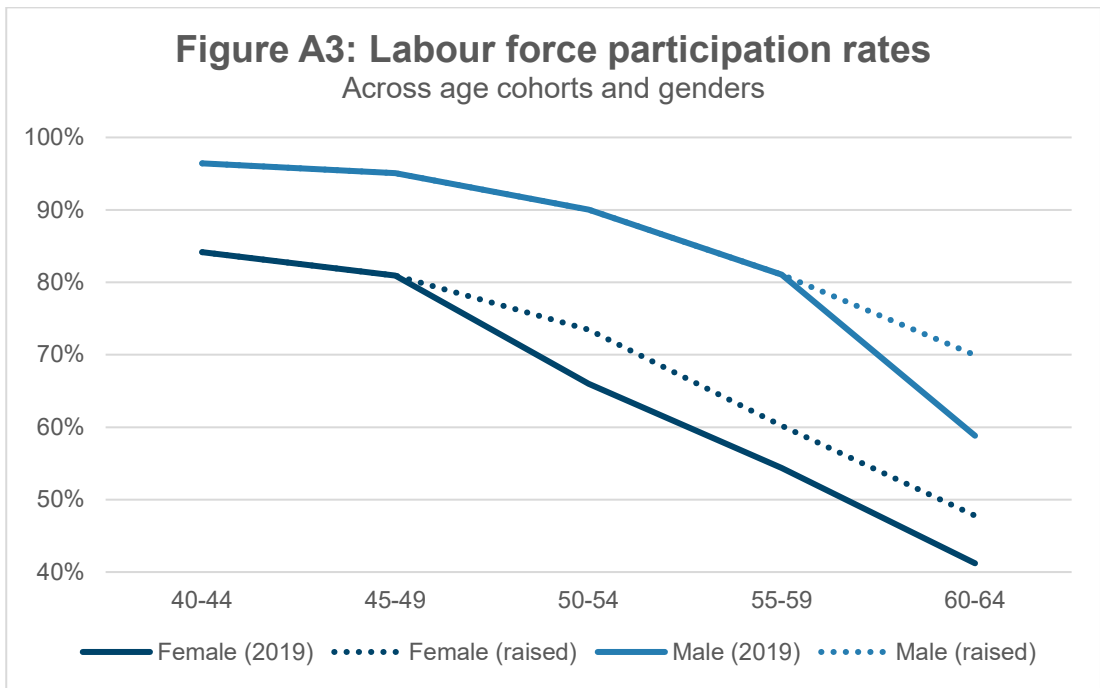
A3. Projecting China’s future workforce

In all five models outlined above, we project the number of workers in China going forward using the growth rate of the working age population from the UN Procurement Division (UNPD) low-variant population forecasts to 2050.

As discussed in the main text, one measure that could potentially offset part of the decline in China’s labour force is raising statutory retirement ages. Retirement ages are relatively low in China by international

standards. Most notably, the current statutory retirement age for workers covered under the urban employee pension system — which covers approximately 59% of urban workers — is set at 50 years for female blue-collar workers, 55 years for female white-collar workers, and 60 years for men.⁶⁰ As such, Chinese policymakers have recently indicated that they intend to raise retirement ages “in a phased manner” as part of the latest five-year plan for 2021–2025.⁶¹

To incorporate the effect of potential changes to statutory retirement ages, we assume labour force participation rates increase for workers in age cohorts that correspond with current retirement ages. For men, we raise participation rates for those aged 60–64 years halfway to that of the 55–59 years cohort. We repeat this process for women aged 50–54 years, 55–59 years, and 60–64 years, using participation rates for the 45–59 years, 50–54 years, and 55–59 years cohorts respectively. Figure A3 displays current and assumed labour force participation for different male and female age cohorts. Note even with the changes, participation rates are assumed to trend lower reflecting that older workers are less likely to be actively employed regardless of formal retirement age rules.



