

Automation could offset China's demographic problem

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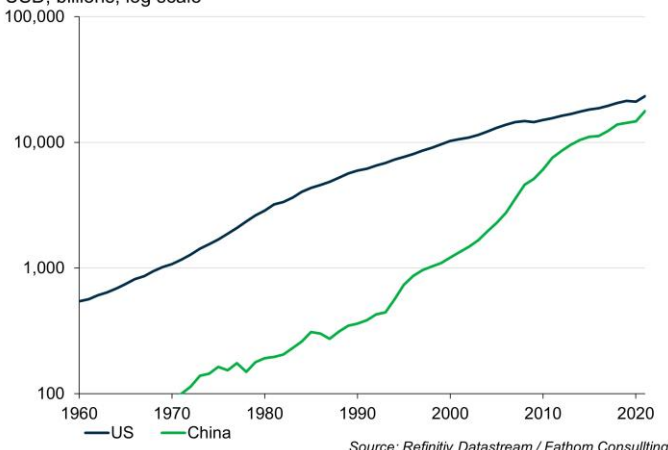
- An abundance of cheap labour enabled China to develop as the world's manufacturing powerhouse
- The past few decades have also seen strong productivity growth, driven by innovations that have been copied from the technological frontier and applied domestically
- However, China's demographic dividend is ending — in 2022, the population fell by 850,000
- The country is now facing a long-term decline in its working-age population, and cannot continue indefinitely to copy the technological innovations of others
- Emerging technologies could help China push through the middle-income trap, especially if they can break the link between labour supply and economic growth

China's economy has grown significantly over the last 50 years, but it remains smaller¹ and less influential than the US economy. The chart below, based on Fathom's proprietary measure of China's economic output (the CMI), shows a remarkable rate of catchup since the 1970s.

China's economy has been catching up with the US — however a poor demographic outlook and slowing productivity growth will put pressure on future growth

China and US nominal GDP

USD, billions, log scale



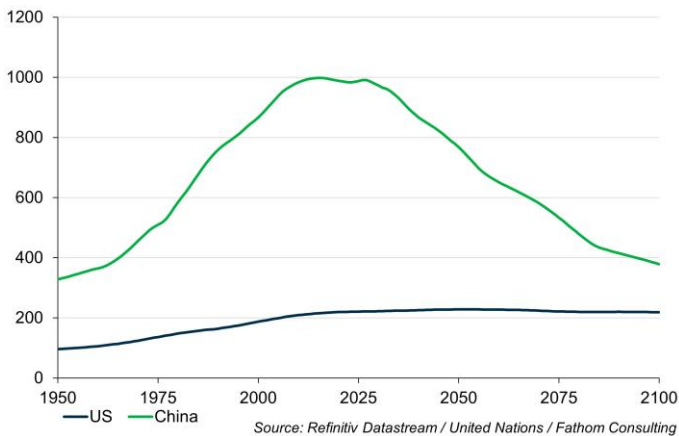
1. When measured according to purchasing power parity (PPP), China's economy does appear larger than that of the US. However, there is a tendency for emerging market currencies (and therefore the size of their economies) to be overstated when measured according to PPP, due to the way that non-tradable goods are handled in PPP calculations. We therefore view market exchange rates as a better metric of comparison.



There are two fundamental, independent drivers of long-run growth — the size of a country's labour force and how productive that labour force is. China has benefited from a large working-age population and strong productivity growth, but this will not continue. In early 2023, China's National Bureau of Statistics announced that the population declined by roughly 850,000 the previous year. This is the country's first fall in population since 1961, but will not be the last. The following chart shows the projected decline in China's working-age population — which is expected to drop by 60% by 2100.

China and US working-age population

Millions aged 15-64, including UN baseline projections



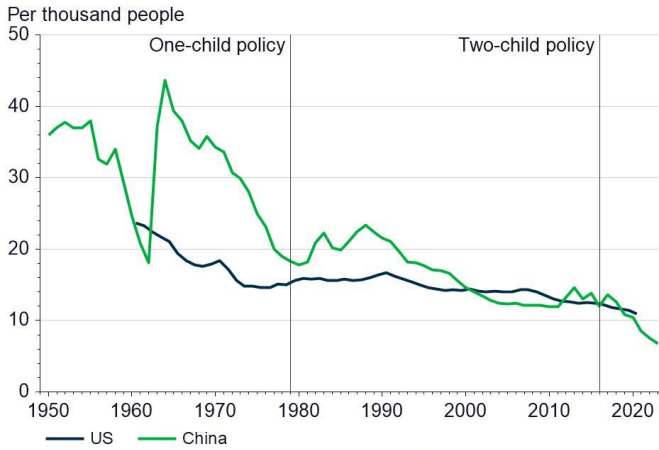
There are three primary causes of China's population decline:

