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# CHINA HORIZONS

DEALING WITH A RESURGENT CHINA

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## Drinking from a glass half-full? Evaluating China's industrial policy successes and failures and implications for Europe

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# Abstract

China is often credited with successful conduct of industrial policy, yet few policymakers truly understand its working. This second brief of a two-piece series on China's industrial policy looks at the sectoral choices based on two of its most prominent initiatives and their success as well as their caveats. Our analysis highlights both the ambiguous sectoral success as well as the complications with which industrial policy has come. A few conclusions from the Chinese experience can be drawn for the EU and its conduct of industrial policy.

## Key findings

- “Made in China 2025” and its spin-off for small and medium enterprises (SMEs), the “10,000 Little Giants” Initiative, form the cornerstone of China's industrial policy strategy since Xi Jinping came to power. While Made in China 2025 aims to create national champions in strategic industries, the 10,000 Little Giants Initiative aims to cultivate Chinese SMEs in “base industries”, ie critical supplies, chemicals, machinery and equipment for the support of national champions.
- China has achieved relevant success in some industries targeted by its industrial policy. This is particularly the case of transportation – most notably railway equipment and shipbuilding – electric vehicles, and renewable energy equipment. Success in other industries has been more ambiguous. China still lags behind the technology frontier in semiconductors and medical equipment, and progress in robotics and space exploration has been modest.
- Despite the aforementioned success in some industries, there does not seem to have been a relevant positive impact on productivity, which remains stagnant. While it is difficult to confirm what is the reason for the stagnant productivity, cronyism, misallocation of subsidies and regional protectionism are both well documented in the literature on China's industrial policy. Beyond such miss results, an additional problem is the growing geopolitical backlash that China's industrial policy has triggered risks its progress in many areas.
- Finally, the lessons that the EU may draw when exploring China's industrial policy are not fully clear. Firstly, our economic model is simply not comparable, so that any inference from China's industrial policy may offer different results. On the positive, the EU's more modest cronyism should be a positive but the instruments that China has been using for industrial policy might simply not be transferable. Another important caveat for China's industrial policy is regional protectionism, to which the EU might relate as a more aggressive industrial policy at the nation state level should have a negative impact on the single market. Finally, a potentially positive lesson to be drawn from China is the importance of planning ahead as far as the industry prioritization is concerned.

# Contents

Abstract .....	- 2 -
Key findings.....	- 2 -
Contents .....	- 3 -
1. The sectoral focus of China's industrial policy strategy: Made in China 2025 and 10,000 Little Giants .....	- 4 -
2. How successful has China's industrial policy been? .....	- 5 -
2.1. Most obvious achievements from China's industrial policy .....	- 6 -
2.2. Which sectors have done better? .....	- 7 -
2.3. Industrial policy for competitiveness .....	- 13 -
3. What happened to China's productivity growth?.....	- 14 -
3.1. Cronyism.....	- 15 -
3.2. Regional protectionism and market fragmentation .....	- 15 -
4. Implications for the EU .....	- 15 -
References.....	- 18 -

# 1. Objective

Since the mid-2000s, the Chinese leadership has turned industrial policy into a major tool in transitioning the economy toward an innovation-centered development model. Since then, a complex web of interrelated policy documents has been published. Over the years, a clear sectoral focus has emerged, including advanced manufacturing, medical equipment, transportation equipment, and electric vehicles, among others. In this second brief of a two-part series on China's industrial policy, we highlight its successes and failures by examining developments in strategic sectors. We focus on various indicators, such as patent grants, value-added in Chinese exports, market share, and China's export share in global markets. We then explore the relationship between China's industrial policy and its stagnating productivity growth. Finally, we draw conclusions for the European Union and its own push for more active state involvement in the economy.

