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Discussion paper

The acquisition of Newport Wafer Fab by China's Wingtech in the context of China's semiconductor strategy

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Summary

The purchase of the Newport Wafer Fab (NWF) by the Chinese state-backed electronics company Wingtech Technology through its Dutch subsidiary Nexperia was placed under review by the UK Government as a potential national security risk, and could still be reversed.

This briefing outlines how the acquisition exists within the context of a Chinese state strategy to increase China's control of semiconductor supply chains, which has potentially serious implications for national security.

US Secretary of Commerce Gina Raimondo has called on allies to help 'slow [China's] innovation rate' in semiconductors. A Boston Consulting Group (BCG) and Semiconductor Industry Association report says dependence on any risky national supplier should be reduced, not increased.

These plants occupy a central position in the high-tech economy. While NWF's technology is not at the cutting edge of semiconductor manufacturing, demand has increased due to its use in power-supply chips which are used in the automotive industry; NWF's technology is being developed for use in electric vehicles, for which China is the largest market. NWF also has important defence contracts.

Previous experience

The Government's first review followed a complaint after Nexperia/Wingtech placed two directors on the NWF board. After Wingtech bought Nexperia, its young CEO Frans Scheper went on early retirement and was replaced by Wingtech CEO Zhang Xuezheng.

In 2017, Chinese private equity fund Canyon Bridge Capital Partners, backed by state-funded China Reform, bought the UK semiconductor firm Imagination Technologies. China Reform claimed it had 'no say in the company's governance', but in 2020 an attempt to place four Chinese fund representatives on Imagination's board was only prevented by a ministerial intervention after Imagination's chief executive Ron Black complained. He left the company shortly afterwards. Imagination staff are reportedly leaving 'in droves' as a result of PRC influence. According to one former executive: 'Once you lose the core of a company, it is almost impossible to come back'.

It is becoming more common for governments to block Chinese purchases of semiconductor-related firms – the US, Italy and South Korea have recently done so.

Shareholding

A 2005 US Department of Defence report[1] stated:

> 'There is no longer a diverse base of integrated circuit fabricators capable of meeting trusted and certified chip needs... From [a] national security view [this creates] such opportunities for mischief that, had the United States not significantly contributed to this migration, it would have been considered a major triumph of an adversary nation's strategy to undermine US military capabilities.'

Wingtech should not be seen as a private company, but as a 'hybrid' firm: almost 30% of its shares can be traced to the Chinese government. NWF's new ultimate owners include the governments of four Chinese cities and one province. One of Wingtech's major shareholders is 'Lhasa Economic and Technological Development Zone Wentianxia World Investment Co Ltd', whose executive director and sole-owner is Wingtech's Chairman and Nexperia's CEO Zhang Xuezheng. According to the Hong Kong Trade Development Council, one of the Zone's early investors was the Tibet Zhongkai Mining Group. Armed security forces are reported to have confronted Tibetans protesting against Zhongkai's plans to dig at their sacred sites.

Subsidy

The US, UK and other countries are in a race with China in the semiconductor technologies at the heart of the economy. A recent White House report states: 'armed with billions in subsidies, the Chinese government [has been] on a buying spree for foreign semiconductor companies.'

China's semiconductor subsidy is creating market distortions. Subsidies keep 'Chinese companies in business even though most do not appear to be making a profit'. The White House finds that China spends hundreds of billions of dollars subsidising semiconductor firms, through government equity investments against the spirit of WTO rules; fund

[1] *Report of the Defence Science Board Task Force on High-Performance Microchip Supply*. Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics. Washington, D.C. 20301-3140. February 2005.

managers 'serve as proxies' for 'military-civil fusion objectives', provoking 'deep concern' internationally. While other firms need to cut their workforce and R&D spend, China's firms can often keep investing because they can depend on subsidy.

Defence implications

While we do not suggest that Wingtech or Nexperia intends to contribute to China's military development, potential contributions to advanced weaponry appear to be a factor in China's semiconductor-related acquisitions generally.

Finnish firm Beneq was acquired in 2018 by China's SRI Intellectual, whose shareholders include CRRC Guohua Equity Investment Partnership, 50% owned by a military-civilian fund. Jianguang Asset Management bought Dutch firm Ampleon in 2015, which then reportedly began to focus on aerospace and defence. NWF has been developing chip technology with Cardiff University for a radar system for use in fighter aircraft.

