

China's quest for greater technological self-reliance

Edition 6, 2021

[Professor Bates Gill](#)

DOI: [10.37839/MAR2652-550X6.2](https://doi.org/10.37839/MAR2652-550X6.2)

Bates Gill is professor of Asia-Pacific security studies at Macquarie University, a Senior Associate Fellow with the Royal United Services Institute (RUSI) in London, and inaugural Scholar-in-Residence with Asia Society Australia.

This essay draws from the author's book on China's foreign policy under Xi Jinping, forthcoming in 2021 with Oxford University Press. Minor portions this essay were published in the Lowy Interpreter on 9 March 2021.

Another China Dream

China's yearly National People's Congress (NPC), which convened earlier this month in Beijing, generated more attention than usual. Most of the headlines focused on the confab's imposition of additional electoral restrictions in Hong Kong, a predictable but nonetheless dismal further deterioration in that city's political vitality.

But amidst the news about Hong Kong, economic growth targets for 2021, and self-congratulation for weathering the covid-19 pandemic, the NPC also approved an ambitious economic agenda for the next 15 years. In particular, the assembled delegates endorsed a sweeping strategy to achieve greater technological self-reliance in the coming decades. This strategic framework—first set out in earnest by China's top leader Xi Jinping last year—is more than mere economic tweaking. Rather, if successful, this strategy will have profound implications for global

economics and geopolitics, including for Australia.

But what is driving this pursuit of self-reliance, especially for China, arguably the greatest beneficiary of breakneck globalisation of the past 25 years? In a nutshell, Xi and other comrades at the top of the Chinese Communist Party (CCP) understand they face significant economic challenges. Some are long-standing. Others have arisen more recently. But they demand attention if the country is to continue ascending the developmental ladder, become a high-income country, and achieve “national rejuvenation” in the next three decades. In basic terms, these troubles involve productivity, innovation, and de-coupling.

Uncertainties ahead

In spite of its economic success, China may face greater economic uncertainty today than at any time since Deng Xiaoping’s reform and opening in the 1980s. Not only is China’s pace of economic growth slowing, but the slowdown is structural and not merely cyclical. Also importantly, the slowdown has similar aspects to troubled transitions which other emerging economies failed to navigate, threatening to stall China in the ranks of middle-income countries.

At its heart, China’s economic challenge is to change the growth model it has so heavily relied upon since the 1990s. China’s remarkable economic sprint relied mostly on capital investments and export-led growth, fueled by the influx of rural-to-urban, inexpensive surplus labor as well as imported technology to increase efficiency. Investment in capital stock helped to build the foundations of a modern, export-led, industrial economy: power plants, telecommunication networks, highways, railways, airports, harbours, and massive urban centers.

However, continuing the pace of economic growth based on this model has become more and more difficult with each passing year. China’s demographics are an immutably big reason for this as China’s growing number of elderly will need to be supported by a dwindling working-age population. China’s workforce population

peaked in 2012 and has been in decline since, contributing to increasing labor costs.^[1] China's aging population also foretells increasing long-term pressures on China's savings rate and capital formation, human capital formation, and its welfare and pension systems as the country grows old before it grows rich.^[2] In addition, capital investments have reached a saturation point.

China's future economic future needs to rely less on capital investment—which in the past was less concerned with efficient use of capital—and much more on extracting efficiencies and productivity from existing capital stock. That means gaining greater outputs per worker and unit of capital through such measures as technological innovation, allocating capital toward higher-yielding results, and shifting towards a greater consumption-led growth model.

However, according to the International Monetary Fund, China's post-covid-19 recovery relied very heavily on government financial support which only extended the burden of poorly-performing, capital-intensive state-owned enterprises (SOEs). On the whole, PRC SOEs operate about 20 percent less productively than their private counterparts.^[3] But, because of their social, political, and economic significance within the Chinese system, SOEs still retain privileged access to resources such as capital and land while putting a disproportionate drag on the economy. State-sector reforms are much needed and should include the closure of loss-making firms, stricter budgetary controls on SOEs, and allowing the market to have a greater say in the allocation of resources. But for the current PRC leadership this appears to be too politically risky—if anything, state and Party intervention in the governance of SOEs and the private sector has increased.

