



European Chamber
中国欧盟商会

CHINA MANUFACTURING 2025

Putting Industrial Policy Ahead of Market Forces



European Union Chamber of Commerce in China

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1. Executive summary

In May 2015, Chinese state planners launched another initiative to promote and support the development of advanced industries and technologies. It is clear that this latest attempt is not to be achieved through measures that will establish a market economy. Instead, government officials have tasked themselves with steering development and have handpicked the industries that they believe will drive China's economy in the future.

Titled China Manufacturing 2025 (CM2025), the plan sets ambitious goals for developing ten industries.¹ The numbers attached to this initiative are staggering. In total, the Chinese central and local governments have announced hundreds of billions of euros of funding in the form of subsidies, funds and other channels of support.

There is no doubt that China's continuous, growing investments in research and development (R&D), and attempts to encourage its domestic industry to strive for quality and efficiency have a great deal of merit. However, the broad set of policy tools that are being employed to facilitate CM2025's development are highly problematic.² This has already created problems for both China's economy and European business. Under recently passed legislation in the new energy vehicle (NEV) industry, for example, European business is facing intense pressure to turn over advanced technology in exchange for near-term market access; in the field of industrial robotics, government subsidies are contributing to overcapacity in the low- and mid-tiers of China's market; and in the information technology industry European business is seeing market access constrict further.

Despite the rhetoric of the Third Plenum's *Decision* of 2013—which strongly advocates market forces—it seems that the Chinese Government is determined to maintain a prominent role in guiding the economy. This is highlighted by the large number of domestic and international market share targets that have been set, along with references to 'indigenous innovation'³ included in the multiple planning documents related to CM2025. The appearance of 'indigenous innovation'—along with mentions of the need to realise 'self-sufficiency'—is particularly concerning – it suggests that Chinese policies will further skew the competitive landscape in favour of domestic companies. The European Chamber believes that all companies should receive equal treatment under Chinese law, regardless of their nationality.

It is plausible that the amount of state support that has been offered by the central and local governments for CM2025 will act as an early warning system to China's international trade partners as to where additional industrial overcapacity is likely to emerge up to 2025 and beyond. As with industries like steel and solar panels in the past, such overcapacity would run the risk of creating new, and exacerbating existing, tensions with China's international trade partners. This would be even more undesirable at a time when support for economic globalisation and free trade is facing growing opposition in some quarters. Furthermore, the government-driven approach to pursuing international acquisitions that align with industrial policy priorities may jeopardise Chinese companies' efforts to complete regular, market-based outbound investments.

In the short and medium term, CM2025 does present attractive opportunities for some European businesses to play an important role, though. Numerous European companies have already established partnerships with Chinese companies in this respect, to provide critical components, technology and management skills for areas covered by CM2025. However, in the long term CM2025 amounts, in large part, to an import substitution plan. Market access for European business can therefore be expected to shrink, especially in areas where Chinese companies are able to

1 Next generation IT; high-end numerical control machinery and robotics; aerospace and aviation equipment; maritime engineering equipment and high-tech maritime vessel manufacturing; advanced rail equipment; energy-saving vehicles and NEVs; electrical equipment; agricultural machinery and equipment; new materials; and biopharmaceuticals and high-performance medical devices.

2 These include: subsidies; protectionism; new pressures on foreign business to transfer core technology; the acquisition of companies with advanced technology in Europe and elsewhere, often with support from state-backed investment funds; and the establishment of ever-larger state-owned enterprises (SOEs) that are being positioned as national champions while their management is often simultaneously politicised.

3 While the exact meaning of 'indigenous' in the context of CM2025 is still not clear, in the recent past it has been found to only refer to technology and products developed in China, and has been defined as "enhancing original innovation through co-innovation and re-innovation based on the assimilation of imported technologies". See page 7 for more information and full citation.



close the technological gap. The world would benefit from additional innovative Chinese products and services, but not at the expense of inhibiting market forces through state-driven schemes.

The commitments made by President Xi Jinping during his speech at the World Economic Forum in Davos⁴ along with those made by the State Council in January 2017,⁵ to encourage investment in advanced manufacturing by foreign-invested enterprises (FIEs) and to ensure that these companies receive equal treatment under strategic policies and measures related to CM2025, were extremely positive. In the interests of mutual benefit, and to ensure that China reaches its full technological potential, the European Chamber hopes that China follows through on these commitments and that European business is indeed permitted to participate in this process and compete as a full and equal partner in an open ecosystem for innovation.