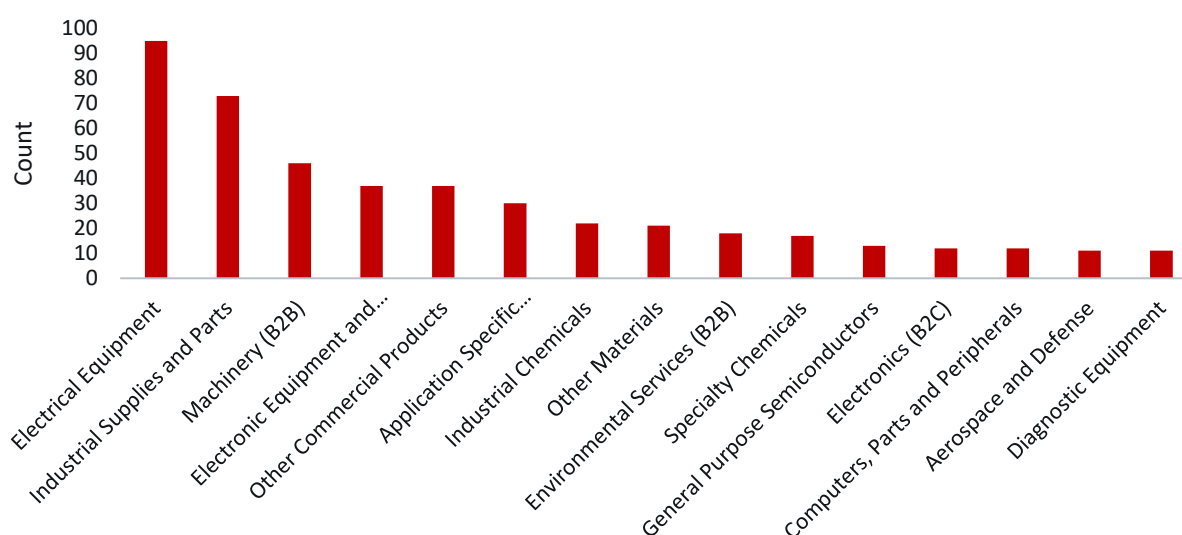
## 2. The sectoral focus of China's industrial policy strategy: Made in China 2025 and 10,000 Little Giants

The sectoral choices of China's industrial policy are best illustrated the two most concrete 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 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).

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 1 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 1: Industry focus of listed Little Giant firms**



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

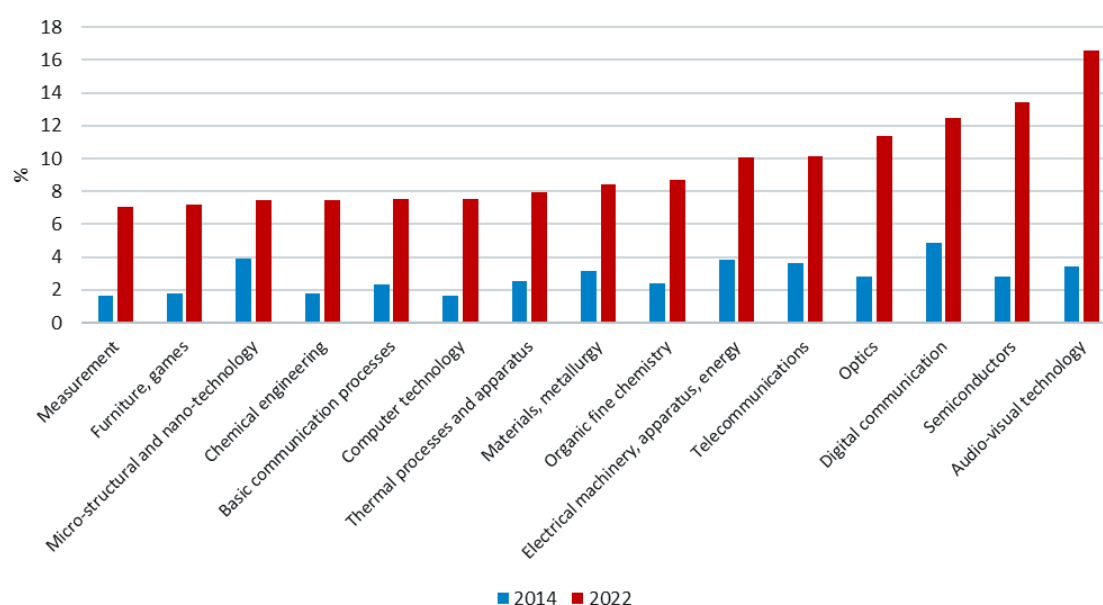
### 3. How successful has China's industrial policy been?