Beijing needs to address these challenges in order to avoid what has been called the “middle income trap.”^[4] This situation arises when a country reaches middle-income levels, but then—owing to higher wage costs and diminishing productivity gains—fails to progress to high-income status. China's gross national income (GNI) per capita now stands at about U.S.\$11,000 which, according to the World Bank, makes China an “upper middle-income” country and on the cusp of reaching the

lower rungs of the high-income ladder. However, as the World Bank reports, of the 101 middle-income economies in 1960, only 13 advanced to a high-income level by 2008.[\[5\]](#)

In addition, it appears a successful transition to high-income status is highly correlated to “institutional quality”: greater political openness, good governance, and the rule of law. Of the 13 economies just noted, the vast majority of them—including PRC neighbors Japan, Singapore, South Korea and Taiwan—developed high-quality political and legal institutions while transiting beyond the middle-income trap.[\[6\]](#) For Xi Jinping, avoiding this trap is imperative but it also carries economic and political risk. Nonetheless, one of China’s most acclaimed economists, former Minister of Finance Lou Jiwei, declared in 2015 that the country has a 50-50 chance of remaining in middle-income limbo if significant reforms were not taken.[\[7\]](#)

The innovation imperative

Given the structural impediments to growth facing the PRC economy, new sources of productivity must be generated. But how? In the past, technology acquisition was an important pathway for introducing greater efficiencies within the PRC economic model. In general, there are three methods by which a country can acquire technology—“transacting”, “taking”, and “making”—and China has used all of them to spur productivity gains and greater innovation. For much of its economic rise since the 1980s, China has relied on the first two methods. Only recently has the country begun to achieve the third by developing a greater capacity for home-grown technology development. “Transacting” and “taking” can still make an important contribution to China’s economic development. However, over the course of the Xi Jinping era, these well-worn pathways have become increasingly strewn with obstacles and risk, particularly in the most advanced technological fields.

In response, industrial policy under Xi Jinping has intensified efforts to leverage both

the public and private sector in the cause of indigenous or “independent innovation” (自主创新). According to the PRC State Council, this means “starting from enhancing the national innovation capacity, strengthen original innovation, re-innovation, and absorption of imported innovation.”[\[8\]](#) As this definition suggests, China already has significant “national innovation capacity”, including within the state-owned sector. For example, CRRC Group, the world’s largest producer of railway equipment, is best known for its development of world-leading high-speed trains. Other companies in the private sector such as Alibaba, have transformed the world of e-commerce by leapfrogging from cash to cashless payment systems. Alibaba, Baidu, and other PRC firms are also active in cutting-edge artificial intelligence research.

However, much of the intellectual property of what China has produced and exported over the past several decades was not indigenously developed nor a result of domestic investment. According to one of the leading analysts of the PRC economy, Arthur Kroeber, beginning in the 1990s, about one-third of PRC exports on average have been manufactured by foreign-invested companies (a figure which topped out at nearly 60 percent in 2005). For exports designated as “high-tech”, the proportion owing to foreign firms is even higher—persisting at around two-thirds even in 2020.[\[9\]](#) As Xi Jinping declared to a high-profile conference on cyber security in 2016:

Our dependence on core technology is the biggest hidden trouble for us Heavy dependence on imported core technology is like building our house on top of someone else’s walls: No matter how big and how beautiful it is, it won’t remain standing during a storm.[\[10\]](#)

Xi has good reasons for concern. China is far from technological self-sufficiency and remains dependent on foreign technologies and market-access, especially in certain foundational technologies, such as semiconductors, which will be crucial to the development of other advanced industrial sectors. China scholar Mathieu Duchâtel points out that the value of PRC imports of semiconductors is higher than its total

imports from the European Union and more than its oil imports, and that the country only produces about 15 percent of its domestic requirements. He writes, “The world’s largest consumer market for semiconductor and integrated circuits depends on foreign suppliers not only for finished processors and other chips, but also for critical equipment and software at each stage of the value chain.”^[11] In this critical sector and others, the intensifying and more protectionist technological competition between China and other major economies—such as the United States, Japan, and Germany—will complicate Beijing’s pursuit of greater productivity, innovation, and self-sufficiency.