However, it is important to understand that even if CM2025 is opened to a wider range of participants, it will not guarantee that China is able to avoid the middle income trap. Of the 101 countries that had achieved middle-income status in 1960, only 13 ultimately reached high-income status. It was a failure on the part of the other 88 countries to undertake the necessary institutional reforms that led to their growth slowly stabilising, before eventually becoming stagnant. This would be a highly undesirable outcome for both China and the world economy, and one that is explicitly cautioned against in the 13th Five-year Plan, as well as in the article written by the 'authoritative person', published in *People's Daily* on 9th May, 2016.⁶

Fortunately, China already has a blueprint that will allow it to carry out the restructuring necessary to avoid this outcome and to lay a strong foundation for its manufacturing industry – the Third Plenum's reform agenda, as committed to in the 2013 *Decision*. It would therefore be advisable for the Chinese authorities to now develop a roadmap that thoughtfully prioritises these reforms and to focus on the key competencies of government: facilitating innovation through support for basic research, building necessary infrastructure and establishing a fair and transparent regulatory environment for private business.

Ultimately, perfecting the market would do far more to ensure that China reaches its full potential for economic development and innovation than more old-school, expensive industrial planning ever could. In this ongoing struggle between 'masters and markets', European business is poised to contribute its expertise and invest in China's future.

2. Why China wants to change

2.1 China has been the world's factory, and now it wants more

For a generation China has been the factory of the world. In 2015, it produced or assembled:

- 28% of the world's automobiles;
- 41% of the world's ships;
- 80%+ of the world's computers;
- 90%+ of the world's mobile phones;
- 60% of the world's colour TV sets;
- 50%+ of the world's refrigerators;
- 80% of the world's air-conditioners;
- 24% of the world's power; and
- Half of the world's steel.

⁴ President Xi's speech to Davos in full, World Economic Forum, 17th January, 2017, viewed 19th January, 2017, <<https://www.weforum.org/agenda/2017/01/full-text-of-xi-jinping-keynote-at-the-world-economic-forum>>

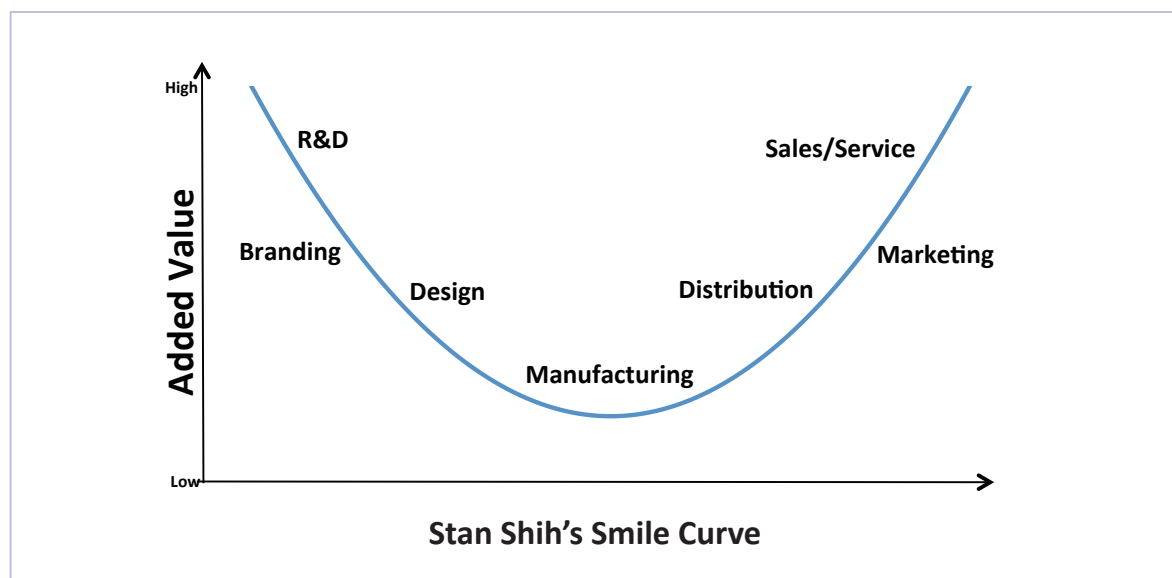
⁵ *Notice of the State Council on Several Measures on Promoting Further Openness and Active Utilisation of Foreign Investment*, The State Council, 17th January, 2017, viewed 21st January, 2017, <http://www.gov.cn/zhengce/content/2017-01/17/content_5160624.htm>