Our previous paper *Inadvertently Arming China?* outlined PRC military-linked entities' interest in UK radar research; acquiring radar and next-generation fighter jet technology is a priority for Beijing. We do not imply that Nexperia or Wingtech has any intention of putting NWF's innovations, technologies or products to military use, but the UK Government would presumably need to be sure that these could not anyway be put to such use against their wishes; in the environment of China's military-civil fusion, whereby the state may demand that civilian technologies are shared with elements of the Chinese military, it is not clear how this could be known in advance.

Intellectual property (IP)

'Core' semiconductor IP has been concentrated among US and UK firms, but the acquisition fits a recent pattern of UK IP loss. Meanwhile China has strategically increased 'access to and control of' semiconductor IP. The White House believes that this creates risk for US industry by limiting its access to IP, as China aims to 'address its strategic technology gap' with the US. Imagination, for instance, has reportedly licensed its IP to state-backed Chinese tech firms, whose backers include the Russian China Investment Fund.

The White House believes that the risk of 'malicious disruptions' to semiconductor supply chains is growing, with major implications for the high-tech economy. Australia's experience shows how China is willing to use trade to punish countries that criticise its government. More supply-chain dependence on China in critical sectors may be detrimental to UK interests.

This briefing recommends that the UK Government should review China's ability to acquire UK semiconductor companies generally, including the ability to purchase defence-funded firms, and that its purchases of semiconductor-related firms be automatically referred to the new Investment Security Unit (ISU).

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Introduction

In July, the Prime Minister announced that he had ordered his national security adviser, Sir Stephen Lovegrove, to investigate the takeover of a Welsh manufacturing plant by a Chinese-owned company.

The factory – or 'fab' – in question, Newport Wafer Fab (NWF), is the UK's largest producer of semiconductor wafers, silicon plates of varying diameter onto which tiny electronic circuits are printed to make the microchips which are present in electronic equipment. NWF's wafers are turned into microchips in factories in countries such as China and Malaysia, to be used in a wide array of electronics including smartphones and vehicles. NWF is the largest factory of its kind in the UK and employs around 450 people.

These plants occupy a central position in the high-tech economy. Semiconductors are essential for modern life, used by consumers on an hourly basis. The semiconductor-based integrated circuit has been called 'the DNA of technology', transforming 'essentially all segments of the economy'. They 'underpin state-of-the-art military systems', enabling 'the development and fielding of advanced weapons systems', while being 'key to the "must-win" technologies of the future, including artificial intelligence and 5G', as well as advanced autonomous systems and hypersonics.

The Prime Minister's announcement followed a review earlier in 2021 that approved the transaction, leading the Business Secretary to announce in May that the Government had no plans to intervene. After concerns were raised by MPs over whether the acquisition constituted a national security threat, the Prime Minister ordered Sir Stephen to review the sale's security implications, explaining that the Government will step in if required. Ministers cut off taxpayer-funded payments to the plant while the purchase was under review.

NWF, which produces around 8,000 wafers per week, is focused on 200mm wafers, which does not place the fab at the cutting edge of semiconductor manufacturing. However, following years of underinvestment, demand has recently increased for the technology due to its use in electric vehicle (EV) power-supply chips. China is currently the biggest market for EVs: Beijing has mandated that they should account for 40% of new vehicle sales by 2030.

The acquisition

Newport Wafer Fab (NWF) has been acquired as a wholly-owned subsidiary for £63m by Nexperia, a Dutch integrated device manufacturer (IDM), or semiconductor company involved in the design, manufacture and sale of integrated circuit products. Nexperia became the second-largest shareholder in NWF in 2019.

Headquartered in Nijmegen, Nexperia has sales offices, R&D centres and manufacturing plants in Germany, the UK, China, Malaysia and the Philippines. The company employs nearly 12,000 full-time workers, with an annual turnover of c.€1.2bn. Nexperia is now dependent on China for most of its turnover, where it is the largest power semiconductor enterprise (power semiconductors can tolerate high voltages and large currents).

Nexperia has been a subsidiary of Shanghai-based electronics company Wingtech Technology since 2019, when the Chinese firm bought a controlling stake, latterly acquiring Nexperia's remaining shares. Wingtech is engaged in the assembly of smartphones and consumer electronics, with over 25,000 employees. Nexperia is now a major part of its supply chains; the Chinese firm maintains its large-scale production in part through foreign semiconductor supplies.

