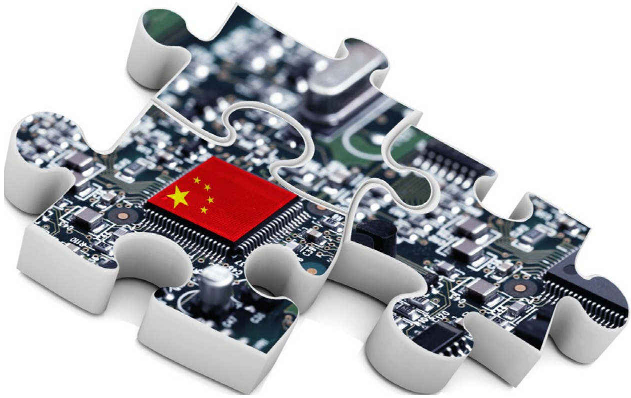

China's Semiconductors

Reflections on Sources and Solutions to an Expensive Problem

Jonathan Liebenau

STRATEGIC UPDATE

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LSE Ideas China Foresight

Digital IR

Analysing Chinese strategy, foreign policy and influence from the inside out.

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Semiconductors Are Important

The semiconductor industry has been a renewed topic of political debate for over three years that has generated more heat than light. The precedents that consequent new industrial policy sets, especially for the United States, is likely to provide a model for both technology investments and trade practices for some time to come. Many of these are likely to have significant unintended consequences, some of which will be very costly to everybody involved.

Semiconductors are unusual among 'general purpose technologies' insofar as they are both highly specialised and commodity products. Furthermore, unlike electric motors or chemical processing technologies, they lend themselves to concentration because facilities to mass produce them are hugely expensive, and innovation and design skills are very hard to acquire.

Since semiconductors constitute a key commodity, and their production and supply are amenable to highly structured ways of conducting business, there are many forms of possible commercial strategies and policy interventions. Two elements of the process require the highest degrees of planning and investment, advanced design and state-of-the-art production machinery, while the rest can be dealt with in ways similar to other commodities. This means that for the past couple of decades there was a clear split between American and European dominance of new chip design, along with the supply of advanced production equipment and mainly-Chinese supply of mass produced semiconductors.[1]

China's Drive toward Technology Dominance

A significant shift in China's technology and industrial policy emerged around forty years ago with an interpretation of the 'four modernisations' of Deng Xiaoping, setting the stage for a boom in private and semi-private technology companies, foreign direct investment, special economic zones and capitalist business practices over the following ten years. By the 1990s, Communist Party technology policies were clearly married to industrial policy; concrete strategies emerged to accelerate technology transfer, divert resources to build science and technology capabilities and create both domestic and export markets for Chinese high technology goods. Investments from Germany and the United States—especially those that brought development models with them from Japan and South Korea—were especially influential in shaping both the character and the focal areas of technology development. While companies such as VW, Siemens and General Motors were important during this period, investments by firms such as Sony (operating as Chengdu Sobey Digital Technology), Panasonic (parts of its Sanyo business were later acquired by Haier), Samsung, SK and Hyundai provided models not only of efficient product assembly but also of technology transfer and innovation. American management theory began to prevail.

The new wave of private high technology and digital services companies date from the late 1980s, when Huawei was established, through to the late 1990s when Alibaba, Baidu and Tencent were built; all soon came to emulate mainly American firms such as Cisco, Amazon, Google and Facebook. During this period and shortly afterwards, a series of major technology companies were established or grew out of state-owned enterprises, such as the army-linked China Electronics Technology Group—itself spun off one of China's two leading surveillance equipment and services firms: HIKVision.

ZTE, Haier and China's three dominant telecommunications services companies—China Mobile, China Telecom and China Unicom—all originated as entirely state-owned enterprises. A further group of private companies also followed, such as Dahua Technologies—the other of the two leading surveillance equipment and services firms—and the leading drone manufacturer: DJI (Shenzhen Great Frontier Innovations Science and Technologies Company). With relatively easy access to capital from state banks and municipal investment mechanisms, these firms grew quickly and most invested in R&D on a scale comparable to their American counterparts. While their governance ranged widely from wholly private to wholly state-owned, all have conducted business largely in step with Chinese industrial, security and technology policy. They have all become prodigious consumers of semiconductors.