As a result, China’s pursuit of technological innovation—whether through foreign acquisitions or home-grown efforts—faces a range of potential chokepoints both at home and abroad. U.S.-China economic competition intensifies this challenge as it moves beyond trade to encompass technology and financial markets. U.S. actions have included the restriction of exports to key PRC technology firms, banning investments in Chinese companies deemed to have links with the PLA, delisting major PRC companies from U.S. stock exchanges, trying to compel the sale of PRC companies to U.S. competitors, ordering the possibility of sanctions against financial institutions doing business in Hong Kong, stemming the flow of PRC scientists and technical experts seeking to work and study in the United States, and stepping up scrutiny of PRC talent recruitment programs. If and as other advanced economies take up similar measures, China’s access to foreign technology, capital and expertise will be increasingly constrained, especially in cutting-edge fields.

Spurring indigenous innovation: “Made in China 2025” and “dual circulation”

In response, Beijing must significantly increase investments in research and development (R&D) to develop new technologies, including technologies that do not yet exist or technologies that are inaccessible due to trade and investment restrictions. In order to spur indigenous innovation, China has increased its R&D

spending—total expenditure on R&D grew by double-digits annually between 2016 and 2020^[12]—and it is now the world’s second largest investor in R&D, behind the United States. However, on other indicators of R&D spending, China does not fare as well. For example, as a percentage of GDP (2.19 percent in 2018), China’s R&D spending ranks behind countries such as Finland, Israel, Japan, South Korea, Sweden, and the United States. To climb up the charts, the NPC endorsed increasing R&D investment at an annual rate of 7 percent in order to reach 3 percent of GDP by 2025.^[13]

One of the most important undertakings under Xi to promote indigenous innovation is known as “Made in China 2025” (中国制造 2025). Launched by the State Council in 2015, it aims to promote indigenous innovation and help transform China into a science and technology innovation superpower by 2049.^[14] Specifically, it is an effort to upgrade its manufacturing base through the integration of information technology—in essence pulling together the strengths of the state-owned and private sectors—to improve productivity, increase the indigenous content of higher-end technology products, reduce reliance on foreign inputs, and position China as a global leader in critical technologies of the future.^[15]

The Made in China 2025 strategy gives priority to ten high-technology sectors:

- next generation information technology;
- high-end numerical control machinery and robotics;
- aerospace and aviation equipment;
- maritime engineering equipment and high-tech maritime vessel manufacturing;
- advanced rail equipment;
- energy-saving vehicles and new energy vehicles;
- electrical equipment;
- agricultural machinery and equipment;
- new materials; and
- biopharmaceutical and high-performance medical devices.^[16]

Made in China 2025 set off alarm bells for governments and businesses around the world. Of greatest concern is the plan's associated objective of increasing the proportion of PRC domestic content across the value chain—design, manufacturing processes, technology and material inputs, and finished products—in the ten prioritized industrial areas and their subsectors. While the PRC government has not officially announced these targets, publications and analysis by Chinese think tanks and foreign counterparts conclude they generally range between 40 to 80 percent, depending on the sector, with the intention of achieving these goals between 2020 and 2030.[\[17\]](#) To do so will mean focusing the PRC's considerable legal, regulatory and fiscal resources to squeeze out foreign competition inside China and position these industries for dominant roles in the international marketplace in the coming decades.

In this sense, Made in China 2025 is an offensive measure to drive innovation and grab greater market share. But for China, it is defensive as well. Xi Jinping noted that one reason to enhance the international leading position of some industries is to “tighten international production chains’ dependence on China, forming a powerful countermeasure and deterrent capability against foreigners who would artificially cut off supply [to China].” Xi specifically named high-speed rail, electric power equipment, new energy, and telecommunication equipment as sectors where China already has advantages.[\[18\]](#)

Owing to the international criticisms of Made in China 2025, the PRC government has lowered the program's profile since 2018.[\[19\]](#) However, the overall strategy to become more technologically self-reliant remains in place. Indeed, the strategy has been reinforced by China's experience in the wake of the covid-19 pandemic in 2020-2021 and the continuing deterioration in economic relations with the United States over that period. In the midst of the global pandemic, Xi Jinping doubled down on promoting self-sufficiency by advocating a “dual circulation” (双循环) strategy—a framework he coined and endorsed last year.[\[20\]](#)