After the NWF facility itself was used as collateral when Nexperia invested in 2019, with declining revenues Nexperia took control of the plant, whose £65m price-tag enabled debts to be repaid to lenders, including the Welsh Government. Nexperia has pledged to expand NWF's production. Since the company's market is primarily in China, it is generally understood that this is where expanded capacity will be directed. After Nexperia installed two directors on the NWF board earlier in 2021, NWF wrote to the Government asking it to intervene, triggering the first review.

Nexperia, Wingtech and the Chinese state

Nexperia has a history of links to the Chinese state. Beginning as Philips Semiconductors within the larger Dutch conglomerate, the company was purchased by a consortium of private equity investors in 2006, becoming NXP (in reference to the consumer's 'next experience'). As NXP's former standard-products business, Nexperia was purchased in 2017 by another consortium of investors including Beijing Jianguang Asset Management Co Ltd, a subsidiary of Chinese state-owned investment fund JIC Group and Wise Road Capital Ltd, another Chinese fund. The new Nexperia company included 11,000 former NXP employees, including chief executive Frans Scheper. In 2019, Wingtech Technology Ltd took a controlling stake in Nexperia; Wingtech now owns 99.63% of Nexperia. In March 2020, Nexperia's young CEO Frans Scheper took early retirement and was replaced by Zhang Xuezheng, the Chairman of the board of Wingtech Technology.

Nexperia owns another wafer fab in the UK, the TrenchMOS plant in Manchester. The company has announced that it will spend $700m over the next two years on its European wafer fabs, assembly factories in Asia, and global R&D sites, boosting capacity at the Manchester fab by 10% by mid-2022. It also promises to expand R&D across its sites, according to the general manager of Nexperia's MOSFETs and GaN FETs business.[2]

The level of Chinese state ownership of Wingtech

Datenna, a Dutch investment screening firm, has reported that 'almost 30% of [Wingtech's] total shares can be traced back to Chinese government entities'. This control is mainly exercised through municipal or provincial State-owned Assets Supervision and Administration Commissions (SASACs), responsible for managing relevant state-owned enterprises (SOEs) including appointing their top executives and board members and approving acquisitions, disposals, major capex and funding plans. While the Chinese state

[2] MOSFET refers to a metal-oxide semiconductor field-effect transistor (designed for significant power levels); GaNMOS refers to gallium nitride field-effect transistor; TrenchMOS is a type of metal-oxide semiconductor.

owns slightly under a third of Wingtech, one of the largest single shareholders is Lhasa Economic and Technological Development Zone Wentianxia World Investment Co Ltd in Tibet.

According to Datenna, Wingtech's Chinese state shareholders are as follows:

- **Wuxi city government (Wuxi is a city in Jiangsu province, near Shanghai)**

Wuxi Guolian Integrated Circuit Investment Center owns 9.76% of Wingtech. According to Datenna, the Wuxi Industry Development Group Co Ltd (a large SOE established by the Wuxi Municipal People's Government in April 2008) owns 83% of Wuxi Union Integrated Circuit Investment Center. The Center's other shareholder, Wuxi High-Tech Zone New Kinetic Energy Industry Development Fund, is owned by three state-owned enterprises, effectively making this shareholder, Wingtech's second-largest, state controlled. Following Datenna's data, this means the state-ownership of Wingtech by the Wuxi municipal government is:

State ownership of Wingtech = 9.74%

- **Kunming city government (the capital of Yunnan province)**

Kunming Industrial Development Equity Investment Fund Partnership, which owns 5.67% of Wingtech shares, is a subsidiary of Kunming Industrial Development and Investment Co Ltd, fully owned by the city government.

State ownership of Wingtech = 5.67%

- **Yunnan provincial government**

Yunnan Industrial Investment Holding Group Co Ltd, which owns 2.13% of Wingtech shares, is an SOE of which the Yunnan Provincial Government SASAC holds 41%. It was established in 2008 as part of a project that led to the formation of five state-owned industrial groups with a registered capital of RMB 6.4bn. This is also 36% owned by the Yunnan Land Reserve Operation Co Ltd, of which 90% is state-owned by two SOEs, the Yunnan Urban Construction and Investment Group and the Yunnan state-owned Financial Capital Holding Group Co Ltd.

State ownership of Wingtech = 1.5542184%

The Yunnan Urban Construction and Investment Group, a provincial-level SOE, owns 3.76% of Wingtech shares. Datenna shows that it is under near-total control (97%) by the provincial government of Yunnan.