⁶ Gong, Wen, Xu, Zhifeng and Wu, Qiuyu, *Asking About Big Trends in the Opening Quarter: Authoritative Person Discusses the Current Chinese Economy*, *People's Daily*, 9th May, 2016, viewed 11th May, 2016, <<http://politics.people.com.cn/n1/2016/0509/c1001-28333725.html>>

While these statistics⁷ are undoubtedly impressive, a close evaluation of China's manufacturing industry reveals the extent of the challenges that it currently faces. The production that China accounts for in many of these industries is still very much low value add and energy intensive, not to mention highly polluting, which is a source of increasing social discontent. To address these issues China plans to upgrade its industrial base and to compete in more advanced market segments. This is an admirable and understandable aspiration for an upper-middle income country that aims to break through to high-income status. It is similar to the transitions undertaken by Europe in the early to mid-twentieth century, and Japan and South Korea over the last fifty years.

2.2 Climbing out of the 'smile curve' trough and escaping the middle income trap

A great number of changes are necessary if China is to hold on to its 20 per cent total share of global manufacturing⁸ and climb out of the trough of Stan Shih's 'smile curve'. In this model, highly profitable product R&D, branding and design sit at the beginning of the process, with distribution, marketing and sales/after service sitting at the other end – these represent the high points of the curve; between these two peaks nestles the far less profitable stage of actual manufacturing and assembly, the segment where China's economy is still primarily focused.⁹



During a European Chamber dialogue in January 2016, a senior official from the Ministry of Industry and Information Technology (MIIT) illustrated the vicious cycle that China's economy is currently trapped in. It begins with low R&D intensity at the enterprise-level, which was characterised as amounting to 33 to 50 per cent of the level seen in advanced industrialised countries, and is compounded by minimal contribution from small

⁷ China has Become a True Automobile Manufacturing Giant Accounting for 28% of Global Market Share, *China Economic Net*, 12th May, 2016, viewed 24th January, 2017, <http://www.ce.cn/xwzx/gnsz/gdxw/201605/12/t20160512_11513927.shtml>; China, Japan and China in a Battle for Survival in the Global Ship Manufacturing Market, *Sohu*, 16th August, 2016, viewed 24th January, 2017, <<http://business.sohu.com/20160816/n464439771.shtml>>; Disappointing Exports Due to Sluggish Global Demand to Continue in 2016, *China Economic Information Network*, 22nd March, 2016, viewed 24th January, 2017, <http://www1.cei.gov.cn/loadpage.aspx?Page=ShowDoc&CategoryAlias=zonghe/ggmflm_zh&ProductAlias=zhongwyb&BlockAlias=YBQBA&filename=/doc/YBQBA/201603220235.xml>; ICT Sector Credit Risk Management Forum held in Guangzhou to Focus on Overseas Risk Control, *Xinhua*, 18th October, 2016, viewed 24th January, 2017, <http://news.xinhuanet.com/fortune/2016-10/18/c_129327619.htm>; Year of Rebirth for the Colour TV Industry: Supply Chain Moves from the Most Traditional to the Most Cutting-edge and Accelerates Coordination, *Era Weekly*, 10th January, 2017, viewed 24th January, 2017, <http://www.ce.cn/cysc/zgjd/kx/201701/10/t20170110_19495453.shtml>; Analysis of Trends in Major Steel-consuming Industries 2016, *DRCNET*, 12th April, 2016, viewed 24th January, 2017, <http://www.dss.gov.cn/News_wenzhang.asp?ArticleID=386567>; BP Statistical Review of World Energy (Electricity), *British Petroleum*, June 2016, viewed 24th January, 2017, <<http://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2016/bp-statistical-review-of-world-energy-2016-electricity.pdf>>; 2015 Steel Industry Review and Its 2016 Prospects, *MIIT*, 6th February, 2016, viewed 24th January, 2017, <<http://www.miit.gov.cn/n1146312/n1146904/n1648356/n1648357/c4637348/content.html>>