- The 'one-child' policy: birthrates are declining in most major economies and the fall is particularly steep in China. It is unclear how much of this is due to the one-child policy, as neither its introduction nor its relaxation had a noticeable effect on the trend in birthrates, as seen in the chart below. However, the policy may have led to a gender imbalance in China that will have a significant impact in the long run
- High childcare costs: China's childcare costs are among the highest in the world. Families can expect to pay around a sixth of annual per capita disposable income on childcare, implying that financial concerns are putting pressure on fertility rates
- Net outward migration: immigration can increase the pool of available workers and relieve pressure on domestic labour supply stemming from low fertility rates. The US benefits from this, as do most advanced economies. China currently remains a relatively closed economy, with net outward migration

The one-child policy has contributed to China's population decline, as have high childcare cost and net outward migration



China and US birth rates

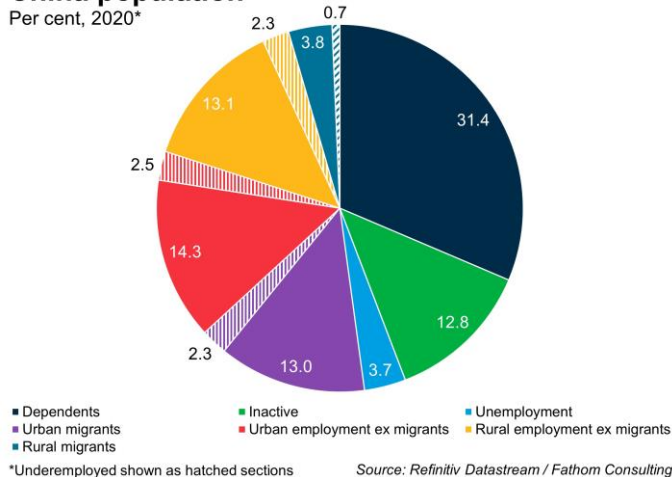


Fathom has previously [looked in detail](#) at the global implications of labour supply in China. In the short term, China could mitigate the effects of demographic decline by making greater use of a pool of workers that we have identified as ‘underemployed’. These workers are supported in inefficient employment, a legacy of the country’s ‘iron rice bowl’ philosophy. Moreover, there remains a pool of rural workers that could still migrate to urban centres and join China’s manufacturing workforce. The combined total of these workers is shown as the hatched sections in the pie chart below.

But demographic pressures will soon [erode](#) this source of labour market slack. Fathom estimates that the slack in the pool of available workers will be eroded by the 2030s at the latest. China must find another way to manage looming labour scarcity before it hits this point.

Slack in China’s labour market will be eroded by the 2030s at the latest

China population





Labour productivity trends in China have been positive over recent decades. As an emerging economy, it has been able to adopt knowhow from the technological frontier in advanced economies and apply it domestically. This has spurred strong productivity growth based on imported knowledge. There is nothing particularly unusual about this — most lower- and middle-income economies will do it.

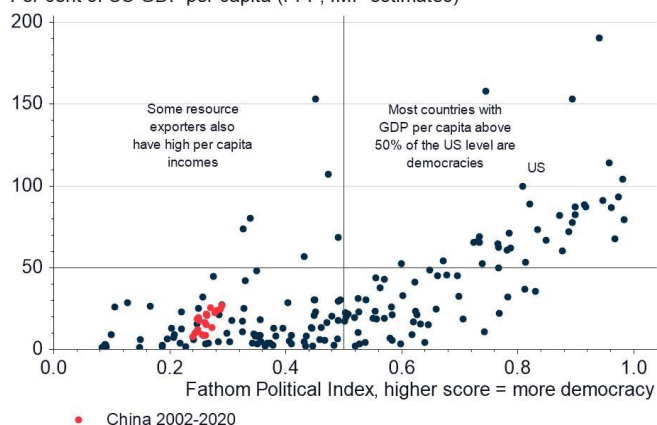
However, this growth tends to stall when countries reach middle-income status — this is known as the middle-income trap. Fathom's view is that China is currently in this trap; breaking through it will pose a major economic challenge.

As the chart below shows, the only countries to have broken through the middle-income trap are either democracies (into which technological knowhow flows easily) or countries with significant resource endowments.