State ownership of Wingtech = 3.6472%

(Total ownership by Yunnan provincial government = 5.2%)

- **Hefei city government (Hefei is the capital of Anhui province)**

Hefei Core Screen Industrial Investment Fund, with 4.33% of Wingtech shares, is 63.38% controlled by Hefei Construction Investment Holding Co Ltd (47% directly and 16.38% through Hefei Hanhe Investment Partnership), which is fully owned by the Hefei Municipal SASAC.

State ownership of Wingtech = 2.74%

- **Zhuhai city government (Zhuhai is in Guangdong province, bordering Macao)**

The next shareholder is Tianjin ICBC International Capital Management Partnership, with 7.42% of Wingtech shares. According to Datenna, Tianjin ICBC is 91% owned by Zhuhai Gree Electric (which in turn directly owns 2.88% of Wingtech). Zhuhai Gree Electric is 3.2% owned by Zhuhai Gree Group, which is fully owned by the Zhuhai municipal SASAC. Zhuhai Gree Electric also owns 2.88% of Wingtech directly (Gree Electric's chair, Dong Mingzhu, has been a member of the 10th, 11th and 12th National People's Congress, in 2003, 2008, and 2013).

State ownership of Wingtech = 0.31%

This would mean that, should the purchase be approved, Newport Wafer Fab's owners will include the governments of four Chinese cities and one province.

Meanwhile Wingtech is 12.36% owned by **Lhasa Economic and Technological Development Zone Wentianxia World Investment Co Ltd,** whose executive director is Zhang Xuezheng, also CEO of Wingtech and Nexperia.

This is an economic and technological development zone approved by the State Council in Tibet (and a 'national demonstration base of new industrialized industries approved by the Ministry of Industry and Information Technology'). It is also involved in China's technological goals through overseas investments in high-tech industrial projects.

According to the Hong Kong Trade Development Council (HKTDC), a statutory body, one of the Lhasa Development Zone's investors was the Tibet Zhongkai Mining Group. Chinese armed security forces have reportedly been sent in to confront Tibetans protesting against Zhongkai's digging plans at their sacred sites.

The review

The acquisition of NWF by Nexperia, and by extension Wingtech, was made official on 16 August with the announcement of the deal on the Shanghai stock exchange. Should the sale be deemed a national security risk, it could still be blocked by the UK Government.

The new National Security and Investment (NS&I) Act will come into force in January 2022, however the UK Government has introduced new security measures since 2018, including in

the form of amendments to the Enterprise Act 2002, enabling intervention in foreign acquisitions of UK tech firms in the interests of national security.

In June 2018, the Government introduced lower review thresholds for military and dual-use technologies, quantum technology and computing hardware. Transactions became reviewable if target companies have annual UK revenue exceeding £1m (down from £70m); or a UK share of supply of 25% or more (other amendments added the sectors of artificial intelligence (AI), cryptographic authentication technology and advanced materials). (Under the 2021 National Security and Investment Act, investigations of flagged transactions will be carried out by the Investment Security Unit.)

In the meantime a consortium of six companies has proposed to purchase NWF from Nexperia. Ron Black, former CEO of Imagination Technologies, announced he was planning a takeover proposal. According to Mr Black, the bid could more than return Nexperia's investment in the company and may include £200m to expand capacity, making NWF the centre of a cluster in south Wales for compound semiconductors for more powerful microchips.

This is happening as the world is experiencing a global microchip shortage affecting a large number of companies and products, caused in part by the Covid pandemic and a rise in demand through home-working. This has put pressure on supply chains, helping increase demand for NWF's products.

The automotive industry depends on chips for systems such as brakes, other safety systems, power steering, and engine controls: the current chip shortage is set to cost the industry c.$110bn globally in 2021,[3] with overall production cut by almost four million vehicles against manufacturers plans.

Given the UK's existing vulnerability to shortages, the Government will need to consider whether the acquisition would increase this risk in future, not least because fab construction is so capital-intensive and time-consuming.

The US and its allies are also engaged in a race with China in the semiconductor technologies at the heart of the modern economy. China has lagged behind other countries in this technology: only 16% of the semiconductors it uses are produced domestically, and it is heavily reliant on chips from South Korea (especially Samsung) and Taiwan (especially the Taiwan Semiconductor Manufacturing Company, TSMC). Beijing intends to increase self-sufficiency through foreign acquisitions and state investment funds, aiming to produce 70% of its semiconductors by 2025.