⁸ Explanation of CM2025: China manufacturing Development Enters into a New Period, *MIIT*, 19th May, 2015, viewed 12th October, 2016, <<http://www.miit.gov.cn/n1146290/n1146402/n1146460/c3270377/content.html>>; "Made in China 2025: Strategic Industries and Emerging Business Opportunities", *EU SME Centre*, 9th March, 2016, viewed 19th January, 2017, <<http://www.eusmeccentre.org.cn/article/made-china-2025-strategic-industries-and-emerging-business-opportunities>>

⁹ Kwan, CH, *China: Wrong Part of the Smile Curve*, *Asia Times*, 4th October, 2002, viewed 12th October, 2016, <<http://www.atimes.com/atimes/China/DJ04Ad01.html>>



and medium-sized enterprises (SMEs), which face challenges accessing capital in China – this in spite of a R&D intensity rate of two per cent at the national level in 2013. Weak innovation capacity combined with a low transformation rate of scientific research achievements then leads to a very short average lifespan for many Chinese SMEs. For those that manage to endure, many suffer from the reduction in competition, which results in stagnation and an inability to ascend to the high-end of the value chain. Finally, it causes structural overcapacity as too many companies are left competing at the lower end on the basis of price, with some sacrificing quality as well.¹⁰

In ‘continental’ China, the more market-driven, coastal provinces of Guangdong, Fujian, Zhejiang and Jiangsu are arguably well on their way toward achieving high-income status. This is in part due to the fact that they have fewer state-owned enterprises (SOEs)—leaving more room for innovative private companies to develop—as well as comparatively stronger connections with the global economy and international chains of production.

However, at the national level China is having to pump in ever more credit to maintain the same amount of economic output. This is illustrated by the fact that while in 2005, one RMB of credit produced one RMB of GDP, in 2008 the same RMB of credit produced less than 0.8 RMB of GDP, and decreased to less than 0.4 RMB of GDP in 2015.¹¹ The reality is that 2016’s 6.7 per cent GDP growth came at the expense of saddling future generations with massive amounts of debt.

If China as a whole is to avoid falling into the middle income trap, in which economic growth levels off and stagnates before the country has reached a high level of GDP per person—a possibility that was explicitly referred to in the 13th Five-Year Plan (13FYP)—future economic development must be driven by innovation, not by opening the credit tap.¹²

2.3 China’s race to get rich before it gets old

As China’s population ages, its eligible workforce—defined as those aged 15 to 59 years old—is contracting. China’s National Bureau of Statistics reported that from 2013 to 2014 it declined by 3.7 million, with a further decline of 4.9 million from 2014 to 2015.¹³ As reported in a December 2016 front-page editorial in the government-run *People’s Daily* titled *New Orientation of the Chinese Economy*,¹⁴ this is related to, and impacts, many of the other challenges that China faces: while the declining rate of economic growth means that future development must be driven by innovation, the contraction in the working-age population makes this goal harder to achieve. This situation is further complicated by the corresponding growth in the number of elderly citizens needing support.

2.4 Feeling squeezed from both sides: competition from developed and developing countries

An official from the MIIT has stated that, “...advanced economies such as the United States (US), Germany and Japan have all formulated policies supporting further development of their own manufacturing industries.

¹⁰ *Overcapacity in China: An Impediment to the Party’s Reform Agenda*, The European Union Chamber of Commerce in China, February 2016, <<http://www.eurochamber.com.cn/en/publications-overcapacity-in-china>>

¹¹ China Update, Astellon Capital Partners, 2016, p. 7.

¹² *The 13th Five-Year Plan for Economic and Social Development of the People’s Republic of China*, www.gov.cn, 17th March, 2016, viewed 17th January, 2017, section 2.1.1 <http://www.gov.cn/xinwen/2016-03/17/content_5054992.htm> For analysis of this topic in the government-run Chinese press, see: Pei, Jianrong and Mao, Pengfei, *China can Draw Lessons from LatAm Efforts to Avoid Middle Income Trap: Experts*, Xinhua, 25th January, 2016, viewed 7th January, 2017, <http://news.xinhuanet.com/english/2016-01/25/c_135043662.htm>; Wang, Jinye et al, *Reform, Social Security, Development of Small Businesses Help Chile Avoid “Middle Income Trap”*, Xinhua, 29th May, 2016, viewed 7th January, 2017, <http://news.xinhuanet.com/english/2016-05/29/c_135397056.htm>

