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UNPACKING CHINA'S INDUSTRIAL POLICY AND ITS IMPLICATIONS FOR EUROPE

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China is often credited with a successful application of industrial policy. One important particularity of China's industrial policy is that it aims at levelling the playing field between the state economy and the private economy in access to finance, yet within a framework of strategic goals. This aim is not relevant for market economies, such as those of the European Union, but only for those where state enterprises are clearly privileged.

Notwithstanding the difficulties in making valid comparisons, our analysis of how China conducts industrial policy in a variety of sectors points to success in some sectors but not all. More importantly, productivity growth in China has already been declining for two decades.

Given the very large resources that China has put into industrial policy, with subsidies being only one part, it is surprising that success is not more evident. This relates partly to factors including cronyism and regional protectionism. While the former might be less relevant for the EU given the different institutional background, the latter certainly is relevant since the EU faces the potential consequences of member country-level industrial policy for its single market. A lesson from China seems to come from the sectoral focus, with a long-term and economic-security mindset. The EU is far from this, but it is in the process of linking economic security to industrial policy.

Finally, responding to China's industrial policy involves diverse investigations and challenges in measuring subsidies accurately. Understanding China's very diverse and complex approach to helping companies achieve the government's industrial policy goals is crucial for anticipating the consequences of China's actions. These could be positive, such as cheaper imports of green technology, or negative, such as Chinese overcapacity spilling over to the EU single market.

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1 Objective

The academic literature contains several definitions of industrial policy, but reducing it to its essence, one might follow Juhász *et al* (2023) who defined it as *"those government policies that explicitly target the transformation of the structure of economic activity in pursuit of some public goal."* Frequently, this public goal is associated with innovation and productivity, industrialisation and security-related matters such as supply-chain resilience or the advancement of dual-use technology.

China's re-emergence, in which extensive use has been made of industrial policy, has triggered industrial-policy re-awakenings elsewhere. Germany's National Industrial Strategy 2030, for example, called China a *"particular successful country in terms of industrial policy"* (BMWi, 2019). Therefore, we analyse the nature of Chinese industrial policy by examining its objectives, instruments and outcomes. We assess how beneficial industrial policy has been for China and how exportable to the European Union its model might be. This is particularly relevant at a time when the EU and its member countries have started to introduce industrial policy instruments. We would like to emphasise, however, that we do not offer an assessment of whether the EU should engage in industrial policy on its own merits, but only on the extent to which the Chinese model might offer lessons.

The next section reviews the traditional arguments for and against industrial policy and how they apply to China. Section 3 sketches briefly the evolution of China's industrial policy since China joined the World Trade Organisation (WTO), with a focus on the instruments used. Section 4 shows the successes and shortcomings of China's industrial policy. Section 5 identifies some policy conclusions for the EU.

2 The economic rationale for industrial policy

Industrial policy has been justified traditionally through the infant-industry argument. To industrialise, underdeveloped countries must shield domestic firms from foreign competition. This is done either by erecting barriers to trade, such as tariffs, or by preferential treatment of domestic firms that compete with foreign incumbents on the home market (Hamilton, 1791; List, 1844; Rosenstein-Rodan, 1943; Melitz, 2005). Industrial policy can also be justified by innovation-related externalities. Research and development ventures usually require high upfront investment, while success is often uncertain. Since inventions, once discovered, are a public good, other firms can free ride on the efforts of the inventor, reducing the private benefits of a socially desirable outcome. Hence, the government can support R&D efforts financially, therefore increasing private incentives to innovate and accelerating technological progress (Nelson, 1959; Arrow, 1962). This rationale seems particularly relevant to technologies characterised by strong intra-sectoral spillovers, such as artificial intelligence, semiconductors and aerospace.

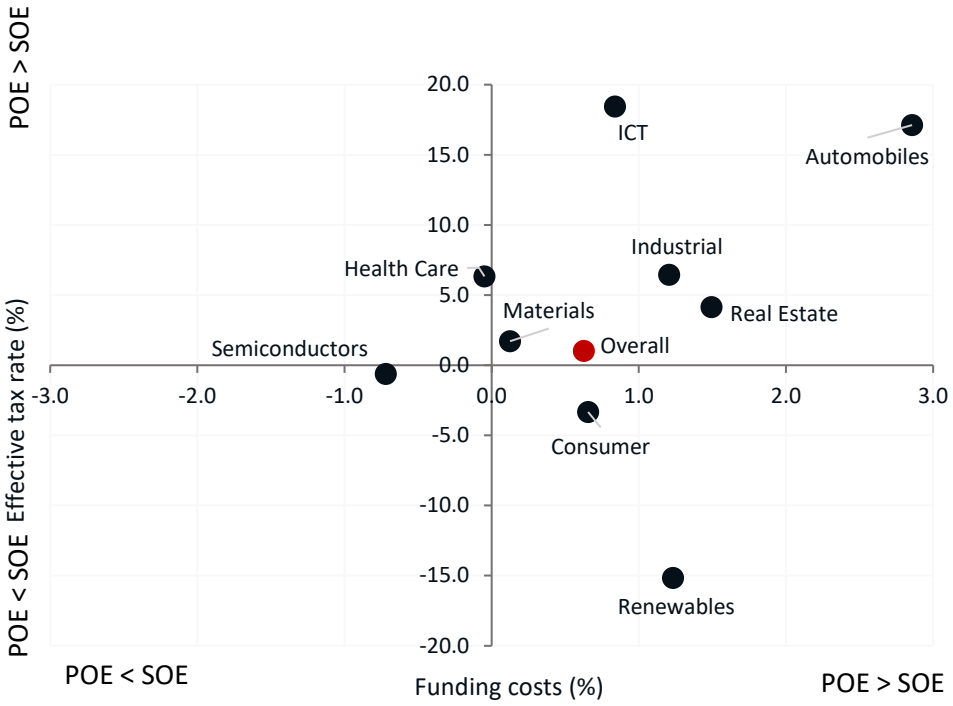
The economic literature also points to many drawbacks related to industrial policy. Informational asymmetries between the government and the market make it hard for bureaucrats to choose the most desirable investment. Government officials are seldom sector-specific practitioners and have themselves blurred views on the dynamics of the market. Furthermore, industrial policy might induce

firms to switch a substantial amount of resources away from productive activities towards seeking rents from the government, creating a breeding ground for corruption and distorted competition (Tullock, 1967; Krueger 1990).

China is a good laboratory for the study of industrial policy since active state guidance of the economy is explicitly promoted. Nevertheless, any analysis of Chinese industrial policy must take into account China's institutional particularities. China already has a millennium-long tradition of a relatively unchallenged state, not easily comparable with the nation states that formed in Europe. While private cultivation of farmland was the backbone of material prosperity in imperial China, the country was ruled by a cohesive fabric of gentry-like economic elites, Confucian officials and wealthy merchants in state-backed resource monopolies (Brandt *et al*, 2014). Some of these dynamics reemerged when the People's Republic legalised private entrepreneurship in 1992. Private entrepreneurs became the drivers of productivity growth but found themselves at a disadvantage when seeking access to finance (Song *et al*, 2011). Privately-owned companies (POEs) were often subjected to the so-called 'three types of arbitrariness': arbitrary fees, arbitrary fines and arbitrary extortion, which they could only smooth out through connections with local government officials.

The situation of POEs improved when China's acceded to the World Trade Organisation, but has deteriorated since President Xi Jinping came to power in 2013 and, in particular, since 2015. When credit growth slowed during China's deregulation campaign from 2016 onwards, private firms were squeezed, while state-owned enterprises could rely on government guarantees to receive loans (Wright, 2023). Since then, the state also reasserted control over some previously POE-dominated sectors, including IT services, online education and real estate. More generally, in China's corporate world, SOEs receive better fiscal and financial treatment than POEs as, documented by García-Herrero and Ng (2021).

Figure 1: SOEs, POEs, divergence in effective tax rates and interest rates (values of POE - SOE, 2019)



Source: Bruegel based on Wind.

China's industrial policy therefore can be seen in the context of a dominant state sector in the production of goods and services. Financing private firms through industrial policy aims to alleviate the disadvantage the private economy faces relative to the state economy, although importantly, under the conditions set by the government. Private-sector activity is channelled into strategic industries through government support, eventually blurring the line between state capital and private capital.

3 How does China conduct industrial policy?

3.1 Industrial policy and technological upgrading

The official objective of Chinese industrial policy is to upgrade China's domestic industrial base, especially in the context of two recent developments. First, the Chinese economy has been decelerating for over 10 years and this deceleration is expected to continue (García-Herrero, 2023). Innovation is the most obvious way to mitigate this. Second, China is now in strategic competition with the United States, with the outcome very much depending on the technological progress China can make. China's aim in this respect is not only to foster growth but also to eliminate the technological chokepoints that the US still counts on to contain China's rise.

Beyond this, China's striving for technological excellence has deep historical roots. China has been, with few interruptions, the cultural and economic centre of East Asia over the last 2,500 years. The eventual downfall of imperial China at the hands of technologically advanced powers in the nineteenth

century was a deep collective trauma effecting its self-perception. Chinese intellectuals and later statesmen thus recognised the importance of science and technology both for economic development and for national security[1]. It is not a coincidence that every leader since the reunification of China under the Communist Party in 1949 has emphasised the centrality of technological self-sufficiency in the rejuvenation of the Chinese nation. Seen through this lens, competitiveness and innovation are matters of national security, aimed at preventing the 'century of humiliation' – the period of China's decay between 1842 and 1949 – from repeating itself. The 'never again' mentality has been further strengthened under President Xi Jinping, and this rationale acts as the animating spirit of the kind of innovation-related industrial policy that China has conducted since the mid-2000s.

A milestone in this evolution came in 2006 when the central government issued the Medium to Long-term Science and Technology Plan (2006-2020)[2]. Industrial policy was officially merged into China's striving for technological self-sufficiency (Naughton and Chen, 2016). The concept of indigenous innovation became central to the narrative. Since 2006, several important industrial policy strategies and state initiatives have been published, of which the most essential are the Decision on Accelerating the Development of Strategic Emerging Industries[3] in 2010, Made in China 2025[4] in 2015, the Plan for the Development of SMEs[5] in 2016 and the 10,000 Little Giants in 2018.

Institutionally, China's push for industrial policy has been made possible by the weakness of the WTO's enforcement mechanisms. China's accession to the WTO in 2001 implied that a very large non-market economy could remain so and, thereby, could use industrial policy instruments to support its industry while retaining a very large share of state-owned companies. WTO provisions have proved ineffective. Member states often ignore the deadlines for the notification of subsidy schemes, and litigation cases drag on for several years (Hillman and Manak, 2023). This has facilitated China's determined application of infant-industry arguments to its industrial development, including the requiring of technology transfer from foreign direct investors in exchange for access to the Chinese market.

3.2 Made in China 2025 and the 10,000 Little Giants

The comprehensiveness of China's industrial upgrading plan are exemplified by the two most concrete industrial policy initiatives conducted by China in the last decade: Made in China 2025 (MiC2025) and the 10,000 Little Giants.