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.

### 3.1. 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 2 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.

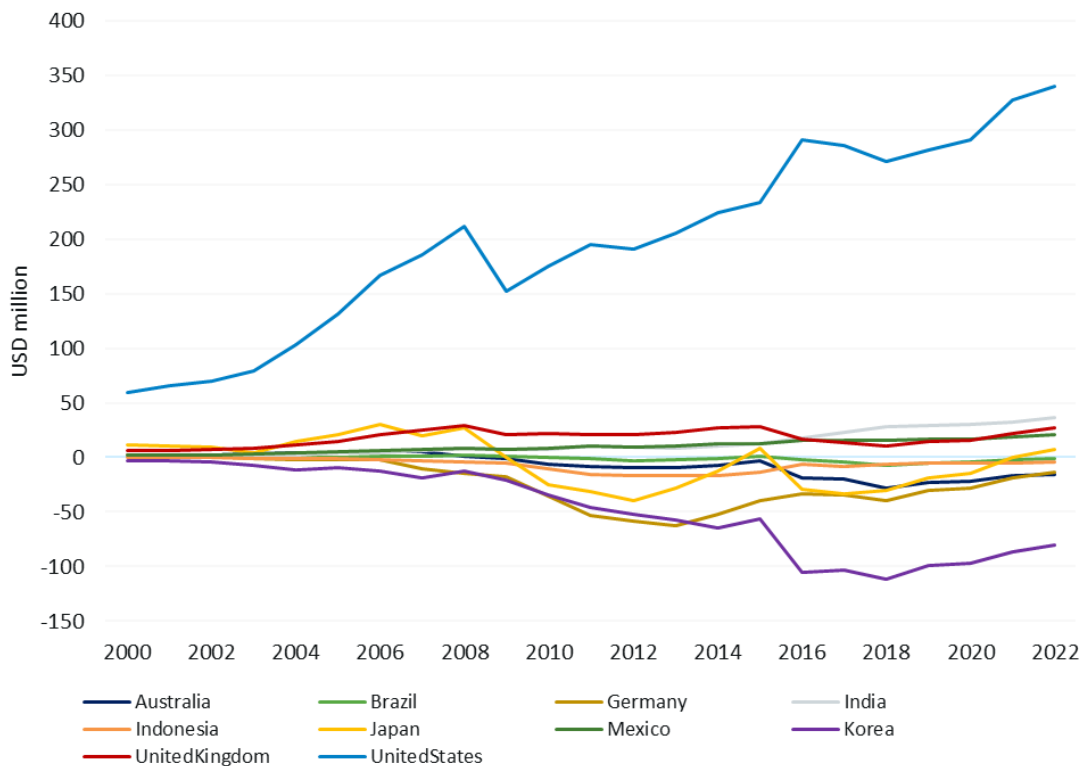
**Figure 2: Share of Chinese patents in total newly granted patents at the USPTO**



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 3 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 3: Difference in the value added in exports between China and selected countries