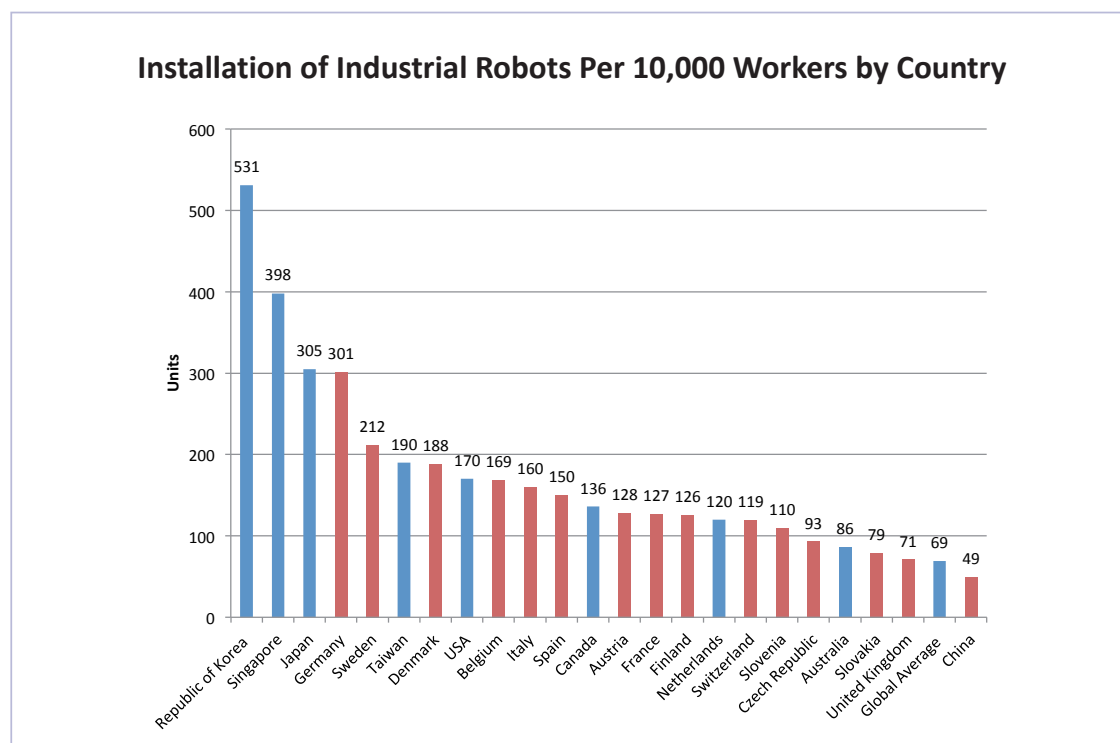
¹³ *Statistical Communiqué on National Economic and Social Development in 2013*, National Bureau of Statistics of the People’s Republic of China, 24th February, 2014, viewed 19th January, 2017, <http://www.stats.gov.cn/tjsj/zxfb/201402/t20140224_514970.html>; *Statistical Communiqué on National Economic and Social Development in 2014*, National Bureau of Statistics of the People’s Republic of China, 26th February, 2015, viewed 19th January, 2017, <http://www.stats.gov.cn/tjsj/zxfb/201502/t20150226_685799.html>; *Statistical Communiqué on National Economic and Social Development in 2015*, National Bureau of Statistics of the People’s Republic of China, 29th February, 2016, viewed 19th January, 2017, <http://www.stats.gov.cn/tjsj/zxfb/201602/t20160229_1323991.html>

¹⁴ Tian, Junrong et al., *New Orientation of the Chinese Economy*, *People’s Daily*, 14th December, 2016, viewed 15th December, 2016, <<http://finance.people.com.cn/n1/2016/1214/c1004-28947084.html>>

Meanwhile, emerging economies such as India and Brazil are also catching up with their own advantages."¹⁵ While there is evidence that the labour cost advantage held by less-developed countries with far smaller domestic markets is actually less significant than often thought,¹⁶ this is a clear indication that the Chinese Government views upgrading the country's industrial base as important not only to holding on to its current manufacturing industry, but also to competing further up the value chain. This is especially important now that China faces the possibility of manufacturing reshoring to economies whose competitiveness is boosted by having more advanced industrial digitisation.¹⁷ As rightfully stated by the same MIIT official, "China is being pressured from both sides".¹⁸