According to the recent report from the White House, 'armed with billions in subsidies, the Chinese government [has been] on a buying spree for foreign semiconductor companies. Globally China went from zero semiconductor company acquisitions prior to 2014 to over 25 potential and completed deals in 2015.' Yangtze Memory Technologies (YMTC), for example,

[3] Dominick Reuter, "The ongoing chip shortage is expected to cost the auto industry $110 billion this year, almost double analysts' estimate from January", (Business Insider, May 14 2021) (In White House report, linked).

was founded in 2016 and has been expanding rapidly, according to the report receiving c.$24bn in Chinese government subsidy.

Yet because the construction cost of a fab is currently up to $12bn[4] or more (plus operating costs), the Chinese sector would also benefit from the fact that the UK taxpayer will have subsidised the acquired firm and therefore, indirectly, the growth of China's semiconductor industry.

Subsidy for semiconductor production is also creating market distortions.[5] Subsidies 'keep… Chinese companies in business even though most do not appear to be making a profit'. The OECD has found that 'Government equity injections have had discernible effects on the financial performance' of semiconductor manufacturers, where 'increases in firm assets are not matched by any increase in profitability'.[6]

According to the White House, China often subsidises firms through 'government equity "investments" [which] aggressively [exploit] gray areas in international trade rules in World Trade Organization (WTO) disciplines', provoking 'deep concern' internationally over 'China's market-distorting behavior'.

So although China has developed what is considered a 'venture capital' sector, the White House finds that this channels 'massive state subsidies into China's domestic semiconductor industry', with fund managers 'in all likelihood, serv[ing] as proxies', including for Beijing's 'military-civil fusion objectives'[7] (however, as with the discussion of state subsidy, counterfeiting, and other factors which are relevant to the political environment, this is simply an illustration of the context in which the acquisition took place, and it does not follow that this necessarily applies to Wingtech/Nexperia). This venture capital model appears designed 'to facilitate a massive subsidy campaign to develop its domestic semiconductor capability to avoid any WTO oversight'. The OECD is understood to be referring to China when it states: '[this] could explain in part the recent proliferation of government funds investing in semiconductor firms, which may allow governments to continue supporting their domestic industry while limiting the risk of a WTO challenge'.[8]

Chinese state support to its semiconductor sector over this period may be as high as $200bn, but limited transparency makes it hard to know the exact scale. Yet while companies elsewhere whose sales become uncertain will often need to cut their workforce, R&D and so on, China's firms, whether or not directly government-owned, can often keep investing, according to the report, 'based on the knowledge that the Government of China will be contributing billions of dollars to the industry.'

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[4] Willy Shih, 'TSMC's Announcement of A New U.S. Semiconductor Fab Is Big News', (Forbes, May 15 2020). In Ibid.

[5] Christopher Taylor, 'Self-sufficiency for China at the Important 28 nm CMOS node: The Plan Can Succeed', (StrategyAnalytics, October 27 2020). In Ibid.

[6] OECD, 'Measuring distortions in international markets: The semiconductor value chain', (OECDiLibrary, December 12 2019). In Ibid.

[7] Dieter Ernst, 'China's Bold Strategy For Semiconductors--Zero-Sum Game Or Catalyst For Cooperation?', (East-West Center, September 2016). In Ibid.

[8] OECD, 'Measuring distortions in international markets: The semiconductor value chain'. In Ibid.

Increased Chinese control over semiconductor supply chains is liable to make countries like the UK more dependent on China for technologies that are vital to the modern economy. However it is becoming increasingly common for governments to block Chinese purchases of semiconductor or related companies: Italy and South Korea have recently followed a US lead. Precedents include:

- The Trump Administration's 2017 intervention against the attempt by Chinese-state backed private equity firm Canyon Bridge Capital Partners to buy US-based chipmaker Lattice Semiconductor Corp for $1.3bn, citing national security concerns (under section 721 of the Defense Production Act 1950, as amended);
- The US also blocked the acquisition of semiconductor testing company Xcerra Corp by Chinese state-backed semiconductor investment fund Hubei Xinyan;
- In March 2021, Italy blocked a Chinese acquisition of one of its semiconductor firms (believed to be the attempt to acquire Milan-based LPE by Shenzhen Investment Holdings);
- US and South Korean regulators blocked the sale of Magnachip (a South Korean firm traded on the NYSE) to Chinese private equity fund Wise Road Capital, which is also a member of the consortium that purchased Nexperia (Magnachip has stated that a letter from the US Treasury Department stated that the purchase poses 'risks to the national security' of the United States).