We then project forward growth in the labour force based on UNPD low-variant forecasts for the working age population to 2050. This suggests that raising statutory retirement ages would unlock around 14–17 million additional workers in any given year. This would largely

offset the decrease in the number of workers produced by lower labour force participation due to ageing, which we estimate by applying existing participation rates for men and women in different age groups against China's ageing demographic profile. It therefore appears unlikely that raising retirement ages will significantly alter the future trajectory of China's workforce over the coming decades.

A4. Projecting future housing investment

Future housing investment is projected in several steps. First, we project urban residential floor space construction using an approach similar to Berkelmans et al (2012).⁶² As per capita demand for residential floor space can be expected to rise with growing incomes, we estimate the following equation drawing upon official Chinese statistics:

$$\text{Urban floor space per capita}_t = \alpha + \beta * \log(\text{real GDP per capita}_t) + \varepsilon_t$$

The above equation is combined with our projection of future economic growth (in an iterative fashion since economic growth both influences and is determined by housing investment) and the urban population projections of the United Nations to project total urban residential floor space construction as per the following equation:

$$\text{Housing construction}_t = \text{urban floor space per capita}_t \times \text{urban population}_t$$

To project future housing investment, we need to reflect that rising average incomes will also imply demand for higher quality housing. As a proxy for housing quality, we use real investment per square metre of construction, drawing upon the housing investment estimates of Herd (2020) and dividing this by total urban residential floor space construction. We estimate the below equation to capture the effect of rising incomes on housing quality.

$$\text{Real investment per square metre}_t = \alpha + \beta * \log(\text{real GDP per capita}_t) + \varepsilon_t$$

The above equation is combined with our projection of future economic growth (again, in an iterative fashion) and projected housing construction to project total urban housing investment as per the following equation:

$$\text{Real investment}_t = \text{Real investment per square metre}_t \times \text{housing construction}_t$$

NOTES

Cover illustration: Sean Gladwell/Getty Images

- ¹ Martin Ravallion, *Poverty in China Since 1950: A Counterfactual Perspective*, (Massachusetts: National Bureau of Economic Research, 2021), <https://www.nber.org/papers/w28370>.
- ² Charles Krauthammer, “The Unipolar Moment”, *Foreign Affairs*, (70)1, America and the World 1990/91, 23–33, <https://www.jstor.org/stable/20044692>.
- ³ See, for instance, Yuen Ang (2021) on how China’s “common prosperity” doctrine reflects an uncertain attempt to tame the excesses of Chinese capitalism in “Can Xi End China’s Gilded Age?”, Project Syndicate, 21 September 2021, <https://www.project-syndicate.org/commentary/xi-china-gilded-age-crackdown-on-corruption-by-yuen-yuen-ang-2021-09>; and Rhodium Group (2021) on recent anti-market policy trends in Daniel H. Rosen, Thilo Hanemann, Rachel Lietzow, Ryan Featherston, Josh Lipsky, and Niels Graham, “China Pathfinder: Annual Scorecard”, Rhodium Group, 5 October 2021, <https://rhg.com/research/china-pathfinder-2021/>.
- ⁴ Total Credit to the Non-Financial Sector (Core Debt, by Country), Q2, 2021, BIS, <https://stats.bis.org/statx/srs/table/f1.1>.
- ⁵ Both the PWT 10.0 economic database and the widely-used Total Economy Database™ of the Conference Board adjust China’s GDP and growth figures downwards arguing that official statistics overstate these. Amongst recent studies, Chen et al (Wei Chen and Xilu Chen, “A Forensic Examination of China’s National Accounts”, Brookings Institution, Spring 2019, https://www.brookings.edu/wp-content/uploads/2019/03/ChenEtAl_web.pdf) finds China’s GDP to be overestimated in official statistics. Other recent studies, however, suggest that official GDP numbers are not substantially overestimated (Carsten A. Holz, “The Quality of China’s Statistics”, *China Economic Review*, (30), 2014, 309-338, <https://carstenholz.people.ust.hk/CarstenHolz-QualityChineseGDPStatistics-25Apr2015.pdf>) or could be underestimated (Hunter Clark, Maxim Pinkovskiy, and Xavier Sala-i-Martin, *China’s GDP Growth May be Understated*, NBER, (Massachusetts: National Bureau of Economic Research, April 2017), <https://www.nber.org/papers/w23323>). Finally, Fernald et al (John Fernald, Eric Hsu, and Mark M. Spiegel, “Is China