MiC2025 was introduced in 2015 by the Xi administration but its planning preceded the coming to power of Xi Jinping in 2013. Ten key industry sectors were singled out for upgrades, some of which were already the central focus of the Decision on Strategic Emerging Industries defined five years

[1] Yan Fu (1854 – 1921), for instance, is widely credited with introducing Western ideas of economics and science to China. Incidentally, his works were the subject of the first chapter of President Xi's PhD dissertation, with Xi crediting Yan as having *"raised the two flags of Science and Patriotism"* to save China from imperialism (Torigian, 2022).
[2] Available in chinese at https://www.gov.cn/gongbao/content/2006/content_240244.htm.
[3] Available in chinese at https://www.gov.cn/zwgk/2010-10/18/content_1724848.htm.
[4] Available in chinese at https://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm.
[5] Available in chinese at https://www.ndrc.gov.cn/fggz/fzzlgh/gjjzxgh/201706/t20170620_1196809.html.

earlier. The key areas of attention within MiC2025 are next-generation IT and telecommunications, advanced manufacturing, and robotics. In that sense, MiC2025 is often compared to Germany's Industry 4.0 (Ling, 2018), a government-backed programme introduced in 2013 to accelerate the integration of manufacturing and next-generation digital technologies. China's MiC2025, however, goes further by targeting production services equally, most notably transportation and logistics, the agricultural and energy sector, and new energy vehicles (NEVs). It also extends to the extraction and processing of basic materials and to pharmaceuticals (see EUCCC, 2016, for a thorough review of the sectors targeted by MiC2025).

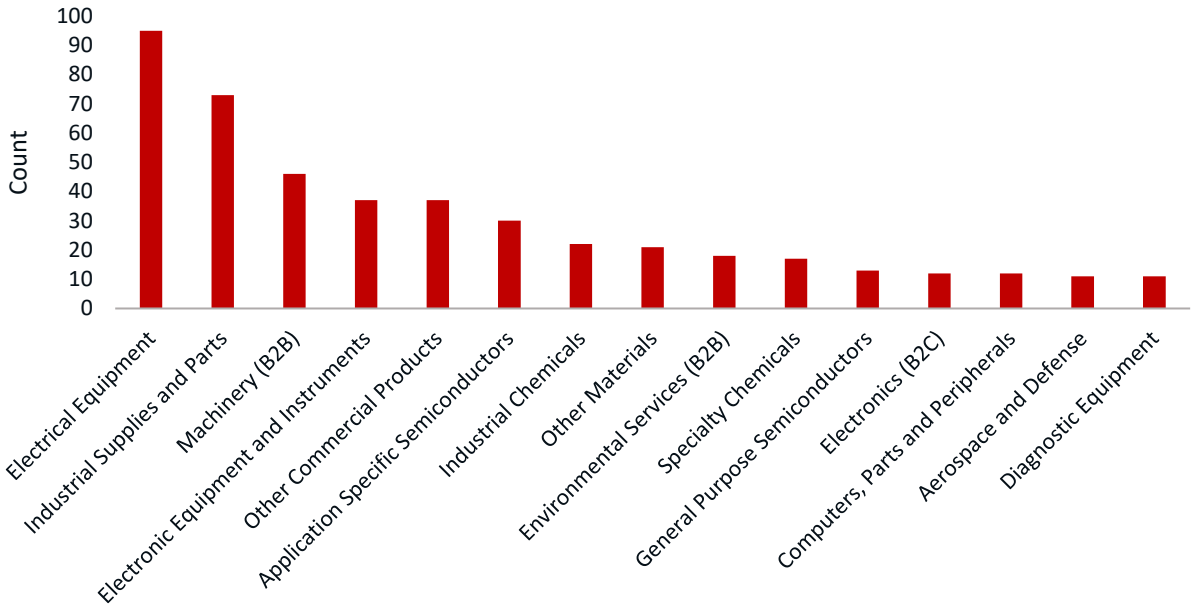
Another important difference is that, unlike Industry 4.0, MiC2025 is a top-down initiative and can be mapped onto the hierarchy of China's overall policy planning framework. In China, the high-level management of policy planning is communicated through five-year plans. Targets are often vague in order to later accommodate local conditions in sub-national policy implementation. Particular aspects of the five-year plans are further detailed in sector- and industry-specific policy plans. MiC2025 is one of these sector-specific (the manufacturing sector) complements to the 13th five-year plan, which covered 2015-2020. Since then, MiC2025 has itself been complemented by industry-specific plans, including the New Generation AI Development Plan (2017) and the New Energy Vehicle Industry Development Plan (2021-2035) in 2020. In addition, the SME Development Plan, introduced in 2016, can be linked directly to MiC2025. This web of national planning is then complemented by policy planning all the way down the administrative hierarchy. Provincial plans adopt the narratives of the national plans, but tailor their industry focus to local conditions (García-Herrero and Krystyanczuk, 2024, showed the differences between central five-year plans and local five-year plans in terms of sectoral policy objectives).

One of the most important spin-offs of MiC2025, and specifically of the SME Development Plan is the 10,000 Little Giants initiative. While MiC2025 aims to foster *"national manufacturing champions"* in a few selected industries, the 10,000 Little Giants initiative is designed to support what five-year plans often label as *"base industries"*. These include supply and processing of basic materials and chemicals, and specialised equipment manufacturing. In other words, the 10,000 Little Giants firms are SMEs in niche markets that should function as the backbone of China's national manufacturing champions, reminiscent of Germany's Mittelstand, to which the 10,000 Little Giants initiative is often compared in Chinese commentary.

In terms of official policy communication, the policy documents underpinning the 10,000 Little Giants initiative are more specific than those on MiC2025. In particular, the process through which a company may become a Little Giant is detailed. Companies must file a competitive application through their respective provincial government once they conform with certain tangible and intangible criteria, as set out in official government communication. Provinces then recommend their chosen firms to the central Ministry of Industry and Information Technology (MIIT), which reviews the material and decides on the final choice. After the selection, the chosen firms are announced publicly on the respective provincial government's website. Figure 2 shows the number of firms per industry selected to become

Little Giants, based on a sample of listed firms. Most specialise in the manufacturing of equipment, materials and processors. Many companies are also engaged in the chip production supply chain. Although 10,000 Little Giants gives more weight to basic sectors than for MiC2025, it is still close enough in terms of sectoral priorities.

Figure 2: Industry focus of listed Little Giant firms



Source: Bruegel based on PitchBook, Wind, data on publicly listed firms in China's onshore stock markets.

Beyond the sectoral choice of companies, it seems important to understand whether the choice of companies follows the criteria laid out in the 10,000 Little Giants official documentation. In an empirical investigation, García-Herrero and Krystyanczuk (2024) analysed the extent to which the firms selected as Little Giants comply with the formal requirements laid out in the application procedure. They found that companies generally do not comply with the main criteria, which is sectoral specialisation: 70 percent of business revenue should come from the company's main business activities. The chosen firms are almost consistently below the 70 percent threshold required for programme participation. However, relative to other listed firms, the companies selected as Little Giants tend to invest more in R&D. In line with the goal of mitigating asymmetries in access to finance between the state and the private economy, Little Giant firms also tend to be relatively more private.

Overall, however, it remains challenging to determine how well the selection process for China's industrial policy strategies works, as for most non-listed 10,000 Little Giants firms data is not available. The existing evidence on listed companies casts doubt on the process, as the selected companies do not seem to comply with the initiative's specialisation requirement.

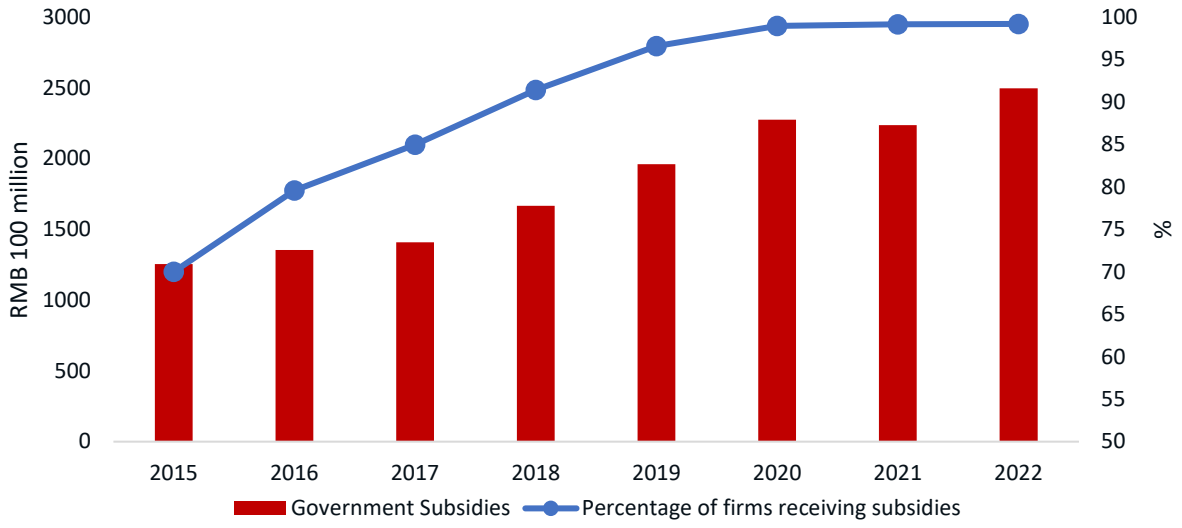
3.3 Instruments of China's industrial policy

The next question we explore is how China's industrial policy is implemented, in terms of the instruments used to support selected companies. This is one of the areas in which the differences between China and market-economies are greatest. In fact, given the institutional dominance of the Chinese state in the allocation of financial resources, the government has a wide variety of instruments at its disposal. We review the most essential channels of quantifiable support, some of which have equally been estimated by DiPippo *et al* (2022). We then draw on the academic literature to highlight more subtle ways in which governments can selectively favour some firms over others.

3.3.1 Direct government subsidies

Measurable (direct) subsidies in China have increased substantially since the mid-2000s, both in volume and in terms of the share of firms receiving them (Figure 3). In 2015, firms listed on China's stock markets received a total amount RMB 125.5 billion in subsidies, which climbed to RMB 249.7 billion in 2022 ($34.47 billion). The overall share of listed firms receiving subsidies increased from around 70 percent in 2015 to 99 percent in 2022. Hence, close to all listed firms now receive one or the other kind of subsidy. This also means that the focus should not be on whether a company receives subsidies, as virtually all publicly listed firms do, but rather the relative size of the subsidy received by a company compared to its competitors, or the average subsidies received by the companies in a specific sector compared to other sectors.