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Three features of US, European and Japanese industrial development coincided with this initial wave of Chinese business development during that twenty-year period: the push to exploit outsourcing and offshoring opportunities, the associated improvements in supply chain logistics, and an onset of stasis or atrophy associated with the period of technology downturn—from the end of the dot-com boom through to the telecom bust that followed and beyond the financial services crisis of 2008. While US digital services companies continued to grow, formerly world-leading US manufacturers such as Cisco and Lucent (both in telecommunications equipment), IBM computers, Corning (optical fibre), 3Com (which was acquired by another ailing company, Hewlett-Packard), Xerox, Motorola, and many others were sold, in relative decline or shrinking. Similar fates met the leading Canadian high technology firms Nortel Networks and BlackBerry, the major German firm Siemens, Olivetti in Italy, Alcatel in France and Britain's International Computers Ltd [ICL]. Many Japanese and South Korean technology leaders also lost their reputations as innovators during this period, with the distinct exception of Samsung.

There is no simple explanation for this loss of leadership in digital technologies manufacturing outside of China. However, the coincident growth of the Chinese firms was fuelled by the dramatic rise of China's GDP and policies that supported it from many directions, including domestic civil and security services procurement, easy access to finance, a boom in engineering education, direct funding through the Chinese Academy of Sciences, and industrial and trade policies that favoured digital technologies. Most of these were associated with infrastructure development including advanced manufacturing (so-called industry 4.0), transport, logistics and distribution, the roll-out of 'smart city' schemes and associated surveillance and security applications. It benefitted from many experiments, failures as well as successes, in corporate management and governance. Some of these are associated with leading innovation practices such as those at Xiaomi and Huawei (in knowledge management), Alibaba and JD.com (in supply chain management), and a variety of company incentive schemes aimed at innovators. While nefarious activities associated with intellectual property theft, industrial espionage and anticompetitive practices have not been uncommon, they contributed in value-added relatively little to the growth outcomes of factors described above.

What this Means for International Competition

China's technology advantages are concentrated on a short list of key areas mainly linked to infrastructure, and include mobile telephony (network as well as mass market equipment), electric and autonomous vehicles, surveillance technologies, drones, mass transport and construction technologies. The last two were primarily spurred by domestic requirements and have only recently entered international competition, mainly in emerging market economies. Their dominance in surveillance technologies is motivated by both the availability of masses of data that is legally restricted or difficult to use in other countries, and by the huge market domestically and abroad primarily from security and other public services. The concomitant machine learning, control and automation technologies fuel the bid for dominance in drones, electric and autonomous vehicles, enabling capabilities associated with 5G services and the 'internet of things'. Domestic laws and regulations, many of them at variance to or even anathema for Western nations, also play a part. For this reason, these factors should be considered as interrelated and associated with skills in labour markets, business development, national R&D activities, and technology policy. One facilitating factor is the use of technical standards, an area of engineering that had been dominated by Western and Japanese firms through multilateral organisations, such as the international standards setting bodies. The recent American-led pressure to diminish the role of multilateral bodies provided Chinese firms opportunities to extend their influence within such institutions, coinciding with Xi Jinping's policy focus in programmes such as 'Made in China 2025'.

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The longstanding influence of UK and Europe in standards bodies and institutions of law have long formed critical foundations to digital technologies, something that is currently being contested as national and multilateral bodies begin to address artificial intelligence constraints and regulation. Along with the United States and Japan, European companies have also led in robotics and advanced manufacturing, still holding the lead in most areas of machine learning and the other most advanced areas of software technology. Chinese improvements in these areas, as measured by research outputs and new product introductions, are in contention for leadership but by most criteria still lag behind.

It is crucial for policy makers as well as industry leaders to be well aware of these factors as they consider the significance of China's competition. Panicky responses to the emergence of Huawei as the leader in 5G overlook the fact that the firm took the technological lead in this area over ten years ago, building on the base of over thirty years of rapid growth. Even if the emergence of such effective competition—largely based on pricing, service qualities or technological leadership—was assisted by nefarious practices, Western nations cannot expect short-term policies that constrain trade, re-design standards or invoke specious security restrictions to re-establish Western technology dominance; neither will recourse to courts, no matter how well justified legal complaints might be.