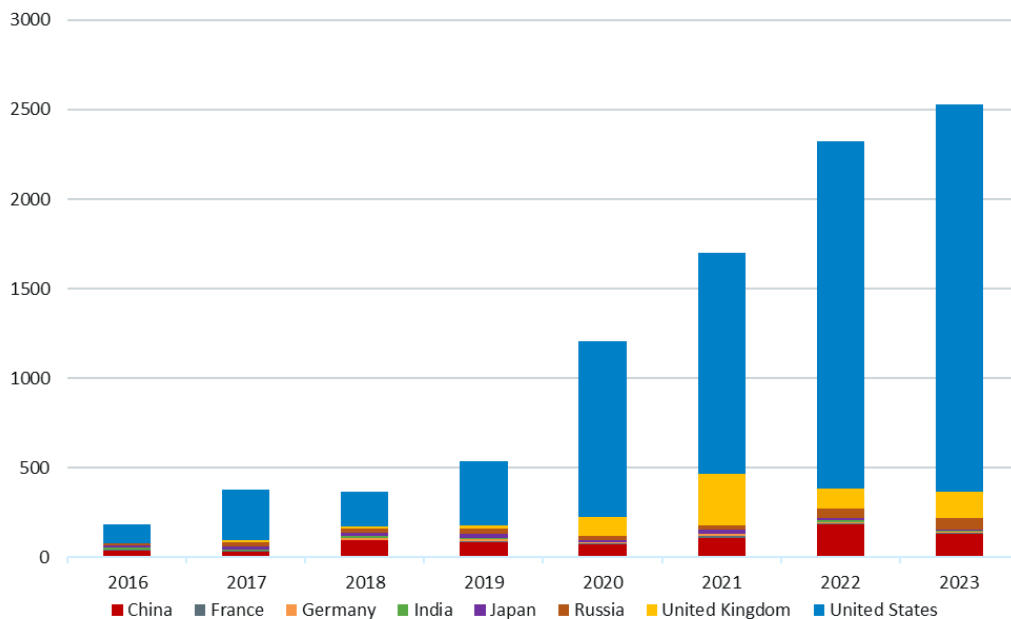


Source: Deorukhkar and García-Herrero (2024)

### 3.2. 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 4).

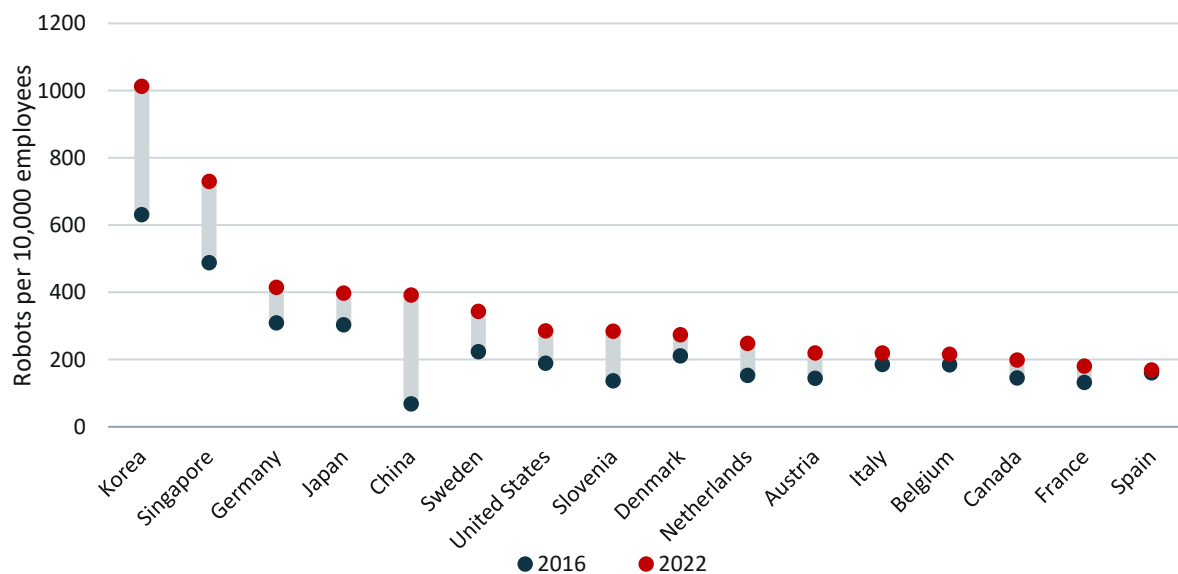
Figure 4: Number of objects launched into space, by country