Is the acquisition a security concern?

The Chinese state, through many layers of ownership, owns the largest overall share in Wingtech, giving considerable *de facto* control.

NWF's technology is not at the cutting edge, but the move by companies like Wingtech to purchase factories and companies abroad is happening in parallel with the Chinese government's growing interest in the control of supply chains in domains like semiconductors, given its interest in making the country independent of Taiwan and elsewhere.

Intellectual Property

While 'core' semiconductor IP has, according to the White House, been concentrated among US- and UK-headquartered firms (with the UK's Arm Ltd the leading IP-licenser), the NWF acquisition fits the recent pattern of the loss of UK semiconductor IP ownership; over the same period, China has strategically increased its 'access to and control of' semiconductor IP.

Beijing's Guidelines for the development of the domestic sector state that the semiconductor industry cannot develop without foreign technological expertise. Even if the NWF acquisition does not provide cutting-edge technology or IP, there is also the question of 'learning by doing', or the opportunity to develop new know-how, which is likely a factor driving China's acquisitions in the industry.

The White House considers that increased 'Chinese control over semiconductor IP may present a risk to U.S. industry by limiting the IP available to U.S. companies': the UK Government may wish to carry out its own assessment of the strategic and economic risks involved in the loss of UK control over semiconductor IP, including implications for future IP access. For its part, China is aiming to 'dominate emerging industries, including autonomous vehicles' to help 'address its strategic technology gap with the United States'.

In the UK, Arm Ltd was purchased by Japan's Softbank in 2016. In 2018, Arm China was formed as a 51% Chinese-owned joint venture; in 2020 it was announced that Nvidia in the US would purchase Arm for $40 bn. In 2017, the UK's Imagination Technologies, thought to be the world's fifth-largest semiconductor IP provider, was purchased by Chinese government-backed private equity fund Canyon Bridge Capital Partners. Beijing has 'gained control of hi-tech know-how on the cheap.' Canyon Bridge is backed by state-funded China Reform; the United States forced Imagination to sell its US subsidiary after the purchase.

While the American co-founder of Canyon Bridge claimed China Reform had 'no say in the company's governance', in April 2020 a board meeting attempted to place four representatives from the Chinese fund on Imagination's board. A UK Government intervention prevented this after Imagination's chief executive Ron Black 'blew the whistle to MPs and ministers'. He left the company shortly afterwards and claimed unfair dismissal. It has been reported that Imagination staff are now leaving 'in droves' as a result of China's influence over the firm, including departures to US rivals Intel and Advanced Micro Devices (AMD), with a former executive quoted as saying: 'Once you lose the core of a company, it is almost impossible to come back'. It is also reported that, following the purchase, Imagination has 'licensed its technology to state-backed Chinese technology companies', including a $20m deal with 'newly founded Chinese graphics chip maker' Birentec (this new company's state backers include the Russian China Investment Fund). One report quotes a departing Imagination executive criticising 'China deals for dimes'.

According to the White House, the loss of IP control may also increase the risk of counterfeiting. Counterfeit semiconductors risk 'catastrophic failure' for electronic systems,[9] with defence systems and critical infrastructure 'particularly at risk' (given NWF's funding history, below, their chips may have potential defence applications). The Biden Administration estimates the loss of revenue from counterfeiting of around $100bn annually for the whole electronics sector.

The White House sees the possibility of 'malicious disruptions' to semiconductors and their supply chains as a growing risk, created in part by outsourcing. According to the Defense Science Board Cyber Supply Chain Task Force at the Department of Defense, 'insertion of a malicious microelectronic vulnerability via the supply chain can occur at any time', for example 'during production and fielding of a weapons system or during sustainment of the fielded system',[10] and these disruptions could be targeted at specific end-users.

[9] Guin et al. 'Counterfeit Integrated Circuits: A Rising Threat in the Global Semiconductor Supply Chain', (IEEE, August 2014).
[10] Defense Science Board, 'Task Force on Cyber Supply Chain', (Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics, April 2017).

Supply chain risk generally has become a major issue in UK political life. Trade disputes could increase these risks: Australia's experience shows that China is prepared to use trade to punish countries that criticise its government. China's position as the leading immediate semiconductor customer grants it increasing power over the global sector, leverage that may grow if it also controls more supply. According to the recent White House report, risks 'will continue to rise as China accounts for an increasing share of the semiconductor ecosystem'.