Ceding Leadership in Production

The emergence of worldwide supply chains bound to China's manufacturing sector gave semiconductor designers and producers—such as Nvidia, Intel, Broadcom, Qualcomm and Applied Materials (all California-based firms)—the opportunity to divest themselves of the lesser value-added aspects of the business located in the United States and focus on lucrative higher skilled production. Some of this was done, such as by Intel, through building production facilities in China. Some was done through equity investments in Chinese producers, such as by Philips—along with the usual American investors, The Capital Group, Blackrock, Vanguard, CITI, JPMorgan, etc. And some through investments in Taiwan Semiconductor Manufacturing Corporation (TSMC), the producers of the greatest number of semiconductors, largely in China. Intel sells one third more in China than it does in the United States and, through Intel China Ltd., owns semiconductor manufacturing companies in Dalian (turnover $4.14 billion) and in Chengdu (turnover $1.52 billion); both are growing fast and are supported by an R&D firm and a trading company in Shanghai. By value, 63.6% of Qualcomm's sales are in China and Broadcom sells about three times as much in China as in the USA.

European and American investments in Chinese companies are also common. A leading Guangdong competitor, TCL Technology Group—largely owned privately along with various Chinese government institutional investors—is also held by Blackrock and Vanguard, as well as UBS. While individual investments, location choices and sourcing decisions are made largely to exploit present opportunities or build a medium-term portfolio, in aggregate the effect had been to segment the industry into large scale commodity production in China, alongside high value-added design and advanced engineering functions in the US, Britain and a very small number of other countries.

Chinese Firm Strategies and Ownership Structures

While we may think of this as an inherently unbalanced set of conditions, they could well have persisted into the 2030s before transitioning into a more balanced set had a few factors not coincided to accelerate the instability. These were first and foremost the strategic ambitions of a few Chinese manufacturers including Huawei, Dahua and DJI; leaders in mobile telephone equipment, surveillance technologies, and drone design and production. All initiated drives to reach state-of-the-art technologies during the late 2000s, transforming their companies from low-end producers of basic equipment into innovators at the forefront of their markets. All benefitted from significant state support, initially mainly in the form of easy financing but later including export assistance and large-scale state procurement contracts. State procurement contracts brought with them the means to further both mass production of specialist equipment and to accelerate machine learning technologies through access to copious data on citizens. These and many other Chinese, as well as foreign, technology firms, both contributed to and gained advantages from engagement in the massive laboratory for digital state repression in Xinjiang.

> These and many other Chinese as well as foreign technology firms contributed to, and thereby gained advantages from, engagement in the massive laboratory for digital state repression in Xinjiang.

The second and third factors were the restrictions on export of 'strategic technologies', tightened from the mid-Trump administration years, and the associated threats of trade war, respectively. Restrictions on the export of certain advanced military technologies have long been in place and are clearly an effective break on the ability of a hostile power to achieve strategic parity. However, such restrictions apply only so long as the domestic capacity is insufficient to replicate, and then innovate beyond, the state of the art.

Coincident with the massive growth of engineering education from the early 2000s and associated national policies, China clearly achieved the capacity to vie for leadership in a few key sectors. A boost for this likely came from recent policies encouraging more civil-military fusion. This gave them the capacity, even before they felt the pressure on supply chains, to build advanced capabilities. For Huawei that meant moving on a few strategic fronts towards the state of the art; especially in 5G infrastructure equipment and premium quality smartphones but more slowly from around 2015 towards advanced semiconductor chip design. During the mid-2010s Huawei was content to source almost all its chips from TSMC and others, producing around five percent of their in-house needs. That ratio was likely to grow slowly over the following decades had it not been for the bellicose rhetoric from the US threatening to cut off the supply of the most advanced designs. So, in response, Huawei accelerated in-house chip manufacturing capacity which reached 30% or more of its end-product production requirements by around 2019.

The threats of a trade war had an additional effect on Chinese semiconductor manufacturers who were implored—or directed in the case of state owned enteprises–to accept further financing and scale up. The leading Chinese firms—the private but state supported Semiconductor Manufacturing International Corporation [SMIC] and the state owned Hua Hong Semiconductor, along with a very large number of both private and state owned chip manufacturers clustered around Shanghai—also scaled up dramatically. SMIC, incorporated in the Cayman Islands, is largely owned by the China Information and Communication Technology Group of Wuhan through Datang Holdings of Hong Kong; although it has many other investors, including Blackrock and HSBC. Its expansion has especially benefitted from municipal investments such as that from Chengdu, which defrayed most costs associated with building their newest chip manufacturing plant. Hua Hong is more straightforwardly majority owned by the Government of China through three main investment arms, but also counts Blackrock, Vanguard, Baron Capital, HSBC and Allianz among its minority investors. Start-ups, as well as growth strategies in the industry, are well in advance in China.[2] They are also supported by long term investments by the leading Korean semiconductor manufacturers: Samsung and SK Hynix. However, after a decade or so of such investment activities the Chinese financial community as well as the semiconductor producers are beyond critical reliance on these forms of inward investment. While the companies appreciate the availability of foreign capital, it does not seem critical to their survival any longer.