Figure 3: Direct government subsidies to listed firms in China

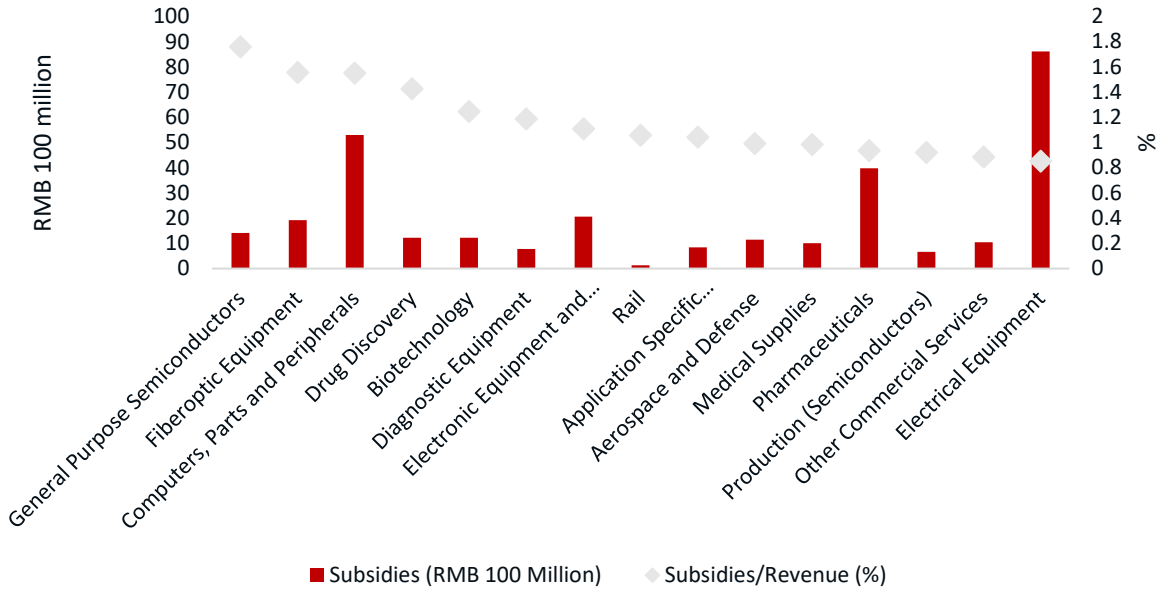


Source: Bruegel based on PitchBook, Wind, data on publicly listed firms in China's onshore stock markets.

Figure 4 shows the distribution of subsidies across manufacturing sectors averaged from 2015 to 2022. In absolute terms, the largest volume of subsidies went to electrical equipment makers. Since listed firms tend to be biased towards large firms (including state-owned energy conglomerates), we

also calculate subsidies as a share of total revenue. This changes the picture substantially, as shown by the blue dots in Figure 4. Consistent with the government's overall industrial policy plan, subsidy intensity is high among listed firms in equipment manufacturing, semiconductors, biotechnology, rail and aerospace. Finally, it is also important to note that direct government subsidies account for less than 2 percent of total revenue. This is significant in absolute terms but indicates that direct subsidies to Chinese firms are themselves not decisive relative to the size of the firms under observation.

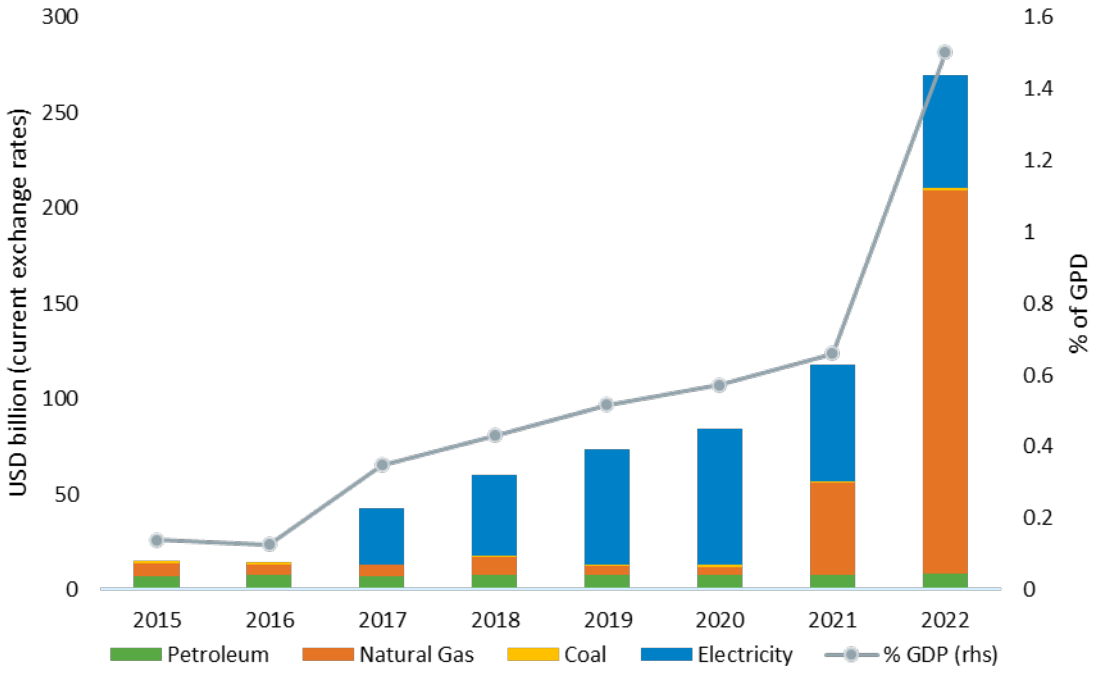
Figure 4: Sectoral classification of direct subsidies in China (2015 - 2022)



Source: Bruegel based on PitchBook, Wind, data on publicly listed firms in China's onshore stock markets.

Yet, independent of subsidies to listed firms, China employs a range of energy subsidies to consumers, both households and firms. International Monetary Fund estimates show that explicit fossil-fuel subsidies in China are used widely (Black *et al*, 2023). While some of the utility firms' subsidiaries are listed on the stock exchanges and thus also appear in the subsidy calculations for listed firms, the IMF estimates far exceed that. In 2021, the Chinese government spent $116.9 billion in energy subsidies, mainly on electricity and natural gas. This number climbed to $266 billion in 2022, equivalent to 1.5 percent of China's GDP that year. However, we must also clarify that by calculating the difference between retail price and supply cost, it is not possible to tell through which channels the subsidies are distributed. We are thus ignorant of whether subsidies are applied independent of sectors or specific firms, and hence, fit our definition of industrial policy.

Figure 5: Fossil fuel subsidies in China, by type



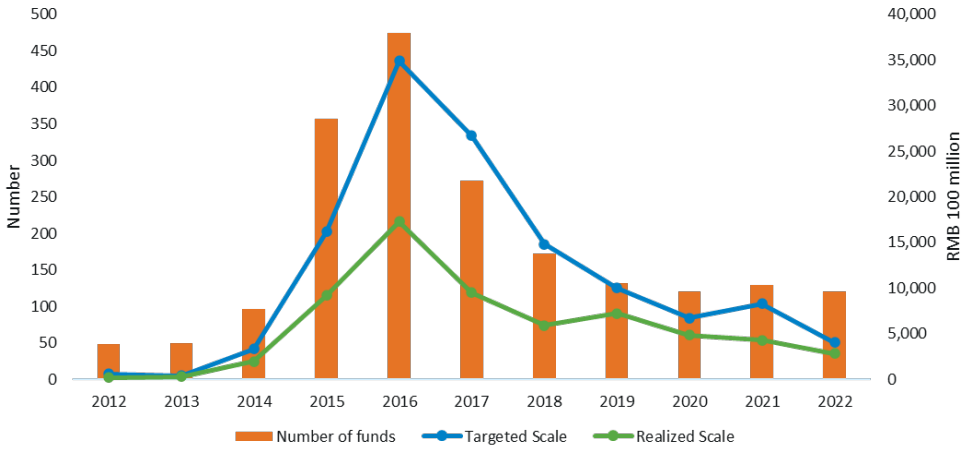
Source: IMF.

3.3.2 Government equity investment

Another essential instrument for achieving China's industrial policy goals is government-guided equity financing, mostly through so-called Industrial Guidance Funds (产业引导基金), or more loosely called Government Guidance Funds (政府引导基金) (henceforth GGFs). Usually, GGFs are set up by government agencies, which fix a fundraising target. The aim is to pool money from other government agencies, state-run banks, SOEs and, equally, private investors. GGFs typically have a sectoral focus and use different investment strategies. Some GGFs invest in other funds, and some invest directly in businesses and assets (Luong *et al*, 2021).

Such funding schemes have been successful in other countries, such as Singapore and Israel, but China's scale is much bigger. Figure 6 displays the increase in the number of newly established GGFs after 2015. While in 2014 only 96 new funds were set up, with a realised scale of RMB 197.79 billion, this number rose to 474 and RMB 1729.35 billion ($240.27 billion) in 2016 – a 10-fold increase – before slowly decreasing thereafter. One striking feature has been the failure of many funds to achieve the targeted scale, which means that the government ambitions in terms of raising funds were even greater than what was achieved, especially from 2016 to 2017. One of the reasons for the excessively ambitious targets lies in in the competition between local governments for funds to support their own companies (Wei *et al*, 2023).

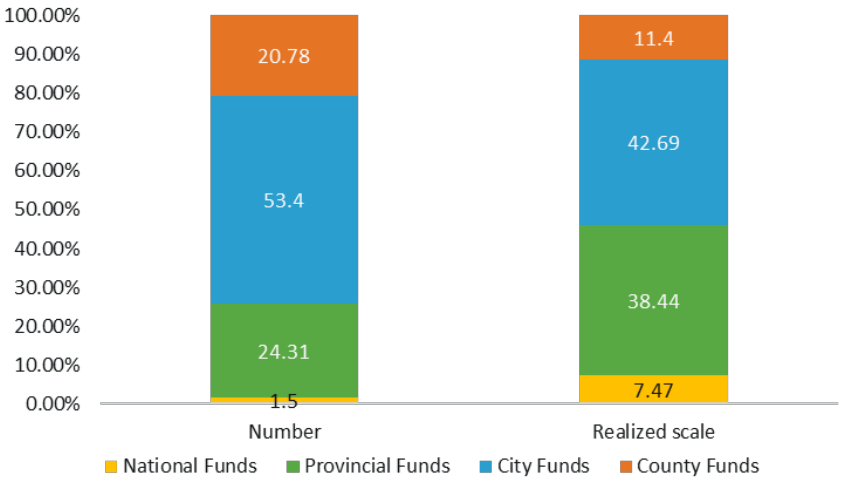
Figure 6: Number and scale of newly established Government Guidance Funds



Source: Zero2IPO.

The heightened competition for funding across different local governments becomes evident when looking at the number of funds throughout China's administrative hierarchy. While some of the large national funds, such as the China Integrated Circuit Industry Investment Fund (also called the Big Fund) have received much attention in the media[6], most GGFs are established locally. As of 2022, only 1.5 percent of all established funds were national funds, despite taking a disproportionate share of the funding reached – 7.5 percent of the total (Figure 7).