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 5). 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 5: Robot density in 2016 and 2022



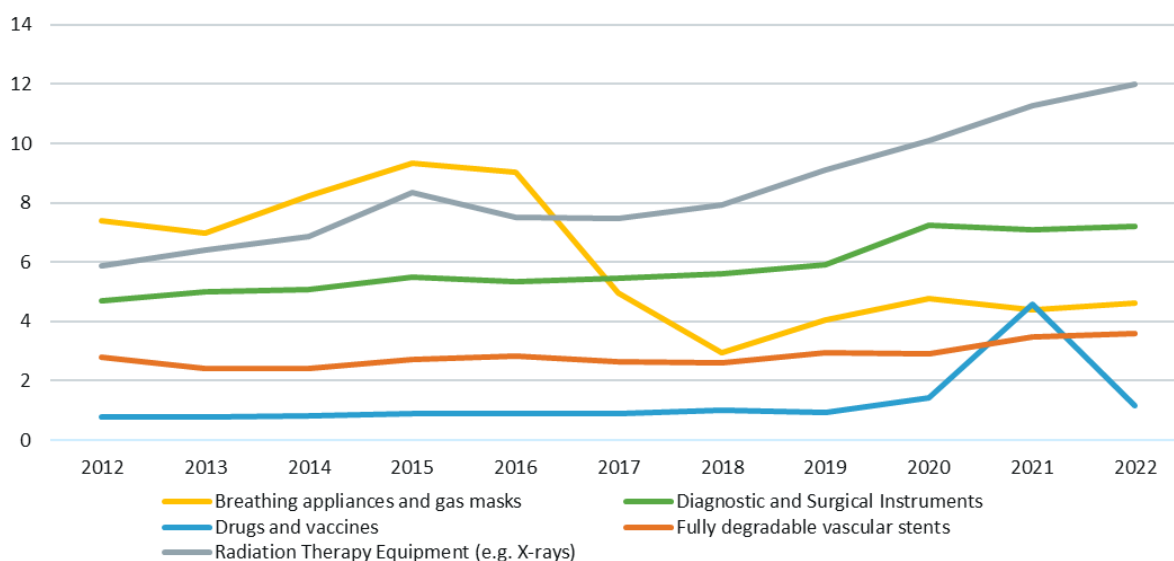
Source: International Federation of Robots



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 6), 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).

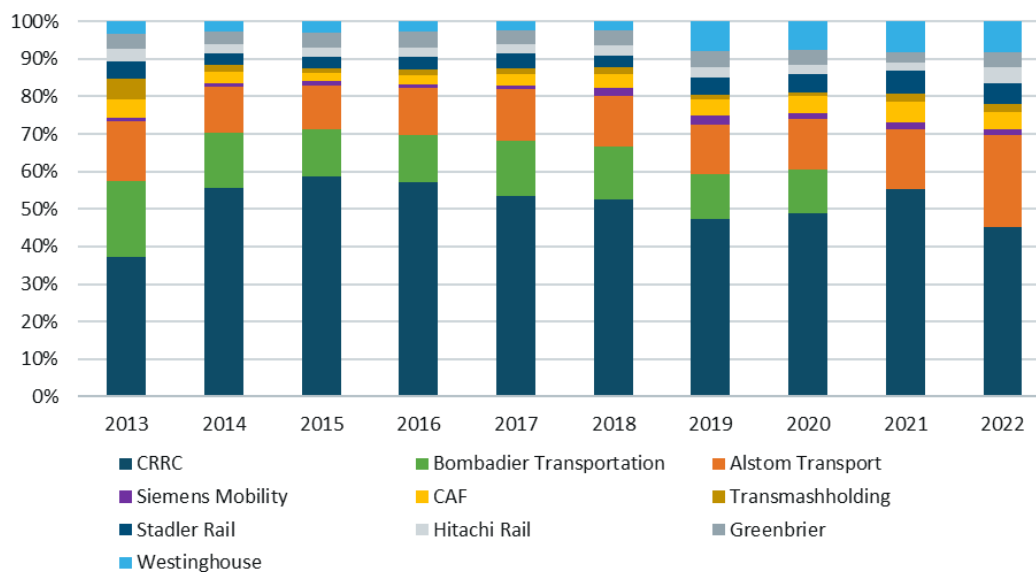
**Figure 6: Share of Chinese exports in world exports (Biotechnology, pharmaceuticals and high-performance medical equipment) (%)**