Threats

The current situation is unstable but by no means is it at an impasse. So far the key US goals of stymieing China while boosting American capacity are all being frustrated. Trade with China is growing overall and Chinese subsidiaries of US companies such as Intel continue to increase in profitability. Chinese capabilities in the most advanced aspects of chip design and production engineering are still far behind those in the United States and Europe but they are rapidly improving. Even evidence of recent Chinese industrial espionage seems to indicate no change to longstanding practices. Demand worldwide for Chinese-produced commodity semiconductors has been volatile because of pandemic-related effects, especially with regard to the Chinese domestic market, but we might expect growth to return to pre-COVID rates sometime soon.

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It is too early to tell how the various US and UK initiatives to limit Chinese encroachment through targeted investments in semiconductor research and production will boost domestic capabilities. Given the difficulties of enacting direct US subsidies for any industry—other than those linked to defence procurement— the main thrusts of policies aimed to rival Chinese dominance in semiconductors focuses on education and research, both of which will take a decade or more to bear fruit. The U.S. CHIPS Act of August 2022[3] commits $52.7 billion to a variety of purposes, much of which can be regarded as protectionist[4] and most of which will only slowly be enacted. The total amount is too large to be spent quickly on research; consider that the European Interuniversity Microelectronics Centre [IMEC] in Leuven, founded in 1984, operates on less than US$1 billion. If the entire $52.7 billion were spent on advanced semiconductor manufacturing facilities it could fund half a dozen factories and would still take a few years to yield output. Traditional approaches to shifting educational priorities start by incentivising teenagers to study relevant subjects, a process that takes a decade to bear fruit even if the university and industry training schemes begin to gear up right now. Britain, along with most European countries, hardly has the spare capacity in its education system to redeploy for this purpose.

The real short-term threat is that Chinese semiconductor-related start-ups will continue to outpace US plus UK start-ups by almost three times as much, while costing less than half [5]; that growth will continue for incumbent Chinese firms even if investments in US subsidiaries in China begin to decline. Given that some of the leading Chinese firms and many of the start-ups are working at the forefront of the technology, a higher proportion of new technologies will emerge from China.

US Policy Problems: Principles, Practices, Enforcement, Political Support & Costs

The efforts of the United States to craft a set of policies and practices to address this problem have called upon a wide variety of approaches: furthering inward investment rules, barring uses of Chinese digital goods and services within the Federal government and some elements of infrastructure, and awareness campaigns about intellectual property theft by Chinese technology companies. However, the substantial move was made by the Biden administration in passing the CHIPS and Science Act in the summer of 2022, which is likely to be the most significant shift in US industrial policy since before the Ronald Reagan administration. While the principle of driving the move to strength is rooted in the capabilities of the workforce and thereby a priority is education and research, we must account for the decade-plus lag time before such investments bear fruit. The primary way to counter the advantages that Chinese firms have with regard to investment capital is to find ways to finance American firms. These policies are paired with ‘buy American’ instructions; these apply especially to government procurement practices and, together with perceived WTO-violating subsidies, are seen as anti-competitive and potentially discriminating against not only Chinese but also European and other producers. Nevertheless, these policies have considerable political support within the United States despite the suggested cost of around $280 billion of new federal funding, which is supposed to be associated with around $300 billion of private investments.

It can be argued that even this colossal amount of money is insufficient to supersede China in production of commodity chips in the short-term; in any case, dominance in design is already secure. However, there are a few trends that are working in favour of more balance between the US and China with regard to chip production. These include the further increase in automation which reduces operating expenditure, spurring the return to American domestic production ('on-shoring' or 're-shoring') and the innovation incentives to hold production close to state-of-the-art designers and users. These have all been amplified by supply chain problems associated with a number of sometimes distantly-related factors: recent market volatility for goods such as cars and smartphones, short-term as well as long-term trade war effects, and a litany of mishaps—from the Fukushima earthquake and the various factory fires in Taiwan and elsewhere, to the blockage of the Suez Canal in 2021 by the Ever Given container ship.