Figure 7: Administrative distribution of GGFs

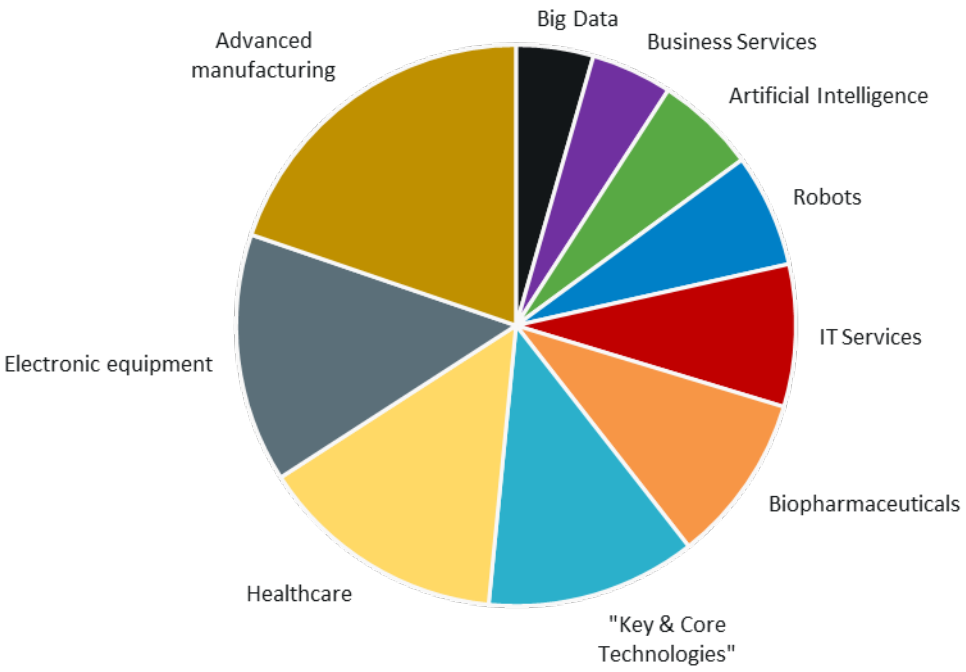


Source: Zero2IPO.

[6] Li Tao, 'How China's 'Big Fund' is helping the country catch up in the global semiconductor race', *South China Morning Post*, 10 May 2018, https://www.scmp.com/tech/enterprises/article/2145422/how-chinas-big-fund-helping-country-catch-global-semiconductor-race.

Finally, as one would expect, these funds are highly focused on priority industries, essentially following the MiC25 guidance. According to China Venture, a private research company focussing on China's innovation economy, 19.8 percent of total GGF investment went to advanced manufacturing during 2017-2019, followed by electronic equipment, biopharmaceuticals, robots, AI and big data. Healthcare also received a large share of 14.3 percent during the same period (Figure 8).

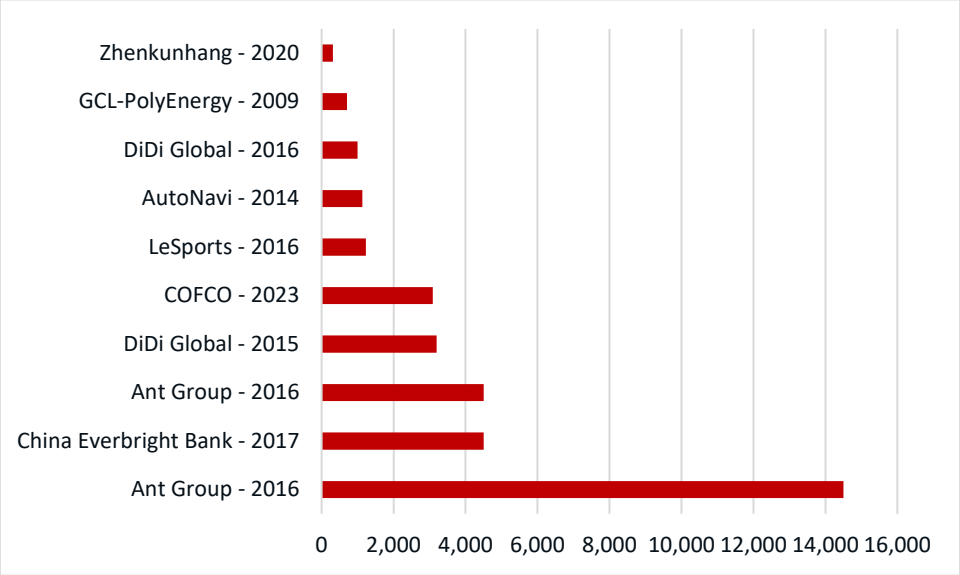
Figure 8: GGF investment across industries (2017 - 2019)



Source: China Venture.

Although GGFs stand out for their scale and number, the Chinese government has other ways to use equity investment to achieve its goals. For instance, China's major sovereign wealth fund, the China Investment Corporation (CIC), has channelled significant amounts of funds into China's digital platform industry (Figure 9). In 2016, Ant Group, China's largest mobile payment provider and a subsidiary of Alibaba, received the equivalent of $4.5 billion in equity investment from CIC. In 2018, this was followed by another injection of $14 billion. Mobility service platform DiDi Global, the Chinese counterpart of Uber, received an investment of $3.2 billion in 2015 and another $1 billion in 2016. AutoNavi, the provider Gao De Di Tu, China's Google Maps, received an investment of $1.13 billion in 2014.

Figure 9: Top 10 CIC equity investment deals ($ millions)

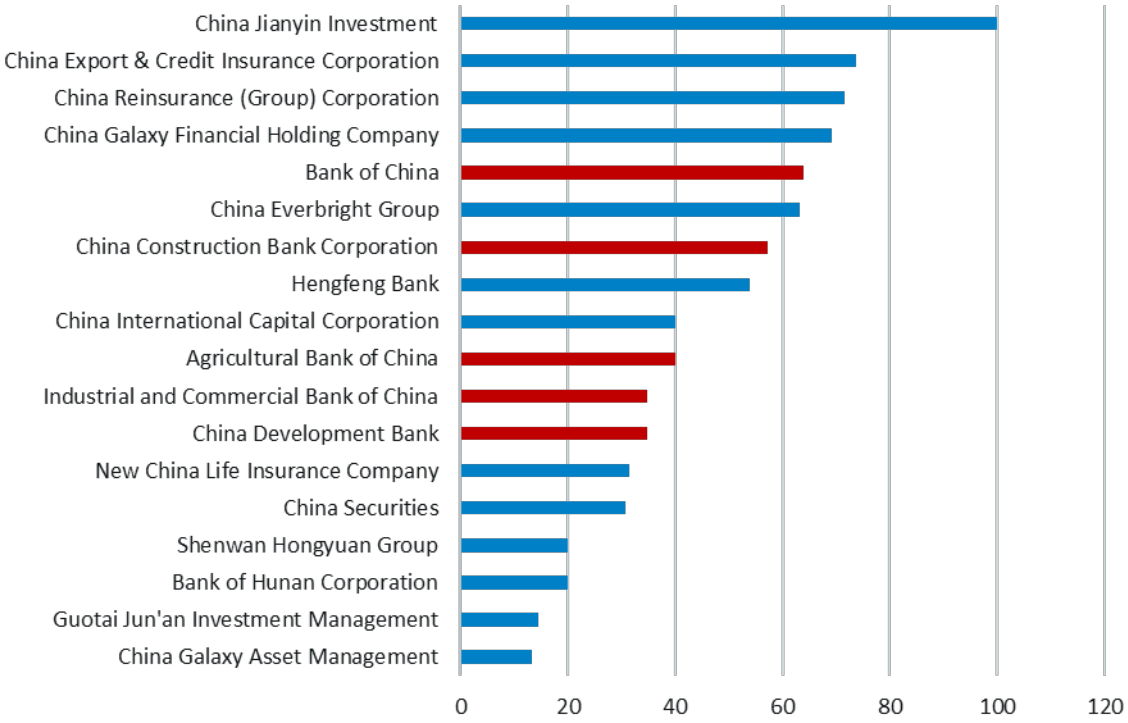


Source: PitchBook.

3.3.3 Bank loans

Beyond subsidies and GGFs, the most obvious channel for industrial policy is bank lending, which accounted for 77 percent of corporate finance in December 2023 (PBoC, 2023). Preferential bank lending to selected firms or sectors can come from various sources with different degrees of policy orientation. First are the three policy banks: the Export-Import Bank of China, China Development Bank and the Agricultural Development Bank. While they mostly concentrate their operations in infrastructure investment, at home and abroad, the Export-Import Bank has been active in the promotion of domestic companies' foreign outreach. Of its RMB 5.94 trillion of assets, RMB 2.64 trillion is held in foreign trade loans, encouraging export and imports of goods and the development of foreign trade enterprises (EXIM Bank, Annual Report 2022). Indeed, support through lending-centred industrial policy mitigates risk for Chinese firms in their overseas operations. This has been shown to lead to an increase in cross-border mergers and acquisitions of firms in targeted sectors relative to non-targeted sectors (Shen *et al*, 2023). Policy banks, however, only account for 9 percent of all lending in China. Another 27.04 percent of China's corporate lending comes from the big four state-owned commercial banks (marked in red in Figure 10) , which have a share of loans into manufacturing equating to between 15 percent and 20 percent of total corporate loans, depending on the bank. All four banks are in turn backed by capital from China's Central Huijin (Figure 10), a wholly owned subsidiary of CIC. The Central Huijin itself is tasked with the strategic investment of China's foreign exchanges reserves in China's domestic market (Liu, 2023).

Figure 10: Percentage of shares held by Central Huijin (%)



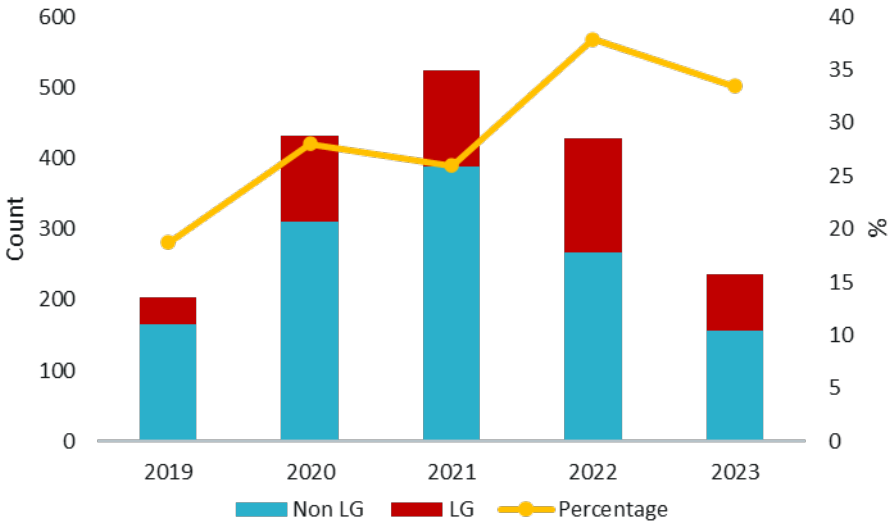
Source: Central Huijin Annual Report 2022, major banks are marked in red.