2.5 A latecomer to manufacturing automation

The pressure from above referred to by the MIIT official is reflected by current trends in automation. While China has numerous companies that have achieved advanced capabilities and competitive market positions,¹⁹ when compared to the leading industrialised countries in the West, as well as Japan and South Korea, China's manufacturing base currently enjoys a lower average level of sophistication. For example, on average, Chinese companies are far less automated with only 49 robots per 10,000 workers. By contrast, the corresponding numbers in Korea, Germany, Sweden and Denmark are 531, 301, 212 and 188, with the worldwide average sitting at 69, according to the International Federation of Robots (IFR).²⁰ Furthermore, according to MERICS the IFR data for China does not take account of migrant workers – if it did China's robot density would be even lower.



15 'Made in China 2025' Initiative Unveiled, *China Daily*, 19th May, 2015, viewed 6th December, 2016, <http://www.chinadaily.com.cn/bizchina/2015-05/19/content_20760528.htm>

16 Wubbeke, Jost et al., *Made in China 2025: The Making of a High-Tech Superpower and Implications for Industrial Countries*, MERICS, December 2016, no. 2, p. 16, <<https://www.merics.org/en/merics-analysis/papers-on-china/made-in-china-2025/>>

17 *Manufacturing Moves Back to the US*, The Boston Consulting Group, 29th January, 2015, viewed 12th October, 2016, <https://www.bcgperspectives.com/content/infographics/globalization_supply_chain_management_manufacturing_reshoring/>

18 'Made in China 2025' Initiative Unveiled, *China Daily*, 19th May, 2015, viewed 6th December, 2016, <http://www.chinadaily.com.cn/bizchina/2015-05/19/content_20760528.htm>

19 Wubbeke, Jost et al., *Made in China 2025: The Making of a High-Tech Superpower and Implications for Industrial Countries*, MERICS, December 2016, no. 2, pp. 30-32, <<https://www.merics.org/en/merics-analysis/papers-on-china/made-in-china-2025/>>

20 *World Robotics Report 2016: European Union Occupies Top Position in the Global Automation Race*, International Federation of Robots, 29th September, 2016, viewed 2nd December, 2016, p. 2, <<http://www.ifr.org/news/ifr-press-release/world-robotics-report-2016-832/>>



3. CM2025 vs Industry 4.0

As China faces up to these challenges, the overall global advancement of manufacturing and technology continues unabated. The first, second and third industrial revolutions resulted from the development of mechanical production driven by water and steam power, the adoption of assembly lines for mass production driven by electricity and a move toward automation through the utilisation of electronics and information technology (IT) respectively. The emerging fourth revolution envisions increasing digitisation of manufacturing with 'cyber-physical systems' of production in which big data and cloud computing enable information to be shared and analysed along entire industrial value chains, as connected networks of humans and robots interact and work together.²¹

In many cases this has already begun to transform how leading companies in Europe and elsewhere approach production. It affords insights into what is happening at every stage of production, which can allow adjustments to be made in real time as machines and systems independently interact and adjust their actions in response to new information. This goes beyond sharing information across production lines, extending across entire industrial value chains—including across multiple factories—functions like maintenance, inventory, logistics and sales, as well as sharing information with suppliers.²² Ultimately, these developments can allow companies to reduce waste, enhance efficiency and to identify potential problems and malfunctions before they occur. Many companies that in the past were largely focused on manufacturing products are therefore now increasingly becoming technology companies.

Germany has been one of the pioneers in this field with the development of its Industrie 4.0 (Industry 4.0) model, which was one of the future projects that emerged from the government's *High-Tech Strategy 2020 Action Plan*. It resulted from in-depth exchanges between the German Government, industry, think tanks and trade unions, with the role of government focused on facilitating exchange and supporting relevant R&D.²³ The European Union (EU) also has a programme under the Horizon 2020 plan called Factories of the Future,²⁴ France has developed an initiative titled the *Industry of the Future*,²⁵ and the UK has the *High Value Manufacturing Catapult* programme.²⁶ In 2014, a group of leading American technology firms established the Industrial Internet Consortium, which engages with government and academia on development and coordination of relevant technologies.²⁷

Significantly, these are generally open initiatives which accept participation from international companies active in the regions they cover.