In essence, the strategy further encourages the Chinese economy to rely on its

enormous internal market or “domestic circulation” (国内循环) rather than foreign markets or “international circulation” (国际循环) which were the basis for the country’s spectacular economic success in the past. The emphasis on greater self-sufficiency gained even greater impetus as the United States took a number of measures in 2020 and early-2021 to further restrict PRC access to U.S. technologies and capital markets.[\[21\]](#) As Premier Li Keqiang declared in his work report to the NPC:

We will give priority to domestic circulation, and work to build a strong domestic market and turn China into a trader of quality. We will leverage the flows of the domestic economy to make China a major magnet for global production factors and resources, thereby promoting positive interplay between domestic circulation and international circulation.[\[22\]](#)

Endorsed by the NPC, the strategy’s key elements will include: increasing technological independence and innovation, securing external supply chains, and not only promoting greater reliance on China’s domestic demand, but also facilitating it through improvements to internal efficiencies in production and logistics. In short, the “dual circulation” strategy is intended to buffer China from the risks of exposure to the international marketplace—especially in the face of deteriorating U.S.-China relations—and place greater faith in its domestic market to drive economic growth in the years ahead.

Australian interests

These developments are significant for Australia. The outlook for Australia-China economic relations is already bleak. If, as declared at the NPC, China will continue to slow its capital-intensive development model and expand its consumption-led and green-growth plans, this would negatively affect traditional Australian exports of iron ore and coal.

Should China successfully transition in the coming decade to high-income status,

this could bode well for Australian exports catering to wealthier Chinese—high-quality agricultural goods, education, tourism, health products, lifestyle brands, and possibly fintech. But that assumes the present awful state of bilateral relations dramatically improves and Chinese consumers are not lured to other sources for those products—both highly unlikely prospects in the near-term.

In addition, if China succeeds in its ambition to dominate markets in key high-end technologies by 2030, this would likely squeeze certain Australian high-tech aspirations in both Chinese and global markets.

Moreover—in line with Xi’s ambition to achieve a greater economic “deterrent capability” against foreigners—it could result in greater leverage against Australia within some advanced technology sectors. As U.S.-China technological competition intensifies, the fallout will wash over our shores.

Beijing’s drive for self-sufficiency may have even larger geopolitical ambitions. Mindful that asserting its control over Taiwan by force would likely result in massive economic retribution by the United States, Japan, Europe, Australia, and others, China needs to build resilience to bear those costs. If a more confident, “self-reliant” China moves against Taiwan, Australia’s security and economic interests will not be immune.

Looking ahead

China is a large and well-resourced economy with numerous advantages and a record of resilience and adaptability. Of the world’s major economies, it emerged strongest from the covid-19 pandemic. It will continue to make strides in innovation, especially if the private sector is given a greater chance to reach its potential. PRC advancements in e-commerce, high-speed rail, drone technology, and artificial intelligence suggest promising possibilities for indigenous innovation in the future. Along with 14 other Asia-Pacific partners, China concluded the Regional Comprehensive Economic Partnership (RCEP) free trade agreement at the end of

2020. Also in 2020, Beijing finalized negotiations with the European Union on a bilateral Comprehensive Agreement on Investment and the 10-country Association of Southeast Asian Nations (ASEAN) became China's largest trading partner, followed by the European Union, with the United States coming in third.[\[23\]](#) These developments may help offset some of challenges noted above by enhancing China's access to key foreign markets besides the United States. China has even put in place its own regulations to punish firms—including foreign firms—which comply with "unjustified" sanctions imposed on China.[\[24\]](#)

But in spite of these and other economic positives for China, persistent structural obstacles remain in place and will frustrate progress in realizing Xi Jinping's economic ambitions.

Internally, the Chinese leadership will face increasing pressures to diminish the role of the state and Party within the economy, permit a greater role for the market, and introduce a legal and regulatory system that is more predictable and bound by the rule of law. But there is little sign that Xi and the Party-state are prepared to take such steps, seeing instead too much social and political risk in doing so. The past PRC growth model and approach to globalization has been an economic success by and large, but has also empowered the Party and Xi Jinping.[\[25\]](#) Sticking with that model—or at least significant elements of it—may bode well for the continuation of authoritarian rule, but will come at an economic cost in the years to come.