Beyond the central government's means, much of China's corporate lending occurs at the sub-national level through the jungle of China's numerous local commercial banks. The term 'commercial' bank is misleading as these banks are generally owned by the respective local government. Banks' CEOs are also hand-picked or approved by the local organisational department of the Chinese Communist Party. The degree to which these banks act in line with central policy goals is more difficult to assess. While there is no reliable data on the direction of local bank's financing activities, local governments often do not internalise the strategic concerns of the central government. To make matters worse, when the central government allowed the establishment of local banks in return for reduced local revenue retention in 1994, it rescinded its oversight over local banking activities as part of the bargain. As a consequence, over time these banks became *"the wildest animals in the Chinese economy"*, lending on behalf of local governments' addiction for investment (Liu, 2023). Since the great financial crisis these funds have increasingly been directed into real estate and infrastructure projects with decreased economic value – hence, China's current local government debt crisis. With Beijing's renewed push for banking oversight since 2016, this might soon change.

3.3.4 Government certification

To complete the story, a goal of firm-specific state support is the signalling of a company's worth to outside private investors[7]. Here again, as the private sector has consistently been at a disadvantage when it comes to access to finance relative to the state sector, subsidies and programmes like the 10,000 Little Giant initiative serve as a perceived guarantee for the competitiveness of the firm in the eyes of outside investors. This is connected to the fact that in a country with still underdeveloped institutions, entrepreneurial firms often do not disclose their actual innovative performance out of fear that competitors will infringe their IP rights. Selective government support helps to 'reveal' those firms. It is therefore not surprising that in Chinese provinces with weaker IP protection, receiving R&D subsidies has been found to lead to better access to bank lending for an innovative firm (Li *et al*, 2019). Likewise, entrepreneurial firms that receive R&D-related subsidies perform better during their IPOs (Chen, 2017). Besides, government certification can help firms to get listing approval from the China Security and Regulatory Commission, broadening their access to finance through equity investment. In 2022 and 2023, more than one third of newly listed firms were Little Giant firms (Figure 11).

Figure 11: Little Giant firms in new stock market listings



Source: Bruegel based on Wind.

3.3.5 Other types of government support

Apart from the channels discussed, government agencies use various more indirect forms of selective support to carry out industrial policy. These include preferential tax treatment and preferential land allocation. Land allocation is important since all land in China is owned by the government, in

[7] In conversations in 2023 and 2024 between the authors and relevant government officials and businesspeople, it became clear that this certification effect is well understood and integrated into the goals of China's industrial policy.

particular local governments. With the real-estate boom and rising levels of development in China's Eastern provinces, land became increasingly a scarce resource. For affordable access to land, firms were thus left at the mercy of local officials. As the government tightened regulations in the property sector from 2016, the oversupply of housing triggered severe debt distress for many property developers. The collapse of real estate giant Evergrande in mid-2021 and the ensuing real estate crisis eased the pressure on land prices and therefore access to land for commercial use. Thus, the importance of this channel in China's industrial policy might decrease in the future.

Yet, the example of land allocation fits into the general picture of more subtle ways of selective government support. A suitable way to illustrate local governments' relationship with businesses is to imagine the government as functioning like a chamber of commerce. Firms can expect numerous benefits if they keep good connections with local officials, beyond subsidies and land. For instance, politically connected firms can expect an edge in court cases over their opponents (Lu *et al*, 2015). Equally, firms might benefit from their connections beyond the tenure of the current leaders. As city mayors are rotated every few years within a province, and provincial governors across provinces, they carry with them business contacts from their previous tenures. This in turn fosters inter-regional trade links for supported firms (Jiang, 2020).

3.3.6 Overall extent of China's industrial policy

To sum up, subsidies are only the tip of the iceberg. China has many more instruments at its disposal although the precise measurement of their scale remains a challenge. Nevertheless, the above analysis suggests that both scale and scope are significant. The analysis also highlights the challenges associated with cross-country comparisons. Evenett and Fritz (2021), drawing on data from the Global Trade Alert (GTA), estimated the number of subsidy awards in China since 2010 to be almost on par with the European Union. However, the GTA data draws on official announcements of subsidy schemes, which in China often omit the scope and the scale of state support. For instance, the Little Giants initiative does not disclose the associated benefits for selected firms. The setup of a GGF is equally not announced in policy documents. Thus, the numerous ways in which industrial policy can be implemented and the institutional context in which policies are applied imply that measuring industrial policy through official announcements has its limits.

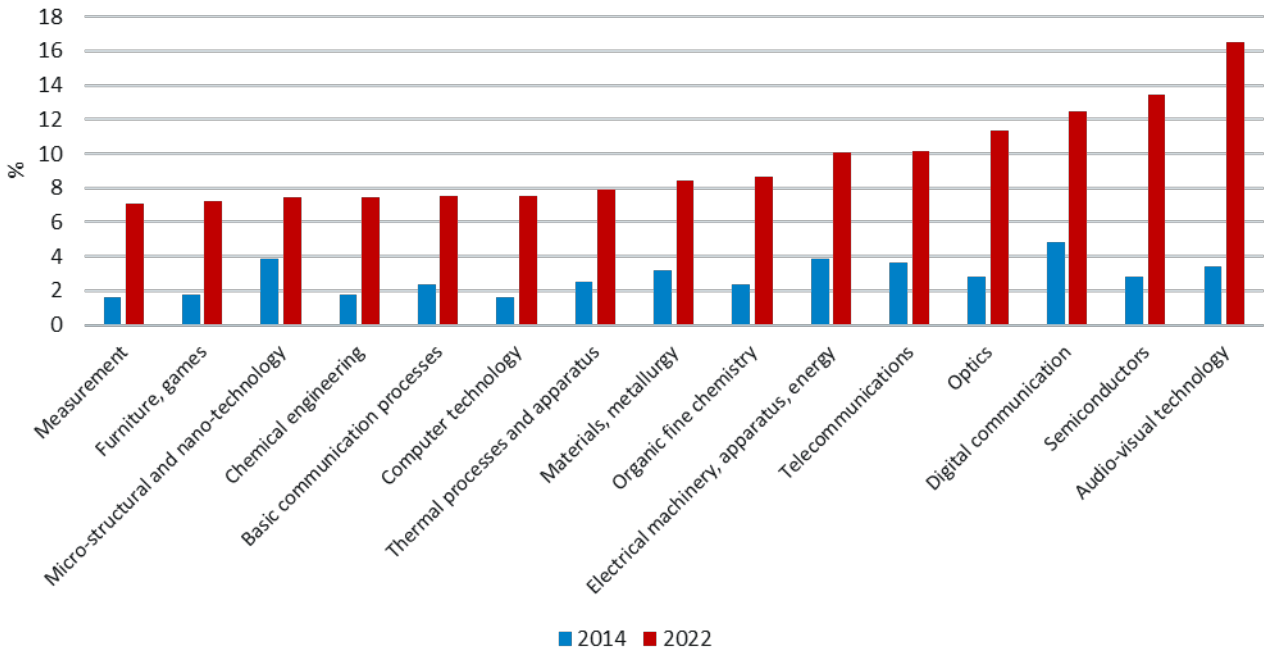
4 How successful has China's industrial policy been?

Measuring the success of industrial policy is challenging as its objectives are multifaceted. In China's case, this is even more difficult as information on the companies receiving support is scant, especially after the government stopped publishing representative industry surveys in 2013. Still, some tentative conclusions can be drawn based on the academic literature and available qualitative and quantitative data.

4.1 Most obvious achievements from China's industrial policy

Starting with one of the main overall objectives of MiC25, namely moving up the ladder, we look into patent filing as an indicator of China's innovation drive. Figure 12 shows that China has increased its share in patent grants across the top 15 fields reported by the US Patent and Trademark Office (USPTO). Several of these are in MiC2025-related industries, such as semiconductors, digital communication, optics, telecommunications and electric machinery.

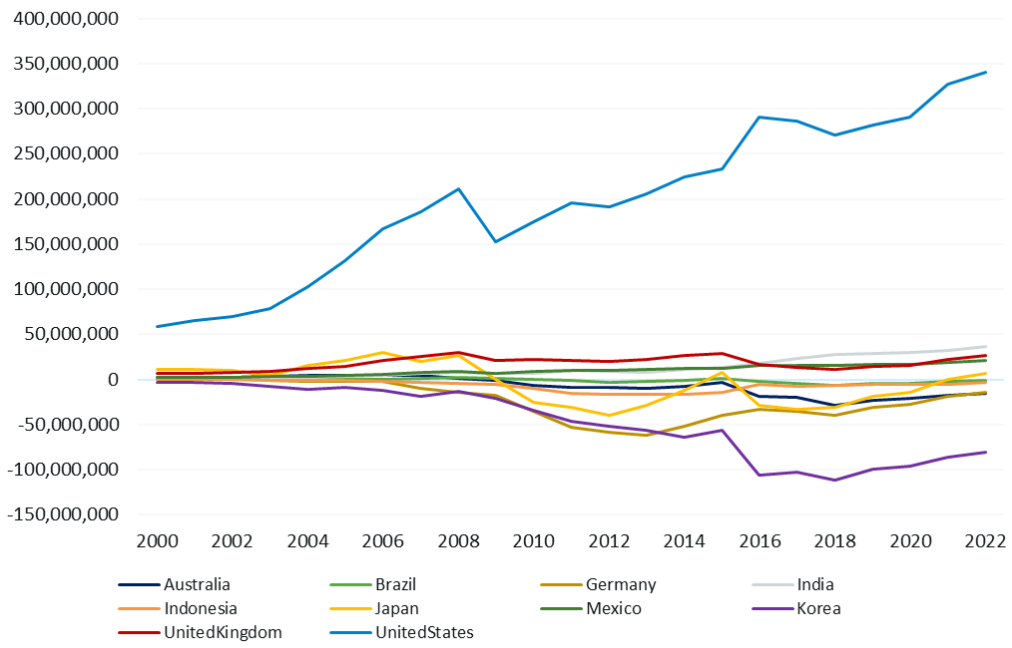
Figure 12: Share of Chinese patents in total newly granted patents at the USPTO



Source: Bruegel based on WIPO.

Beyond China's rising capacity for innovation, it is important to look at the surge in the domestic value added in exports in China since its accession to the WTO. Figure 13 shows how much China is increasing its value added in exports compared to other countries (especially Germany). It should also be said that, although value-added can give a general picture of whether a country has moved ahead in terms of technological capacity, it is an imperfect measure of industrial policy as many other factors are at play. A closer sectoral analysis is thus needed.