Fudging its Figures? Evidence from Trading Partner Data”, Federal Reserve Bank of San Francisco, September 2015, <https://www.frbsf.org/economic-research/files/wp2015-12.pdf>) suggest China’s GDP statistics have been improving in accuracy over time.

⁶ See Justin Yifu Lin, “The Economics of China’s New Era”, Project Syndicate, 1 December 2017, <https://www.project-syndicate.org/onpoint/the-economics-of-china-s-new-era-by-justin-yifu-lin-2017-12>.

⁷ *The Growth Report: Strategies for Sustained Growth and Inclusive Development*, Commission on Growth and Development, (Washington: World Bank, 2008), <https://openknowledge.worldbank.org/bitstream/handle/10986/6507/449860PUB0Box3101OFFICIAL0USE0ONLY1.pdf>.

⁸ Ricardo Hausmann, Lant Pritchett, and Dani Rodrik, *Growth Accelerations*, NBER, (Massachusetts: National Bureau of Economic Research, June 2004), <https://www.nber.org/papers/w10566>.

⁹ Justin Lin refers to 8–9% growth for the next two decades, whereas we focus on the next three decades, for which the East Asian “miracle economies” grew by 7–8% a year. See Justin Yifu Lin, “The Economics of China’s New Era”, Project Syndicate, 1 December 2017, <https://www.project-syndicate.org/onpoint/the-economics-of-china-s-new-era-by-justin-yifu-lin-2017-12>.

¹⁰ Nicholas Lardy of the Peterson Institute says that “China’s potential growth for a considerable period into the future is more rapid than the 6 to 7 percent rate observed in recent years”. See Nicholas R Lardy, *The State Strikes Back: The End of Economic Reform in China*, Peterson Institute for International Economics, (New York: Columbia University Press, 2019), <https://www.piie.com/bookstore/state-strikes-back-end-economic-reform-china>.

¹¹ Lant Pritchett and Lawrence H. Summers, *Asiaphoria Meets Regression to the Mean*, NBER, (Massachusetts: National Bureau of Economic Research, October 2014), <https://www.nber.org/papers/w20573>.

¹² See Appendix A1 for the full list of existing studies and how these compare to the baseline projections of this study.

¹³ David Shambaugh, *China and the World*, (Oxford: Oxford University Press, 2020), <https://global.oup.com/academic/product/china-and-the-world-9780190062316?cc=au&lang=en&>.