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UK & EU Priorities

The European Union response has been significant but somewhat contradictory. While complaining that the US CHIPS and Inflation Reduction Acts are contrary to principles and, probably, rules of the World Trade Organization, the EU has replicated some of their features, albeit on a much smaller scale.[6] The UK

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response to the Chips Act has not yet seemed coherent and the broader stimulus policy, the 'Plan to Forge a Better Britain Through Science and Technology'[7], suggests allocating around five percent of the scale of US incentives spending. The UK response seems predicated on the assumption that recent relative declines in technological leadership can be reversed mainly through vague and inexpensive actions, such as 'showcasing' science and technology and create a 'pro-innovation culture'. There is an underlying ambivalence about Chinese investments in businesses such as the Newport Wafer Fab—first allowing China's Wingtech semiconductor firm to buy in 2021 and then ordering them to sell majority interest in 2022—and the under-valuing of tech firms on the London Stock Exchange relative to, for example, the NASDACQ. This figured in to the decision of the chip design firm ARM to raise capital outside of Britain.

Broadly, the goals of all leading industrial economies should include both the means to produce high technology goods domestically and the wherewithal to maintain replicable capabilities in controlling elements of the state-of-the-art in chip design and production technologies. Short-term, politically reactive policies that generate unsustainable technology projects or fiddle around at the edges of the production process are likely to waste money. They fail to address the three things which China has relied upon to grow their semiconductor industry: a large scale engineering research and education programme that has had nationwide effects over the past two decades, sustained access to plentiful cheap investment capital, and a rapidly expanding domestic market for digital goods and services.

What Should Be Done

The first step toward re-entering competition in technology with China is to understand better how China came to this position of strength. Western nations should look beyond complaints of unfair practices and recognise that Chinese companies have enjoyed recent successes based on over twenty years of strategic practices. The West should learn better from Chinese companies' practices of long-term finance and planning, taking lessons from (and tolerance for) failed business experiments and setbacks, and sophisticated labour market and management developments. These are all found in the best of Western business practices. However, they are too rare and they have not been allowed to dominate Western economies. Western nations should also return to an attitude toward government in its careful application of regulations and market shaping activities that, within the West's legal and civic norms, can achieve what the Chinese Communist Party achieves through autocracy. These include judicious use of large-scale projects such as urban development, transportation and information infrastructure that foster mechanisms likely to have spillover effects of strengthening technology businesses. Countries should find ways that advance technological applications that are the reverse of the experiments in repression, such as those applied in Xinjiang: surveillance and artificial intelligence for traffic control rather than social control, and monitoring individuals to effect vaccine distribution rather than withholding rights.

It seems unlikely that short-term tax incentives and 'business friendly environment' policies will do much to address these larger, longer-term requirements. Measures such as freeports do little more than

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redistribute resources or provide very localised boosts, while the rest of industrial policy sets out on a race to the bottom.

The West still outperforms China in most areas of advanced technology. However, it should be recognised that it has much to learn about how it lost the lead in some of those areas. It is most important that democratic nations strengthen and build upon those institutions that underlie technological success. These include existing institutions of law and trade, standards, and civic virtue. They also require us to reconsider how countries should plan for their national futures, strengthen their labour forces, cooperate and find consensus to prioritise innovation. One can look to, and build upon, bodies such as the Francis Crick and Turing Institutes in London as one kind of model, and aspects of France's transportation policy as another kind. German technology law is, in parts,exemplary. But these need to be scaled appropriately, sustained and constantly improved. A short-term enthusiasm for an outer space project, a flurry of subsidies for fashion and industrial design, and great expectations of spillover from prowess in vaccine development are all well and good, but there is little room for optimism when one watches political capital frittered away in squabbles over fisheries while the foundations of our economies are undermined. ■

Endnotes

1 A leading source of trade information is https://semiengineering.com (available in English and Chinese) and the U.S. Semiconductor Industry Association (https://www.semiconductors.org). The work of Douglas B. Fuller is especially good on the political economy of the Chinese semiconductor industry, see especially, *Paper Tigers, Hidden Dragons, Firms and the Political Economy of China’s Technological Development* Oxford U. P. 2016, and subsequent writings. For a general introduction, see: https://www.semiconductors.org/wp-content/uploads/2021/05/BCG-x-SIA-Strengthening-the-Global-Semiconductor-Value-Chain-April-2021_1.pdf