Figure 13: Difference in the value added in exports between China and selected countries

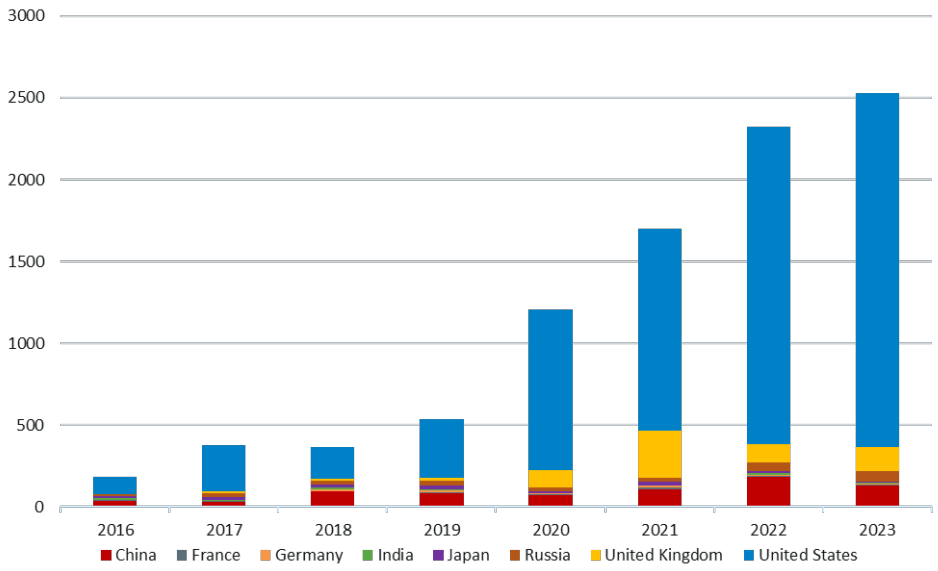


Source: Deorukhkar and García-Herrero (2024).

4.2 Which sectors have done better?

Starting with space, China's unmanned exploration of the far side of the moon, starting in January 2019, has hit the headlines but the reality is that the annual number of objects launched into space by China remains limited. While growth in absolute number has been evident, from 38 Chinese launches in 2016 to 128 launches in 2023, the evaluation of success might be very different if viewed relative the United States. The adoption in the US of reusable rockets through SpaceX's breakthrough in 2016 has led to a widening in the gap between the two powers (Figure 14).

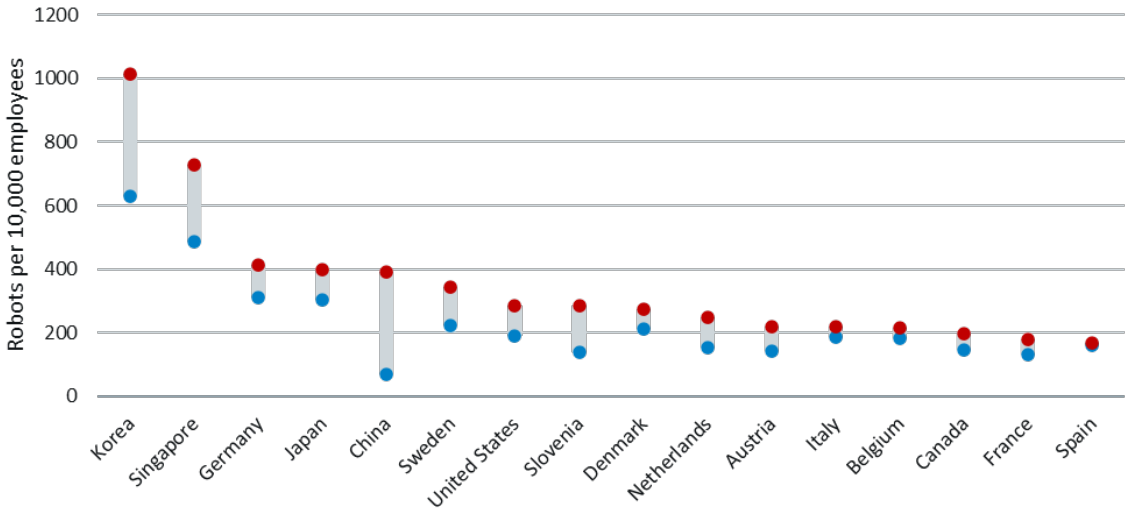
Figure 14: Share of objects launched into space, by country



Source: UN Office for Outer Space Affairs.

On robots and automation, progress has been rather positive. The installation of robots by Chinese companies went up from 68 per 10,000 employees 2016 to 392 in 2022 (Figure 15). Only South Korea achieved a bigger jump during the same period. Still, these figures should not be overinterpreted. Political incentives have inflated these numbers since local officials are evaluated based on the degree of automation in their jurisdictions. This often led firms to automate in order to receive benefits from local governments, not out of concerns for production efficiency (Lei, 2021).

Figure 15: Robot density in 2016 and 2022

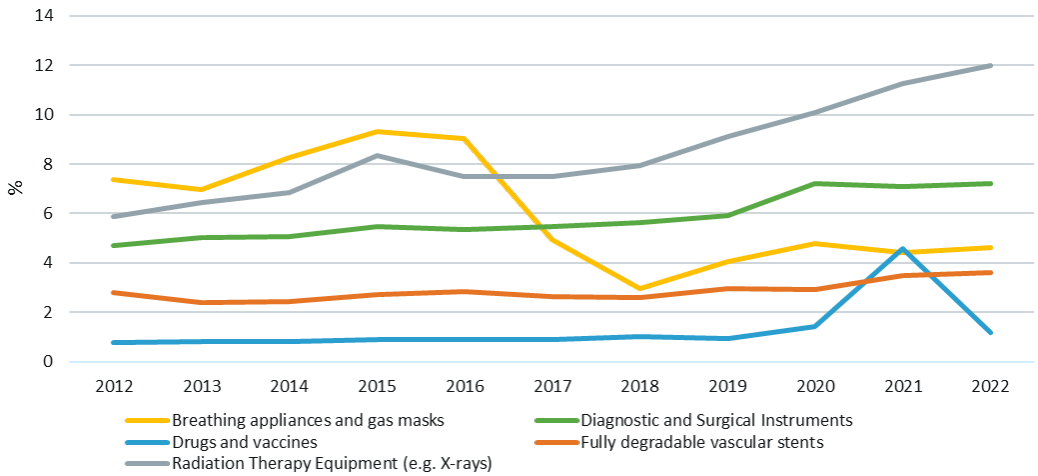


Source: International Federation of Robots.

Another field which has become a central focus for industrial policy in China is semiconductors. China has committed enormous resources to the development of cutting-edge chips, with limited success (García-Herrero and Weil, 2022). Numerous problems have arisen. Local governments often favoured foreign firms over local producers to boost GDP figures and employment. Foreign firms clustered in a few cities – Shanghai, Suzhou and Wuxi, where they benefited from being close to familiar suppliers. For local Chinese firms, these dense networks of foreign conglomerates have been difficult to penetrate, limiting the technological spillovers that could be gained from the passive pouring of funds within China's Two Big Funds (Tan, 2021). In addition, the stepping-up of US export controls throughout 2023 has further restricted China's access to cutting-edge chips.

In the field of medical technologies, the government has equally ramped up support, most notably through state procurement and investment in basic research. But progress has been slow. While China's share of world exports in this sector has grown by a few percentage points, it still only hovers around 8 percent (Figure 16), far behind other more successful sectors. The market for medical devices and innovation in pharmaceuticals is still driven by US firms (MedTech Europe, 2023; EFPIA, 2023). China's failure to develop an MRNA-based vaccine in response to COVID-19 and the reliance of Chinese hospitals on foreign imported devices have exposed lagging progress in this area (Brown *et al*, 2023).

Figure 16: Biotechnology, pharmaceuticals and high-performance medical devices

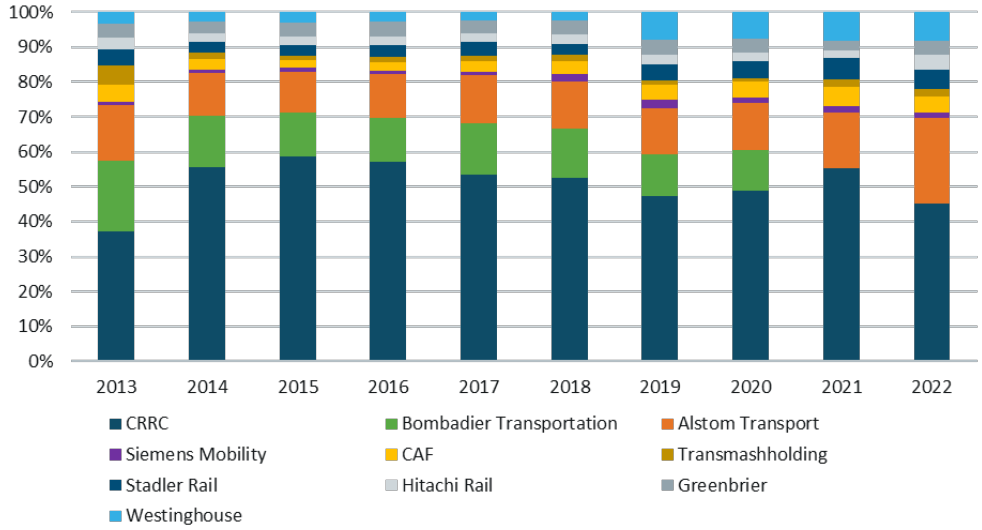


Source: Bruegel based on UN Comtrade.

One major field of focus of MiC2025 is transportation. MiC2025 includes targets for air, railway and maritime transport and the corresponding equipment. At a first glance, China seemed to have made significant progress. First, the China Railway Rolling Stock Corporation gained global market share in 2014, from close to 40 percent the previous year to around 50 percent to 60 percent (Figure 17). However, this sector has become increasingly competitive at global level with revenues for smaller

firms rising, while Alstom's acquisition of Bombardier in 2020 has turned Alstom into a formidable competitor to the China Railway Rolling Stock Corporation.

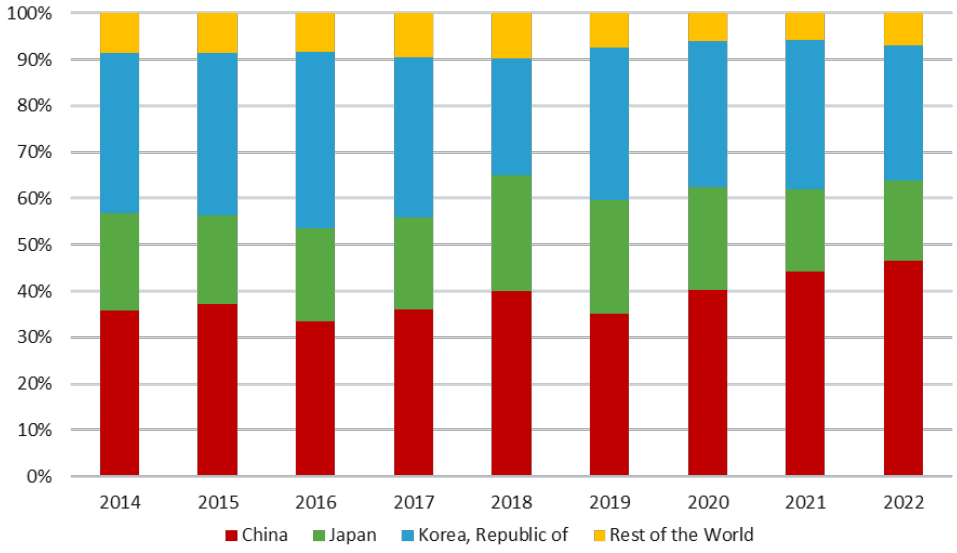
Figure 17: Global market share of rolling stock manufacturers



Source: Bruegel based on Orbis, PitchBook.