China is in the middle-income trap and, unlike countries that have broken through the trap, it is neither resource-rich, nor a democracy

Fathom Political Index and GDP per capita, 2020

Per cent of US GDP per capita (PPP, IMF estimates)



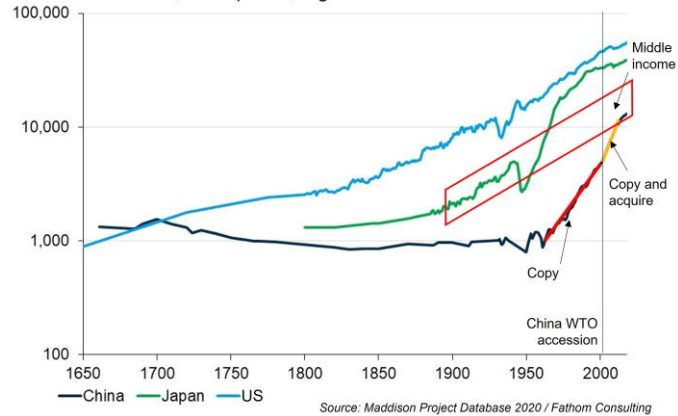
Source: Refinitiv Datastream / Fathom Consulting

China is not a democracy, neither does it have resource endowments to rely on. Instead, it has achieved middle-income status through copied and acquired knowledge, as the next chart highlights. However, the growth in GDP per capita that this approach enabled has begun to tail off, suggesting that China is reaching the middle-income trap. Without significant resource endowments, democratisation might offer a way through; but the CCP has little appetite for this. The red data points in the chart above show that any hope that China would democratise following its accession to the WTO was misplaced. Combined, these factors suggest that China will struggle to break out of the middle-income trap.



GDP per capita

International dollar, 2011 prices, log scale



Previous Fathom studies have identified China's attempts to push through this barrier (for instance, through acquisitions of companies in strategically important sectors). There is no consensus on how successful this policy has been and, as the US and other advanced economies are becoming increasingly wary of Chinese businesses, a different tactic may be needed.

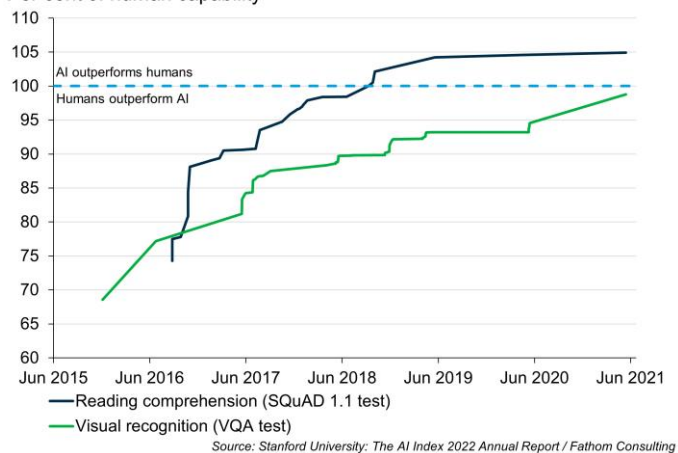
A path through?

Automation, achieved through emerging technologies such as robotics and artificial intelligence (AI), could be the solution to China's demographic woes. For the first time, a wave of technological innovation may result in an overall decline in demand for human labour. A later note in this series will explain why in detail. If this is the case, the link between labour supply and economic growth could be broken. In some cases, AI is already surpassing human capabilities, as shown in the following chart.

Emerging technologies may break the link between labour supply and economic growth, offering China a way to overcome its demographic woes

AI comprehension accuracy

Per cent of human capability





China's poor demographic outlook provides clear motivation to automate: it may be the only way to overcome the labour shortages the country will soon face. In 2022, the government announced that it would introduce programmes to increase the birth rate and reduce the financial burden on parents, but even if they are successful (which is unlikely), these will not alleviate the issue entirely.

There are signs that the CCP is already looking to automation as a solution. The Made in China 2025 plan (and subsequent policy statements) identified robotics and artificial intelligence as key sectors for growth. The country's success in these areas will be discussed in subsequent notes. If China can successfully break the link between labour and growth, its economy can continue to grow and it might threaten US hegemony in the future.

Welcome to the machine

A comparative assessment of the USA and China to 2035, focusing on the role of technology in the economy

This note is the second in a series highlighting the findings of *Welcome to the Machine*, Fathom's recent report on techno-economic competition between the United States and China to 2035.

[Read more from this series or read the report in full](#)

Further Reading

[Introducing 'Welcome to the Machine'](#)

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