- ¹⁴ For example, Natasha Kassam and Darren Lim, “How China is Remaking the World in Its Vision”, *Australian Foreign Affairs*, February 2021, <https://theconversation.com/how-china-is-remaking-the-world-in-its-vision-155377>; or Graham Allison, “What Xi Jinping Wants”, *The Atlantic*, 1 June 2017, <https://www.theatlantic.com/international/archive/2017/05/what-china-wants/528561/>.
- ¹⁵ Fred Bergsten, “China and the United States: The Contest for Systemic Leadership”, in *US–China Economic Relations: From Conflict to Solutions*, Peterson Institute for International Economics, (Washington: PIIE, June 2018), 43–52, <https://www.piie.com/sites/default/files/documents/piieb18-1.pdf>.
- ¹⁶ Ray Dalio, “Don’t Be Blind to China’s Rise in a Changing World”, *Financial Times*, 23 October 2020, <https://www.ft.com/content/8749b742-d3c9-41b4-910e-80e8693c36e6?shareType=nongift>.
- ¹⁷ Further policies to drive down the cost of having children have since followed, including effectively banning the commercialisation of private tuition. See “China Bans For-Profit School Tutoring in Sweeping Overhaul”, Bloomberg, 24 July 2021, <https://www.bloomberg.com/news/articles/2021-07-24/china-bans-school-curriculum-tutoring-firms-from-going-public>.
- ¹⁸ See appendix for detail.
- ¹⁹ Based on estimates by Richard Herd, “Estimating Capital Formation and Capital Stock by Economic Sector in China: The Implications for Productivity Growth”, Policy Research Working Paper, No. 9317, World Bank, Washington, DC, 2020, <https://openknowledge.worldbank.org/handle/10986/34126>.
- ²⁰ Wang Jing, Chen Bo, Yu Ning, Zhu Liangtao, Wang Juanjuan, Zhou Wenmin, and Denise Jia, “How Evergrande Could Turn Into ‘China’s Lehman Brothers’”, Caixin Global, 20 September 2021, <https://www.caixinglobal.com/2021-09-20/cover-story-how-evergrande-could-turn-into-chinas-lehman-brothers-101775596.html>.
- ²¹ These include Dalian Wanda, HNA, Anbang Insurance, Baoshang Bank, and Huarong.
- ²² Andy Lin, Thomas Hale, and Hudson Lockett, “Half of China’s Top Developers Crossed Beijing’s ‘Red Lines’”, *Financial Times*, 9 October 2021,

<https://www.ft.com/content/d5803d64-5cc5-46f0-bed0-1bc207440f9c>.

²³ See appendix for detail.

²⁴ “China’s Hukou System Explained”, NH Global Partners, <https://nhglobalpartners.com/the-chinese-hukou-system-explained/>.

²⁵ Kenneth Rogoff and Yuanchen Yang, “Has China’s Housing Production Peaked?”, *China & World Economy*, (29)1, 1–31, 2021, <https://onlinelibrary.wiley.com/doi/abs/10.1111/cwe.12360>.

²⁶ Zheng Yangpeng, “What Does China’s Move to Relax Hukou Residency Curbs Mean for the Property Sector?”, *South China Morning Post*, 11 April 2019, <https://www.scmp.com/property/hong-kong-china/article/3005615/what-does-chinas-move-relax-residency-curbs-mean-property>.

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²⁹ Martha Lawrence, Richard Bullock, and Ziming Liu, *China’s High-Speed Rail Development*, World Bank, (Washington: World Bank, 2019), <https://documents1.worldbank.org/curated/en/933411559841476316/pdf/Chinas-High-Speed-Rail-Development.pdf>.

³⁰ Klaus Schwab, *The Global Competitiveness Report 2019*, World Economic Forum, (Geneva: World Economic Forum, 2019), https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.

³¹ OECD Statistics.

³² Holding constant the other key assumptions we make for our baseline projection.

³³ *The Economist* summarises China’s current policy program as consisting of industrial modernisation (e.g. targeting a

constant share of manufacturing in GDP, encouraging the uptake of industrial robots), better urbanisation (e.g. *hukou* reform, smart cities, and creating urban mega clusters such as the Greater Bay Area), and various reforms aimed at lifting efficiency (e.g. in education, financial regulation, bankruptcy law, etc.). See “China’s Future Economic Potential Hinges on Its Productivity”, *The Economist*, 14 August 2021, <https://www.economist.com/briefing/2021/08/14/chinas-future-economic-potential-hinges-on-its-productivity>.