In the shipbuilding industry, China's market share is also significant. China's key players have benefitted from an extensive subsidy programme during the 2000s, which, together with a policy of mergers, has helped them gain global market share (Barwick *et al*, 2019). China is now the industry leader in this field, with approximately half of new ships built by Chinese firms (Figure 18). Japan and, more recently, South Korea have lost market share.

Figure 18: Global market share of shipbuilding firms

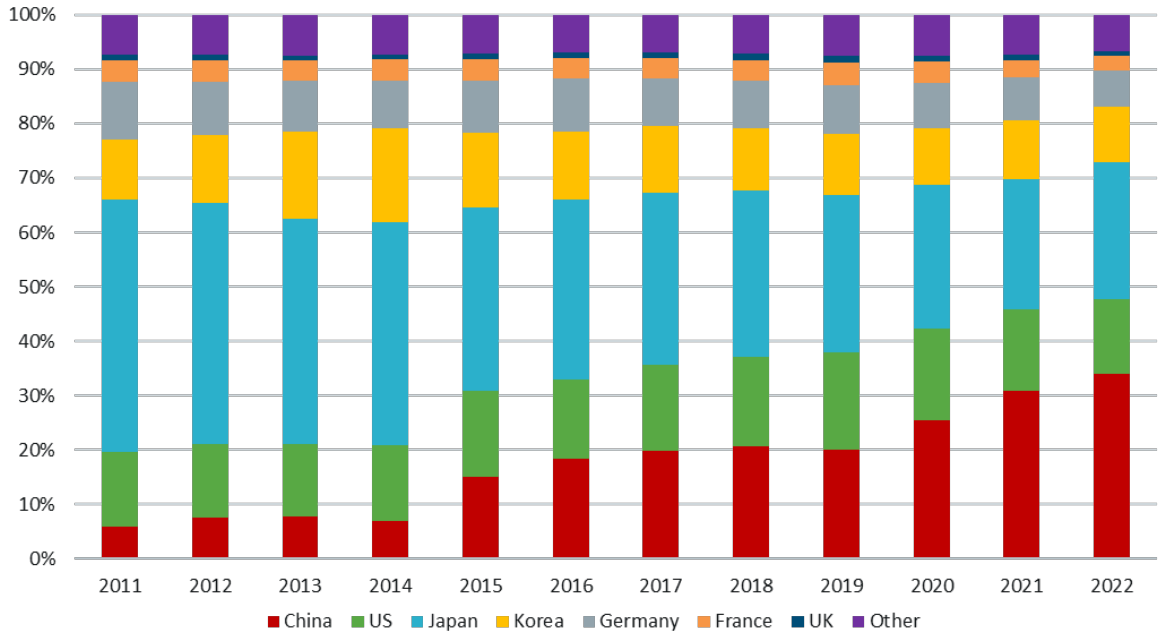


Source: Bruegel based on UNCTAD.

One of the toughest challenges for the Chinese transportation sector has been the duopoly of Airbus and Boeing, which has characterised the aviation industry since the 1990s. Zenglein and Sebastian (2023) showed that, while China has reduced its dependence on imports of railway and shipbuilding equipment, it still relies heavily on foreign inputs for the construction of its newly designed commercial aircraft, the C919. More generally, civil aviation seems to be one of the sectors, together with semiconductors, where China's upgrading seems to have lagged most.

Judged by the growing share of patents in the transportation sector, China's innovative capacity has gone up (Figure 19). Even if the quality of these patents is uncertain, there appears a clear trend. For instance, China's Fuxing Hao bullet train has reached a maximum speed of 350km/h, with the new CR450 model in development expected to run at a maximum speed of 450 km/h. In maritime transport, China successfully finished its first domestically produced aircraft carrier in 2017, as well as the first domestically produced cruise ship in 2023. Even in commercial aviation, where challenges have been greater, China's design of the C919 is a milestone as well. In other words, although the actual novelty of patented technology will have to be examined by future studies, progress is undeniable.

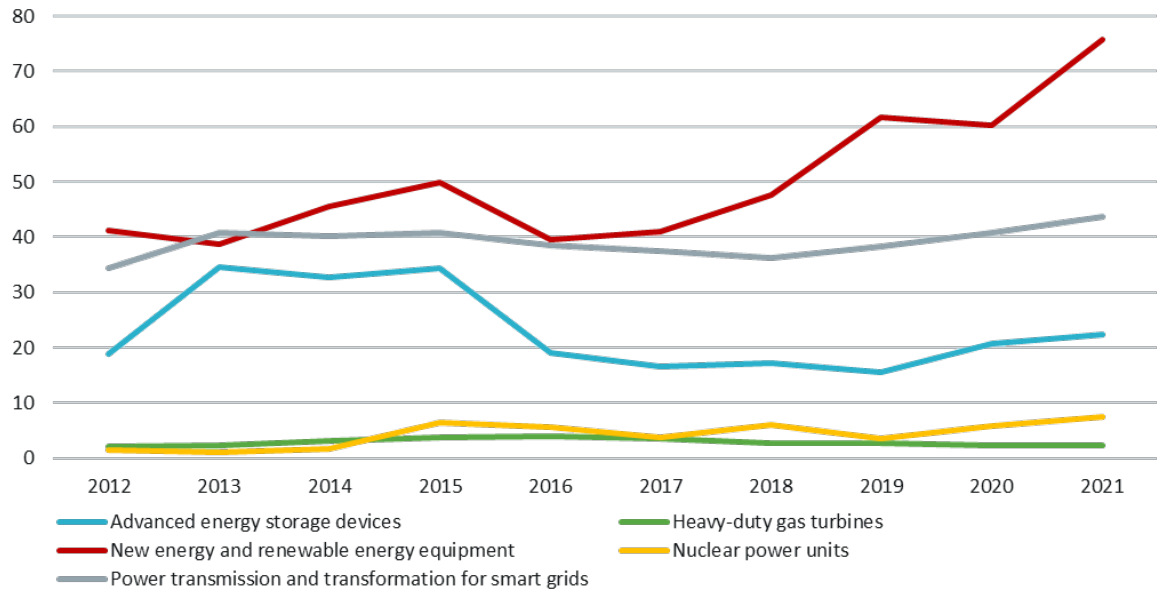
Figure 19: Country share of USPTO patent grants in the transportation sector



Source: Bruegel based on WIPO.

Energy infrastructure as a basis for manufacturing is another key component of industrial policy. China has been particularly successful in renewable energy equipment, photovoltaic cells and wind power equipment. Not only has China gained ground in export share (Figure 20), but Chinese firms are increasingly expanding the technology frontier.

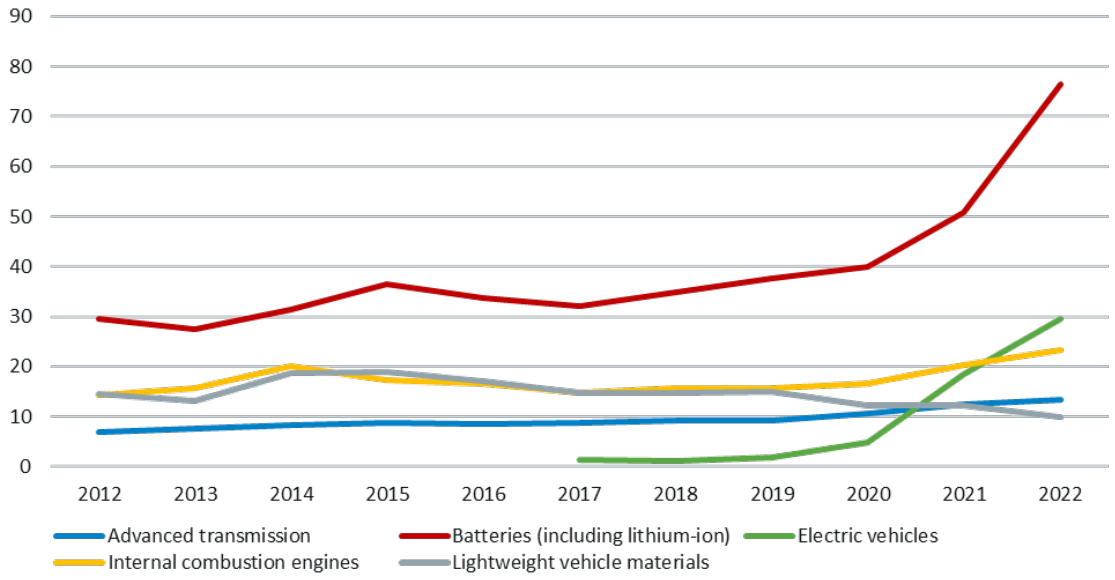
Figure 20: Share of Chinese exports in world exports (electrical equipment) (%)



Source: Bruegel based on UN Comtrade.

Finally, equally notable has been the success of China's electric vehicles sector. Figure 20 shows that, in 2022, China's share of EV world exports was 30 percent but on EV batteries China was dominant, accounting for almost 80 percent of global exports, up from 40 percent in 2020 (Figure 21). Chinese manufacturers and battery producers have been able to leapfrog in these areas. Part of this success is explained by the mere fact that EVs and battery technology are emerging or re-emerging industries with few incumbent foreign competitors. The other aspects have been China's generous government support and the large amount of funds spent on R&D, which have propelled China to the top of the ranking in related scientific publications (García-Herrero and Schindowski, 2023).

Figure 21: Share of Chinese exports in world exports (new energy and energy saving vehicles) (%)



Source: Bruegel based on UN Comtrade.

To sum up, China has made significant progress in some of the government's priority fields, at least when measured in terms of market share, value-added and number of granted patents. What is less clear is the extent to which China has been able to contribute to breakthrough inventions. In some industries, this has been achieved. In others, such as semiconductors, pharmaceuticals and commercial aerospace engineering, China has not reached the technology frontier, which is still set by US and European companies. At the same time, the adoption of robots show that the economic efficiency of some of that progress is distorted by the politics of industrial policy. Local government incentives often do not internalise the central government's objective of technological upgrading for the sake of productivity.