2 See: Dylan Patel, “Why America Will Lose Semiconductors; Tangible bi-partisan solutions for solving a national security crisis” Semianalysis.com; 13 June 2022; https://www.semianalysis.com/p/why-america-will-lose-semiconductors

3 “Fact Sheet: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China,” U.S. White House, 9 August 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china

4 Sarah Kreps and Paul Timmers, “Bringing economics back into EU and U.S. chips policy”, Brookings

December 20, 2022 https://www.brookings.edu/techstream/bringing-economics-back-into-the-politics-of-the-eu-and-u-s-chips-acts-china-semiconductor-competition/

5 Jesse Allen, “Startup funding, January 2023” Semiengineering.com, 1 February 2023, https://semiengineering.com/startup-funding-january-2023/#Table; see also monthly updates and their annual report.

6 ‘European Chips Act’, European Commission https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-chips-act_en; https://digital-strategy.ec.europa.eu/en/library/european-chips-act-staff-working-document

Maria Demertzis, ‘The EU response to the United States Inflation Reduction Act; The EU must avoid the trap of having to take sides in the conflict between the US and China’, Breugel, 1 Feb. 2023 https://www.bruegel.org/comment/eu-response-united-states-inflation-reduction-act

7 https://www.gov.uk/government/news/plan-to-forge-a-better-britain-through-science-and-technology-unveiled (6 March 2023)

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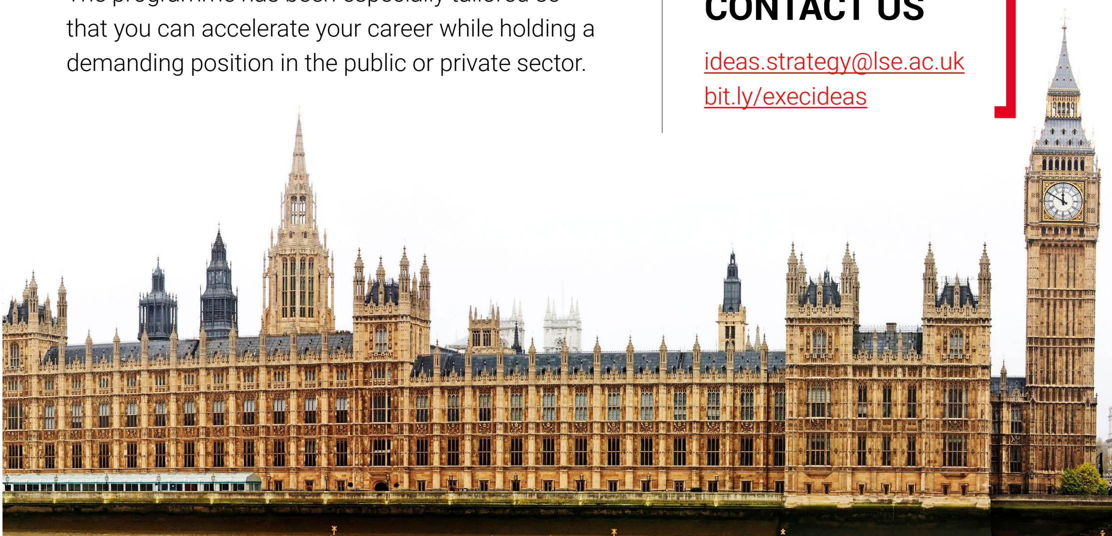

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Reflections on Sources and Solutions to an Expensive Problem

Jonathan Liebenau

The semiconductor industry has been a renewed topic of political debate for over three years. Due to recent US sanctions on the most advanced semiconductors, the industry has quickly become another flashpoint in the competition between the US and China to dominate the 21st century's strategic technologies. In this Strategic Update, Dr Jonathan Liebenau explains the development of the semiconductor industry in the context of China's rise to become an increasingly capable technology power. China's sustained efforts in industrial policy to cultivate a domestic innovation system coincided with Western firms' offshoring strategies since the 1990s, transforming China into a large producer and consumer of semiconductors. While Taiwan and the West retained cutting edge chip design capabilities, Chinese firms such as Huawei and Hikvision have become competitive providers of mobile phones, surveillance equipment and related infrastructure services. Despite Washington and its partners' conviction to constrain in China's technological prowess, industrial policy initiatives such as the CHIPS Act will face an uphill battle when it comes to bringing manufacturing capacity back to Western economies. In this context, the UK must combine short term incentives with a longer-term strategic vision to remain competitive in one of the 21st century's key strategic arenas.

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