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- ³⁶ Robert Barro, “Economic Growth in a Cross Section of Countries”, *The Quarterly Journal of Economics*, (106)2, May 1991, 407–443, <https://www.jstor.org/stable/2937943>.
- ³⁷ Homi Kharas and Indermit Gill, “Growth Strategies to Avoid the Middle-Income Trap”, Duke Global Working Paper Series No. 17, January 2020, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3526261.
- ³⁸ Ibid., and Pritchett and Summers, *Asiaphoria Meets Regression to the Mean*, 2014, <https://www.nber.org/papers/w20573>.
- ³⁹ Daniel Rosen, “China’s Economic Reckoning”, *Foreign Affairs*, July/August 2021, <https://www.foreignaffairs.com/articles/china/2021-06-22/chinas-economic-reckoning>; Lardy, *The State Strikes Back*, 2019, <https://www.piie.com/bookstore/state-strikes-back-end-economic-reform-china>; David Orsmond, *China’s*

Economic Choices, Lowy Institute, Analysis, (Sydney: Lowy Institute, 17 December 2019), <https://www.lowyinstitute.org/publications/china-s-economic-choices>; “China’s Economic Growth and Rebalancing and the Implications for the Global and Euro Area Economies”, European Central Bank, 2017, https://www.ecb.europa.eu/pub/pdf/other/ebart201707_01.en.pdf.

⁴⁰ Kam Wing Chan, “Internal Migration in China: Integrating Migration with Urbanization Policies and Hukou Reform”, Policy Note 16, Knomad, November 2021, <https://www.knomad.org/sites/default/files/2022-01/Policy%20Brief%2016-%20Internal%20Migration%20in%20China-Integrating%20Migration%20with%20Urbanization%20Policies%20and%20Hukou%20Reform-Nov%202021.pdf>.

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⁴² Takatoshi Sasaki, Tomoya Sakata, Yui Mukoyama, and Koichi Yoshino, “China’s Long-Term Growth Potential: Can Productivity Convergence be Sustained?”, Bank of Japan, 30 June 2021, https://www.boj.or.jp/en/research/wps_rev/wps_2021/data/wp21e07.pdf; and Orsmond, *China’s Economic Choices*, 2019, <https://www.lowyinstitute.org/publications/china-s-economic-choices>.

⁴³ Recent research by the IMF, for instance, quantitatively shows that technological diffusion to emerging and developing economies has increased due to globalisation and that technological leaders benefit from each other’s innovation. See *World Economic Outlook: April 2018, Cyclical Upswing, Structural Change*, International Monetary Fund, April 2018, <https://www.imf.org/en/Publications/WEO/Issues/2018/03/20/world-economic-outlook-april-2018>.

⁴⁴ Diego Cerdeiro, Rui Mano, Johannes Eugster, Dirk Muir, and Shanaka Peiris, “Sizing Up the Effects of Technological Decoupling”, International Monetary Fund, Working Paper, 12 March 2021, <https://www.imf.org/en/Publications/WP/Issues/2021/03/12/Sizing-Up-the-Effects-of-Technological-Decoupling-50125>.

⁴⁵ Jude Blanchette and Andrew Polk, “Dual Circulation and China’s Hedged Integration Strategy”, Center for Strategic & International Studies, 24 August 2020, <https://www.csis.org/analysis/dual-circulation-and-chinas-new-hedged-integration-strategy>. The authors describe the dual circulation strategy as one of “hedged integration”.

⁴⁶ W Baumol and W Bowen, “On the Performing Arts: The Anatomy of Their Economic Problems”, *The American Economic Review*, (55)1/2, 1 March 1965, 495–502, <https://www.jstor.org/stable/1816292>; and William Nordhaus, *Baumol’s Diseases: A Macroeconomic Perspective*, NBER, (Massachusetts: National Bureau of Economic Research, 2006), https://www.nber.org/system/files/working_papers/w12218/w12218.pdf.

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⁴⁹ For instance, Yu Huang, Marco Pagano, and Ugo Panizza, “Local Crowding-Out in China”, *The Journal of Finance*, (75)6, 2855–2898, 2020, <https://onlinelibrary.wiley.com/doi/abs/10.1111/jofi.12966>, document evidence of higher local public debt levels crowding out local private investment.

⁵⁰ Following the standard investment accelerator effect linking the rate of investment to speed of economic growth.

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[11/Chinas-High-Savings-Drivers-Prospects-and-Policies-46437](#).

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