Externally, Xi and the Chinese leadership face growing pushback around the world to the country's quest for technology acquisition and indigenous innovation. A resulting bifurcation of the global economy, one which detaches elements of the PRC economy from their most prized markets and supply chains, will have a crippling effect on China's growth and economic aspirations. Having set lofty political expectations for China's economic success in the coming decades, Beijing faces the challenge of achieving increased productivity, greater self-reliance, and heightened income levels even as its economic and technological competition with other advanced countries continues to escalate.

Faced with these challenges, the announcements emanating from the Great Hall of the People during the NPC signal a profound re-thinking in Beijing. The stakes are high, not only for China but also for global economics and geopolitics for years to come.

Footnotes:

[1] Li Hongbin, et al., “The End of Cheap Chinese Labor,” *Journal of Economic Perspectives* 26, no. 4 (2012): 57-74, doi: 10.1257/jep.26.4.57.

[2] Lei Xiaoyan, “Grey Matter: Its aging population is an issue of major concern for China requiring policy changes to address it,” *China Daily*, November 13, 2020, <https://global.chinadaily.com.cn/a/202011/13/WS5fadcebda31024ad0ba93c88.html>.

[3] *People’s Republic of China: 2020 Article IV Consultation*, International Monetary Fund, December 2, 2020, <https://www.imf.org/en/Publications/CR/Issues/2021/01/06/Peoples-Republic-of-China-2020-Article-IV-Consultation-Press-Release-Staff-Report-and-49992>.

[4] This term defined by Indermit Gill and Homi Kharas, *An East Asian Renaissance—Ideas for Economic Growth* (Washington, D.C.: World Bank Group, 2007).

[5] The World Bank and the Development Research Center of the State Council of the People’s Republic of China *China 2030: Building a Modern, Harmonious, and Creative Society* (Washington, D.C.: World Bank Group, 2013), p. 12, <http://documents1.worldbank.org/curated/en/781101468239669951/>

pdf/China-2030-building-a-modern-harmonious-and-creative-society.pdf.

[6] The 13 economies are: Equatorial Guinea, Greece, Hong Kong, Ireland, Israel, Japan, Mauritius, Portugal, Puerto Rico, Singapore, Spain, South Korea, and Taiwan. On the correlation between “institutional quality” and breaking out of the middle-income trap, see Michael Witt, “How China Can Avoid the Middle Income Trap,” *INSEAD Knowledge*, April 12, 2016. <http://knowledge.insead.edu/blog/insead-blog/how-china-can-avoid-the-middle-income-trap-4629>.

[7] Chen Qingqing, “China may hit middle-income trap—minister,” *Global Times*, April 26, 2015, <http://www.globaltimes.cn/content/918760.shtml>.

[8] 中华人民共和国国务院 [State Council of the People’s Republic of China], 国家中长期科学和技术发展规划纲要 (2006—2020年) [National Medium- and Long-Term Program for Science and Technology Development (2006-2020)], [国务院公报](http://www.gov.cn/gongbao/content/2006/content_240244.htm) [State Council Bulletin], no. 9 (2006), section 2.1, http://www.gov.cn/gongbao/content/2006/content_240244.htm.

[9] Arthur R. Kroeber, *China’s Economy: What Everyone Needs to Know* (New York, N.Y.: Oxford University Press, 2020), p. 81.

[10] “Core technology depends on one’s own efforts: President Xi,” *People’s Daily Online*, April 19, 2018, <http://en.people.cn/n3/2018/0419/c90000-9451186.html>.

[11] Mathieu Duchâtel, *The Weak Links in China’s Drive for Semiconductors*, Institut Montaigne Policy Paper, January 2021, p.

7.

[12] “China’s spending on R&D rises to historic high,” *Xinhua*, August 27, 2020, http://www.xinhuanet.com/english/2020-08/27/c_139322217.htm.