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 7).

Figure 7: Global market share of rolling stock manufacturers

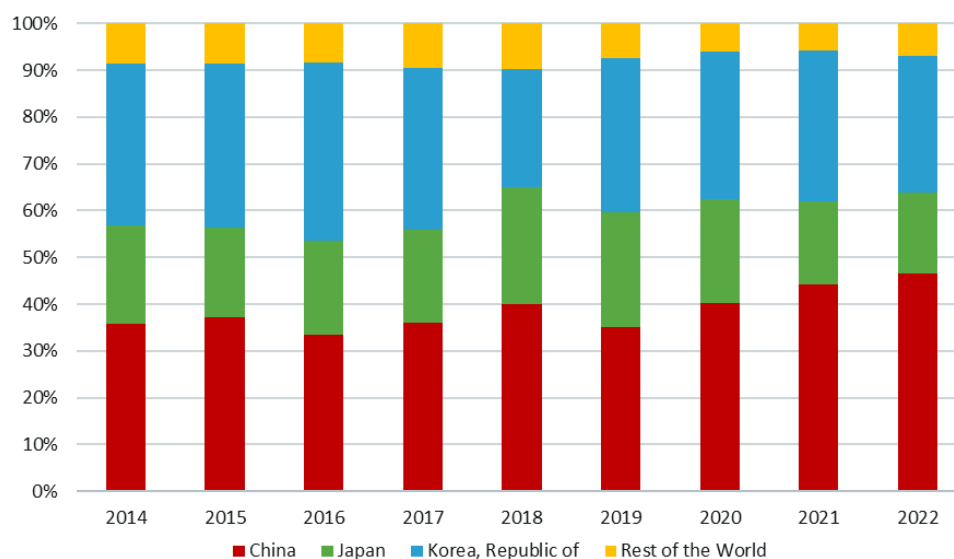


Source: Bruegel based on Orbis, PitchBook

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.

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 8). Japan and, more recently, South Korea have lost market share.