3.1 Fundamental differences to the EU's approach remain

European Union Member States focus primarily on facilitating the process of innovation and technological development. This involves the establishment of strong institutions; protection of intellectual property (IP); support for R&D in universities and public research centres (without assigning technological pathways through which innovation is meant to take place); ensuring that SMEs have an opportunity to contribute; and by being a highly demanding customer in government procurement. Industry 4.0 is primarily a bottom-up process led by enterprises.

In contrast to the top-down approach that is often taken by the Chinese Government, the EU does not view massive amounts of state funding and subsidies in support of the sale of products as an effective policy tool. For

21 Wee, Dominik et al, *Industry 4.0: How to Navigate Digitisation of the Manufacturing Sector*, McKinsey & Co., 2015, pp. 7-13, viewed 5th December, 2016, <https://www.mckinsey.de/files/mck_industry_40_report.pdf>

22 *Industrie 4.0: The Digitisation of the Economy*, Federal Ministry for Economic Affairs and Energy, Germany, viewed 5th December, 2016, <<http://www.bmwi.de/EN/Topics/Economy/Industrial-policy/industrie-4-0.html>>

23 *Industrie 4.0: Smart Manufacturing for the Future*, Germany Trade & Invest, viewed 6th December, 2016, <http://www.gtai.de/GTAI/Content/EN/Invest/_SharedDocs/Downloads/GTAI/Brochures/Industries/industrie4.0-smart-manufacturing-for-the-future-en.pdf>

24 Factories of the Future, European Commission, viewed 6th December, 2016, <http://ec.europa.eu/research/industrial_technologies/factories-of-the-future_en.html>

25 The Industry of the Future, Government of France, viewed 6th December, 2016, <http://www.economie.gouv.fr/files/files/PDF/pk_industry-of-future.pdf>

26 *High Value Manufacturing Catapult*, Innovate UK, viewed 6th December, 2016, <<https://hvm.catapult.org.uk/>>

27 Industrial Internet Consortium, viewed 6th December, 2016, <<http://www.iiconsortium.org/>>

example, funding of only up to EUR 200 million was allocated for Industry 4.0 within the German Government's *Action Plan*, with representatives from numerous industries also committing to spending EUR 2.5 billion in six areas over the ten-year project lifetime.²⁸ Unlike in China, the initiative only provides support in the form of R&D tax credits with no subsidies provided for actual manufacturing or sales of products.

Member States generally also adopt an open approach in which a wide range of partners can participate. Specifically in the field of R&D, this openness is highlighted by the fact that, at the end of 2016, China was one of the top three international cooperation partners in the *Horizons 2020* programme for joint research projects.

Support for R&D in the EU is also more strongly directed toward basic research in areas where new breakthroughs could take place. For example, in 2013, the UK, Austria, France, Italy and the Netherlands spent roughly 16, 19, 24, 25 and 39 per cent of their total research budgets respectively on basic research, which included public, industrial and private funds.²⁹ In the same year only five per cent of China's total budget for R&D was dedicated to basic research.³⁰ For government-funded basic research in universities the gap is also significant, with the UK, Austria, France, Italy and the Netherlands allocating roughly 45, 55, 82, 56 and 58 per cent of resources in this area in 2013, and China just 36 per cent.³¹

4. The CM2025 initiative

4.1 So what is CM2025?

The Chinese Government has developed CM2025 in response to the domestic and international challenges that its manufacturing industry faces. While it may initially appear to be heavily inspired by Germany's Industry 4.0, CM2025 is actually more than that. Industry 4.0 is about technological advancement; CM2025 is about restructuring the entire industry and making it more competitive using advancement in production technology as just one of the instruments. In other words, Industry 4.0 is only one part of the Chinese strategy. A key speech delivered by President Xi Jinping at a joint meeting of the Chinese Academy of Sciences (CAS) and the Chinese Academy of Engineering (CAE) in June 2014 provides insights into some of the fundamental political drivers of the initiative. He stated: "China's foundation for science and technology innovation is still not firm. China's capacity for indigenous innovation, and especially original innovation, is still weak. Fundamentally, the fact that we are controlled by others in critical fields and key technologies has not changed."³²