[13] Data in this paragraph from United Nations Economic, Social and Cultural Organization Institute for Statistics website, <http://uis.unesco.org/apps/visualisations/research-and-development-spending/> and Wang Tao, “China’s Next Five-Year Plan to Prioritize Technology, Innovation,” *Caixin Global*, 25 September 2020, <https://www.caixinglobal.com/2020-09-25/wang-tao-chinas-next-five-year-plan-to-prioritize-technology-innovation-101609731.html>; Teddy Ng, “China’s ‘two sessions’: key takeaways from the opening of the National People’s Congress,” *South China Morning Post*, March 5, 2021, <https://www.scmp.com/news/china/politics/article/3124219/chinas-two-sessions-theme-overcoming-challenges-unifies-npc>.

[14] For excellent analysis of Made in China 2025 and its implications, Josh Wübbeke et al., *Made in China 2025: The Making of a High-Tech Superpower and Consequences for Industrial Companies*, MERICS Papers on China no. 2 (Berlin: Mercator Institute for China Studies, December 2016); Max J. Zenglein and Anna Holzmann, *Evolving Made in China 2025: China’s industrial policy in the quest for global tech leadership*, MERICS Papers on China no. 8 (Berlin: Mercator Institute for China Studies, July 2019). See also Scott Kennedy “Made in China 2025,” Center for Strategic and International Studies, June 1, 2015, <https://www.csis.org/analysis/made-china-2025>.

[15] “‘Made in China 2025’ Industrial Policies: Issues for Congress”, Congressional Research Service, August 11, 2020, <https://crsreports.congress.gov/product/pdf/IF/IF10964/6>.

[16] “ 国务院关于印发 ‘ 中国制造2025 ’ 的通知 [“State Council Notice on the issuance of Made in China 2025,” 中华人民共和国国务院 [State Council of the People’s Republic of China], May 8, 2015, http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm.

[17] In-depth details on Made in China 2025 as well as details of its domestic content goals are provided in *Made in China 2025: Global Ambitions Built on Local Protections* (Washington, D.C.: United States Chamber of Commerce, 2017), especially Appendix 3, https://www.uschamber.com/sites/default/files/final_made_in_china_2025_report_full.pdf.

[18] Xi Jinping, “国家中长期经济社会发展战略若干重大问题” [“Certain major issues for our national medium- and long-term economic and social development strategy”], 求是

[*Seeking Truth*], October 31, 2020, https://web.archive.org/web/20201111020608/http://www.qstheory.cn/dukan/qs/2020-10/31/c_1126680390.htm. This article is translated and by Etcetera Language Group and can be found at <https://cset.georgetown.edu/research/xi-jinping-certain-major-issues-for-our-national-medium-to-long-term-economic-and-social-development-strategy/>.

[19] Michael Martina, Kevin Yao and Yawen Chen, “Exclusive: Facing U.S. blowback, Beijing softens ‘Made in China 2025’ message”, *Reuters*, June 25, 2018,

<https://www.reuters.com/article/us-usa-trade-china-madeinchina2025-exclu-idUSKBN1JL12U>.

[20] Frank Tang, “Explainer: What is China’s dual circulation economic strategy and why is it important?,” *South China Morning Post*, November 19, 2020, <https://www.scmp.com/economy/china-economy/article/3110184/what-chinas-dual-circulation-economic-strategy-and-why-it>.

[21] Che Pan, “US-China tech war: Beijing’s top policy official lays out strategy to address Washington’s ‘stranglehold’ over China,” *South China Morning Post*, January 26, 2021,

<https://www.scmp.com/tech/policy/article/3119294/us-china-tech-war-beijings-top-policy-official-lays-out-strategy>.

[22] Li Keqiang, *Report of the Work of the Government*, delivered at the Fourth Session of the 13th National People’s Congress of the People’s Republic of China, March 5, 2021, p. 10, <http://en.people.cn/n3/2021/0313/c90000-9828536.html>.

[23] Ryan Hass, “How China is Responding to Escalating Strategic Competition with the U.S.,” *China Leadership Monitor*, no. 67 (2021), <https://www.prclleader.org/hass>.

[24] Tom Mitchell, “China launches measures to protect companies from US sanctions,” *Financial Times*, January 9, 2021, <https://www.ft.com/content/33c307b7-7157-442d-90b4-f48308429d02>.

[25] Min Ye, *The Belt Road and Beyond: State-Mobilized Globalization in China: 1998-2018* (New York, NY: Cambridge

University Press, 2020), chap. 8.

Image: Ship on the Huangpu River, China. Credit: [Jonathan/Flickr](#).