Figure 8: Global market share of shipbuilding firms

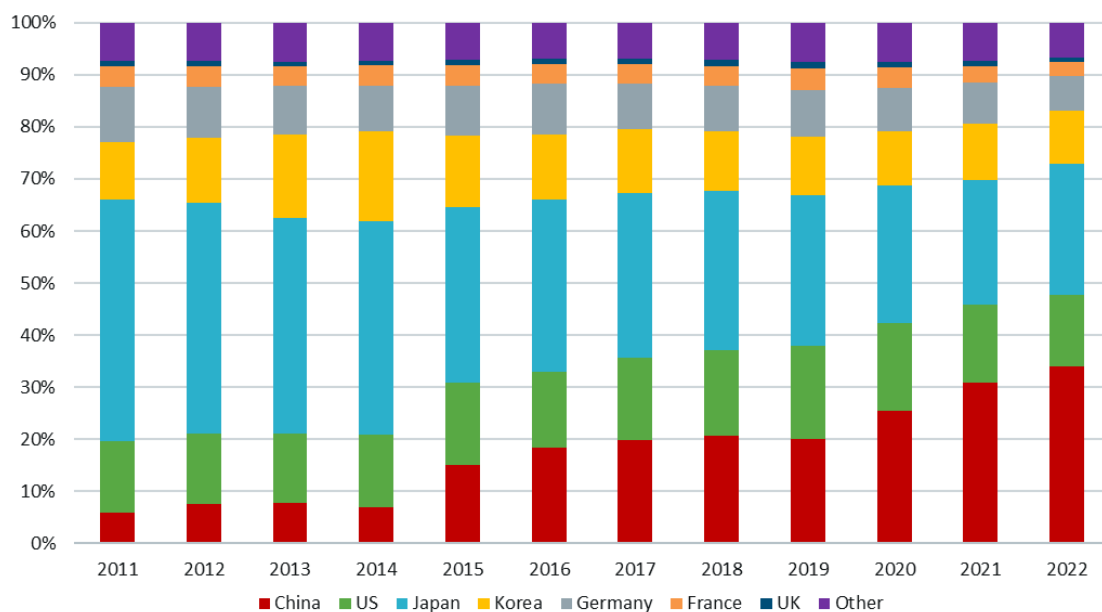


Source: Bruegel based on UNCTAD

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 9). 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.

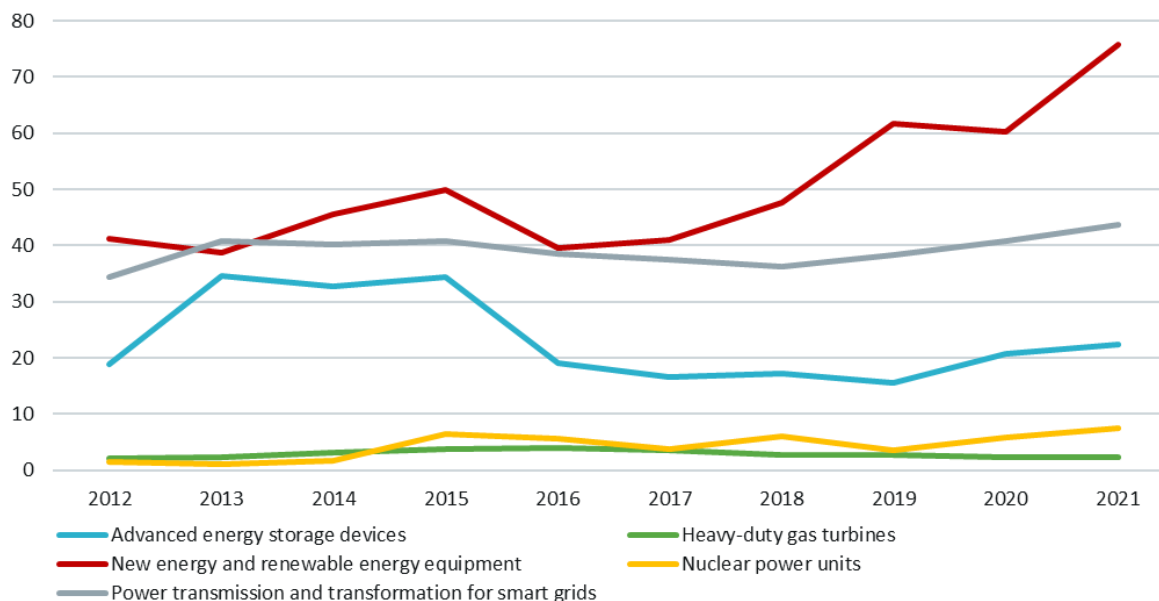
**Figure 9: Country share of USPTO patent grants in the transportation sector**



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 10), but Chinese firms are increasingly expanding the technology frontier.