4.3 Industrial policy for competitiveness

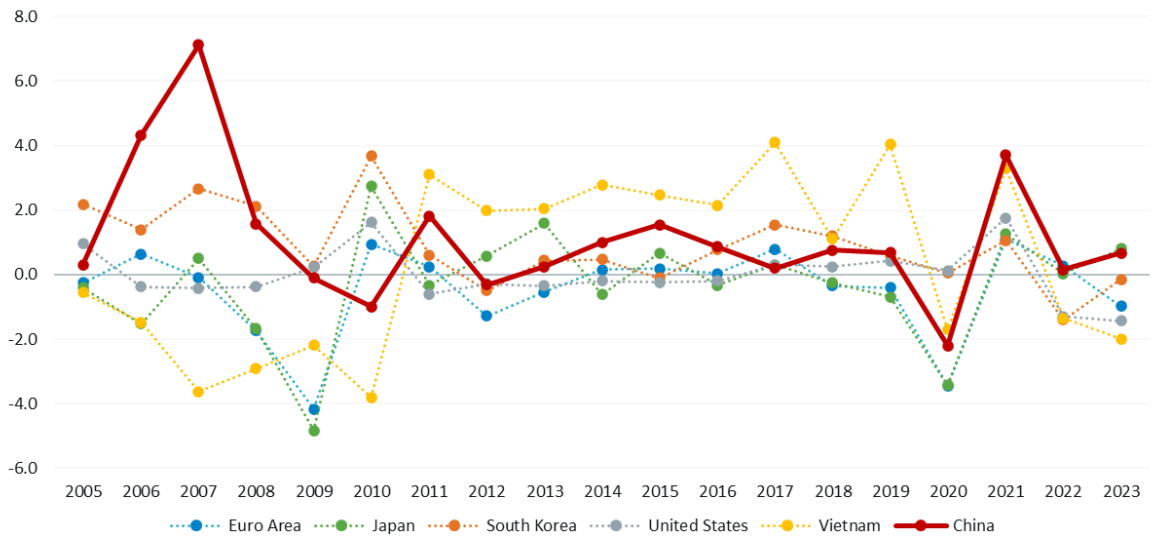
As noted in section 3, China's industrial policy aims to create innovative national champions that are able to effectively compete with incumbent foreign firms abroad. In some sectors, China has done this. This is weighted against the cost of market distortions that industrial policy brings about. The benefit of having competitive firms to service both the home market and foreign markets depends crucially on the openness of trade partners and their ability to absorb Chinese products, which in turn relies on a geopolitically stable environment. Here it becomes tricky. China draws in part on the experiences of Taiwan and South Korea during the 1970s, which, by 'picking winners', turned some of their most innovative entrepreneurial firms into globally competitive multinationals (eg Samsung and TSMC). The growth of these firms has, in return, fuelled the creation of backward linkages at home, and business opportunities for domestic suppliers of goods and services to these firms. China is different in two ways. Unlike Taiwan and South Korea, China is outside of the traditional United States alliance network

in the Indo-Pacific. Second, China's sheer size implies that industrial policy not only creates national champions but also global champions. It is, thus, not surprising that China's growing, industrial policy-induced competitiveness is seen as a threat to the national security of established powers, and raises economic concerns in major exporters globally, such as Germany and South Korea.

4.4 What happened to China's productivity growth?

Finally, since the goal of China's industrial policy is to reach the technology frontier, and gains in productivity are a stated goal of China's innovation-driven development strategy, we investigate the relationship between China's industrial policy and productivity. For a still developing economy such as China, growth in total factor productivity has been remarkably low since the great financial crisis (Figure 22). In other words, despite bringing some sectors closer to the technology frontier, productivity increases seem to have been offset by a counteracting force.

Figure 22: Total factor productivity growth, by country (%)



Source: The Conference Board.

There are three factors to consider. First, as mentioned in section 2, China has a particular institutional culture. The Chinese state is visible in the economy, as can be attested from its lack of competitive neutrality, and the sheer scale of state funds flowing into the economy. This situation tends to create relatively more obstacles to productivity growth compared to the Western model. However, this is a structural factor and has been in place since the early 1990s. A second reason could be that through some variable factor there has been a general deterioration of the business environment. While no comprehensive microeconomic evidence exists for the entire period, findings from Brandt *et al* (2023) suggests that a decline in the entry of new firms is behind the reduction in TFP growth in the manufacturing sector. However, the authors' sample, although representative, only covers the period

until 2013, which does not include the acceleration of industrial policy since 2015. And yet, an increasing uncertain business environment for SMEs has been noted by qualitative evidence, even since 2015 (Lei, 2023). This raises the question about a third potential factor, namely the distortive effects which industrial policy can have.

4.4.1 Cronyism

One reason for the documented misallocation of state resources is cronyism, which became rampant after the great financial crisis (Ang, 2020). Synergetic ties between government officials and large enterprises, with the goal of exchanging material favours, is pervasive and is intertwined with industrial policy. In many places, local officials benefitted from fostering connections to large firms as they could readily call on them for city development projects, without having to go through tedious public tenders. Local governments equally played an essential role in enabling start-ups to benefit from FDI spillovers by negotiating technology transfers on their behalf. Private enterprises were also encouraged to provide liquidity to local state banks for the latter to be able to compete with the four centrally-managed commercial banks (Liu, 2023). From the perspective of firms, political connections mean benefits from industrial policy, ie more subsidies and more land for productive use (Tao, 2017; Wu and Yang, 2020). The downsides of cronyism include market distortions and an uncertain business environment for smaller firms. SMEs that find themselves outside of political circles receive ever more unpredictable visits by local officials. Fieldwork between 2017 and 2021 done by Lei (2023) offers some examples of such misuse of authority. Some SMEs are obliged to shut down their production facilities because of alleged violations of environmental or safety standards. Other firms report being compelled to procure equipment from specific suppliers. Furthermore, evidence based on listed firms suggests that subsidies do not go to the most productive firms and can even depress firm-level productivity growth *ex-post*, suggesting allocative inefficiencies (Branstetter *et al*, 2023). Although the pervasiveness of cronyism depends on the province under observation, local governments generally use industrial policy as part of a carrot-and-stick approach to advance their strategic objectives, especially in the private sector.

4.4.2 Regional protectionism and market fragmentation

Cronyism in China is connected to another phenomenon: regional protectionism. In particular, since the 1990s and increasingly since the mid-2000s, province and city governments have systematically erected inter-regional trade barriers to shield their local champions from domestic competitors. The auto industry is a good example of how administrative regulations were put in place to achieve this (see Barwick *et al*, 2021). From the perspective of local authorities, this can be optimised behaviour as it maximises the benefits of selective state support within the given jurisdiction, even if it reduces overall economic efficiency. The central government has become aware of this problem, resulting in a push to break down these barriers. Under the umbrella of the 'dual circulation' strategy, the government has initiated a comprehensive reorientation towards the domestic market. Measures that

have followed include a strengthening of anti-trust laws and the encouragement of digital and logistic networks along domestic industrial supply chains (Wu, 2024).

5 Policy implications: takeaways for Europe

Having reviewed the recent history of China's industrial policy, how it functions and its successes and failures, the question arises of what Europe can learn from the Chinese experience.

The first conclusion is that China's industrial policy has been only partly successful. The transportation sector, in particular shipbuilding and railway, has seen significant advances. Likewise, renewable energy equipment, EVs and battery technology have been success stories from which China will benefit for years to come. In other sectors, progress has been more ambiguous. Nevertheless, the successes have so far not been enough to lift China out of stagnant productivity growth. Evidence suggests that industrial policy is closely linked to government favouritism, which in turn begets regional protectionism. Political connections are associated with increased direct subsidies, with preferential land allocation, and lower financing costs for credit. To maximise the effect of government support for their favoured firms, provinces have erected administrative barriers to entry in their jurisdictions. Finally, the goal of international competitiveness is challenged by the fact that China's industrial policy has triggered a geopolitical backlash from its main trading partners.

The next question – beyond the degree of success – is how applicable the lessons from China's industrial policy are for other economies and, in particular, the European Union.

First, China's industrial policy happens in a very specific institutional setup that is hard to compare to Europe's. China's institutions are still in development. Depending on the region, the rule of law is applied with a considerable level of arbitrariness. Loans tend to be biased towards the state sector at the expense of the private sector. Ironically, a good part of China's industrial policy is a way to offer support to private companies in the sectors that are strategic enough for such support to be warranted. In other words, China's industrial policy can be seen as a directive tool for a structurally disadvantaged private sector, which is faced with weak intellectual property rights. It is a tool to smooth out the imbalances faced by those firms with sufficient innovative capacity. This function of China's industrial policy is very different from that of a market economy, including the economies within the EU.

Still, Europe's developed and formalised institutions make it less vulnerable to the kind of government-business collusion seen in China. Cronyism is much more pervasive in low- and middle-income economies (Faccio, 2006). Industrial policy in the EU can therefore be run in a more transparent way than in China. In the same vein, the fact that the banking sector is generally not in public hands also helps mitigate the pitfalls. However, the EU has one weak spot: its lack of market integration.

The EU must also anticipate the medium- to long-run geoeconomic consequences of its industrial policy when designing it. China's state-induced competitiveness has alarmed its trading partners, and has already put China in a difficult spot on the global stage. The EU has traditionally been the major

power that is most keen to uphold multilateralism through institutions such as the WTO. If the EU gives into to the temptation of a subsidy competition with China and the United States, it will undermine its commitment to the international rules-based order. Furthermore, the EU would risk direct reactions from partners on which it is dependent, either for security or for trade. Since the EU is fiscally relatively constrained, it is unlikely that the outcome will be a more competitive, more united EU. This has to be taken into account when choosing which sectors to support.

It is the right prioritisation of sectors that is the key. It would be a mistake to focus on those sectors in which China has already been successful in its own industrial policy strategy. These are the sectors in which the EU is least likely to be able to compete, because of its generally higher labour costs and because of the long time it would take to gain the practical know-how that Chinese firms have acquired over the years. Priority shall be given to new sectors in which China does not yet have a comparative advantage, and/or to those that are vital for its security. If the EU can find an elegant way to channel its relatively scarce fiscal resources into the right sectors, then industrial policy might succeed. If the EU follows the Chinese model blindly, it risks its future.

On the more specific point of the EU response to China's industrial policy, a wealth of different investigations have been opened. An EU anti-subsidy investigation has been opened into Chinese battery electrics vehicles[8]. As of early 2024, the EU's trade defence instruments have been used to launch investigations into Chinese solar panel manufacturers[9] and a subsidiary of CRRC[10]. Our conclusions point to the difficulties in viewing the extent of China's industrial policy only through the size of direct subsidies. What is more concerning is that many of the other instruments the Chinese governments has at its disposal (from bank loans to state-guided funds) are both hard to measure and hard to classify as 'financial contributions conferring a benefit', which is at the core of the definition of actionable subsidies under the WTO's subsidies and countervailing measures regime.

These considerations highlight how much more the EU needs to know in terms of how China conducts industrial policy, as a basis for figuring out the consequences: from the positive, such as cheaper prices for the EU energy transition, to the negative, such as how the EU can protect itself from the consequences of China's industrial policy in terms of overcapacity reaching the EU single market.

[8] Alice Hancock, Henry Foy, Hudson Lockett and Peter Campbell, 'EU to launch anti-subsidy probe into Chinese electric vehicles', *Financial Times*, 13 September 2023, https://www.ft.com/content/55ec498d-0959-41ef-8ab9-af06cc45f8e7.
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Appendix: Word cloud of the key industrial policy tools launched by the Chinese government.

MLP (2006-2020):

Strategic Emerging Industries:

Made in China 2025:

SME Development Plan (2016):

The figure shows the key concepts of China's four major industrial policy plans between 2006 and 2016. While each of these plans point to a specific focus, the word for technology (技术) and innovation (创新), as well as development (发展) appear throughout all these plans.

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