Thus the lack of cutting-edge fabs in the UK is not in itself an argument to allow more dependence on China for non-cutting-edge products. In fact the United States is now calling on allies to help 'slow [China's] innovation rate', according to US Secretary of Commerce Gina Raimondo, specifically highlighting semiconductors. According to a recent report by Boston Consulting Group and the Semiconductor Industry Association, semiconductors should be considered a strategic traded product and dependence on any risky national supplier should be reduced, not increased.

Defence considerations

While one of the factors the original enquiry considered appears to have been the lack of cutting edge technology, another major question is whether there are possible implications for defence.

Over the last generation, two major factors have transformed the semiconductor industry in the US especially: manufacturers leaving defence markets for commercially-oriented applications; and subcontracting abroad, especially to China and Taiwan, to generate higher volumes. The result has been a fall in the number of US firms providing 'mission-critical' semiconductors for military purposes.

Meanwhile, because 'semiconductor autarky' for China – or elsewhere – would be difficult due to the technological and logistical complexity of the sector, China's military semiconductor supply is likely to depend more on securing access to semiconductor supply chains abroad. Semiconductor technologies are a 'foundational' part of military supply chains: China is aware that controlling more of the supply chain will increase its capacity to independently and reliably build advanced weaponry. Meanwhile, in some of the acquisitions of semiconductor-related enterprises by Chinese firms with close ties to the government, there appears to have been either Chinese military-linked backing or a later pivot towards the aerospace and defence sector:

- Beneq, a Finnish supplier of atomic layer deposition (ALD)[11] equipment for semiconductors and other products, was acquired in 2018 by Chinese firm SRI Intellectual. SRI has two main shareholders: CRRC Guohua Equity Investment Partnership, 50% owned by a military-civilian fund; and CRRC Qingdao Sifang Vehicle Research Institute Co Ltd, a subsidiary of a State Council-directed institute;
- Jianguang Asset Management acquired Dutch chipmaker Ampleon in 2015 for around €1.7bn ($2bn). Jianguang Asset Management is a subsidiary of state-owned

[11] A central process in semiconductor device manufacturing.

China Jianyin Investment limited. Ampleon has reportedly pivoted to focus on the aerospace and defence sector since it was acquired.

Because NWF does not produce cutting-edge technology, it has been argued that its purchase by Nexperia cannot present a security risk. Beyond the obvious context of semiconductor shortages and China's race to secure microchip manufacturing, this simplifies the renewed relevance of Newport's wafers and R&D. The fab carries out UK Government-funded semiconductor research, with over a dozen contracts largely funded by Innovate UK. One NWF defence contract develops chip technology with Cardiff University for a radar system for use in fighter aircraft, a £5.4m project intended to provide technology for contractor Leonardo, missile developer MBDA and aerospace chipmaker Arralis.

In a previous paper, *Inadvertently Arming China?: The Chinese military complex and its potential exploitation of scientific research at UK universities*, we demonstrated that Chinese military-linked entities have an interest in radar research in the UK. Researchers in UK universities who have been funded by the British taxpayer and UK defence groups to work on radar technologies also researched radar-jamming with China's military-linked laboratories, including the Key Laboratory of Radar Imaging and Microwave Photonics (some research discussed detection-avoidance by stealth aircraft).

Radar and next-generation fighter jets are an area of interest for military development in China. As stated in a recent Commons debate, this might put the company 'into the national security bracket'. Beyond defence, in the US and elsewhere there is an emerging understanding of the need for secure supplies of semiconductors due to their central place in supply chains: Ciaran Martin, the former head of the National Cyber Security Centre, has characterised the purchase as a 'level one' top priority issue because of the importance of ensuring UK 'sovereign capacity' over the production of key technologies such as microchips.

Concluding points

The purchase of the Newport Wafer Fab (NWF) semiconductor facility by Chinese electronics company Wingtech through its Dutch subsidiary Nexperia is not a straightforwardly commercial acquisition, and is better understood within the context of a strategy of increasing Chinese control of semiconductor supply chains.

Wingtech is not a private firm, but a 'hybrid' state-private company. NWF's contracts include researching chip technology development for military aircraft radar systems, and allowing the acquisition may create risks for the future use of this UK taxpayer funded component of UK science.

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