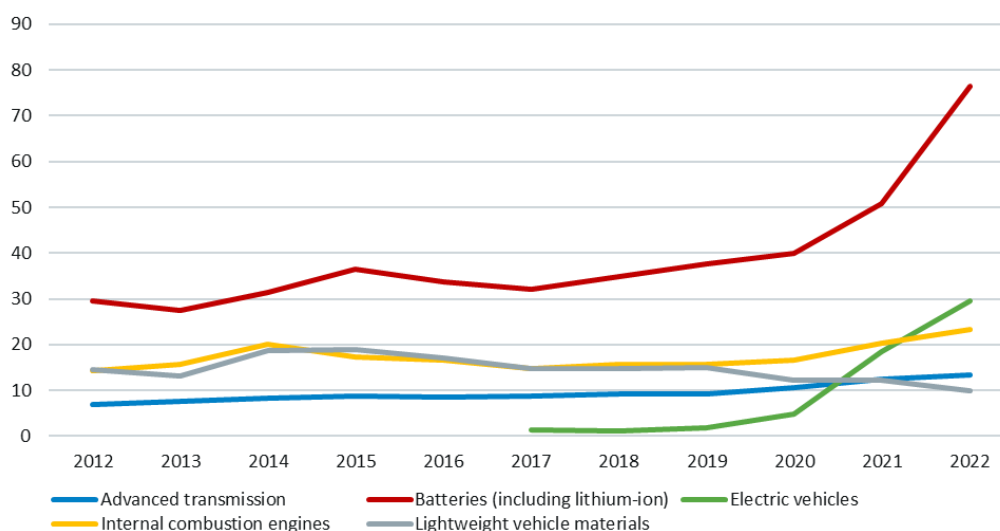
Figure 10: Share of Chinese exports in world exports (electrical equipment) (%)



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 11). 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 11: 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.

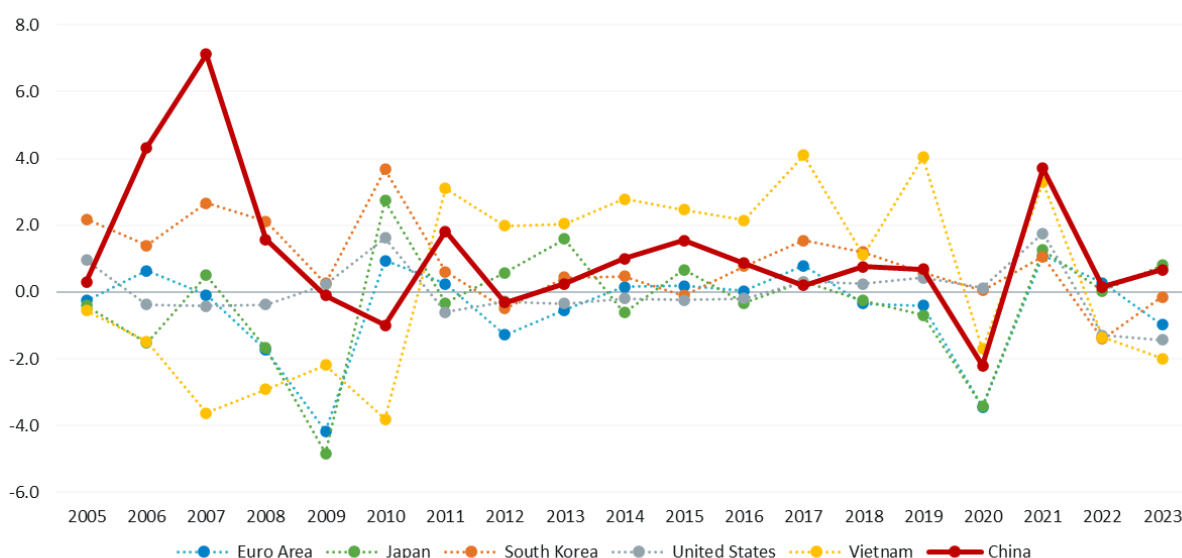
### 3.3. Industrial policy for competitiveness

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. 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 12). In other words, despite bringing some sectors closer to the technology frontier, productivity increases seem to have been offset by a counteracting force.

Figure 12: Total factor productivity growth, by country (%)



Source: The Conference Board

There are three factors to consider. First, 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.

## 4.1. 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.

## 4.2. 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. Implications for the EU

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.

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