As a result, it was concluded that it was necessary to strengthen China's domestic capacity for innovation and to break down institutional obstacles that stood in the way of doing so. In part, this is meant to be accomplished through improved coordination between government, academia and industry. While the exact meaning of 'indigenous' in the context of CM2025 is still not clear, in the recent past it has been found to only refer to technology and products developed in China, and has been defined as "enhancing original innovation through co-innovation and re-innovation based on the assimilation of imported technologies".³³

28 *Industrie 4.0: Smart Manufacturing for the Future*, Germany Trade & Invest, viewed 6th December, 2016, <http://www.gtai.de/GTAI/Content/EN/Invest/_SharedDocs/Downloads/GTAI/Brochures/Industries/industrie4.0-smart-manufacturing-for-the-future-en.pdf>

29 *Research and Development Statistics: R-D Expenditures by Sector of Performance and Type of R-D (2016 Edition)*, OECD, 2016, viewed 25th January, 2017, <http://www.oecd-ilibrary.org/science-and-technology/data/research-and-development-statistics/research-and-development-statistics-r-d-expenditure-by-sector-of-performance-and-type-of-r-d-edition-2016_5b3ace4d-en>

30 Ibid

31 Ibid

32 *Xi Jinping: Speech at the 17th Conference of the Chinese Academy of Sciences and 12th Conference of the Chinese Academy of Engineering*, Chinese Communist Party News, 9th June, 2014, viewed 12th October, 2016, <<http://cpc.people.com.cn/n/2014/0610/c64094-25125594.html>>

33 *The National Medium- and Long-Term Plan for the Development of Science and Technology, 2006-2020*, State Council, 26th February, 2006, viewed 22nd December, 2016, <http://www.most.gov.cn/mostinfo/xinxifenlei/gjkjgh/200811/t20081129_65774.htm>



Innovation vs invention

It should be recognised that 'innovation' and 'invention' are not interchangeable. 'Innovation' can be defined as the introduction of new things and methods that produce value in the market.³⁴ This can be as simple as adapting an existing technology or business model to a new industry where it has not previously been utilised. 'Invention' can be defined as "something that has never been made before, or the process of creating something that has never been made before."³⁵ It is the latter that often requires a major investment in basic research.

Covering the 10-year period 2016 to 2025, and with targets set for both 2020 and 2025, the CM2025 initiative constitutes the first of a three-stage plan for establishing China as a leading global manufacturing power by 2049, the 100th anniversary of the founding of the People's Republic of China. It aims to do so by addressing the fact that China's manufacturing industry is currently large without being strong due to its continuing lack of internationally-competitive companies and products of its own,³⁶ as well as its dependence on foreign companies for many core technologies and classes of capital equipment. It also acknowledges that with the days of double-digit growth in manufacturing output having come to an end due to inefficient traditional methods and a lack of high-end manufacturing, the country needs to upgrade the quality of its industrial base. The initiative is generally viewed as heavily influenced by the German model with some adjustments to suit China's own situation.³⁷

Premier Li Keqiang first mentioned the authorities' commitment to CM2025 during his annual Government Work Report during the National People's Congress in March 2015.³⁸ The initiative was officially unveiled in May 2015 by China's State Council,³⁹ and is subsequently referred to multiple times in the 13th Five-year Plan (FYP) that was approved in March 2016.

Further underlining its importance, the China Strong Manufacturing Leading Small Group was established in June 2015, with Vice Premier Ma Kai serving as chair.⁴⁰ Minister Miao Wei of the MIIT was designated as vice chair in conjunction with five other ministerial-level officials, such as NDRC Vice Director Lin Nianxiu.⁴¹ The MIIT is tasked with leading implementation of the initiative under the guidance of the Leading Small Group, with the NDRC, the Ministry of Science and Technology (MOST), the Ministry of Finance (MOF) and the CAE also playing important roles.

34 *Fast and Furious*, *The Economist*, 12th September, 2015, viewed 16th December, 2016, <<http://www.economist.com/news/special-report/21663325-chinese-private-firms-are-embracing-innovation-fast-and-furious>>

35 'Invention', Cambridge Dictionary, viewed 19th January, 2017, <<http://dictionary.cambridge.org/dictionary/english/invention>>

36 *Notification on the Printing and Distribution of Made in China 2025*, State Council, 8th May, 2015, viewed 7th December, 2016, <http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm>; *Made in China 2025*, *China Daily*, 10th March, 2015, viewed 7th December, 2016, <http://www.chinadaily.com.cn/opinion/2015-03/10/content_19764324.htm>

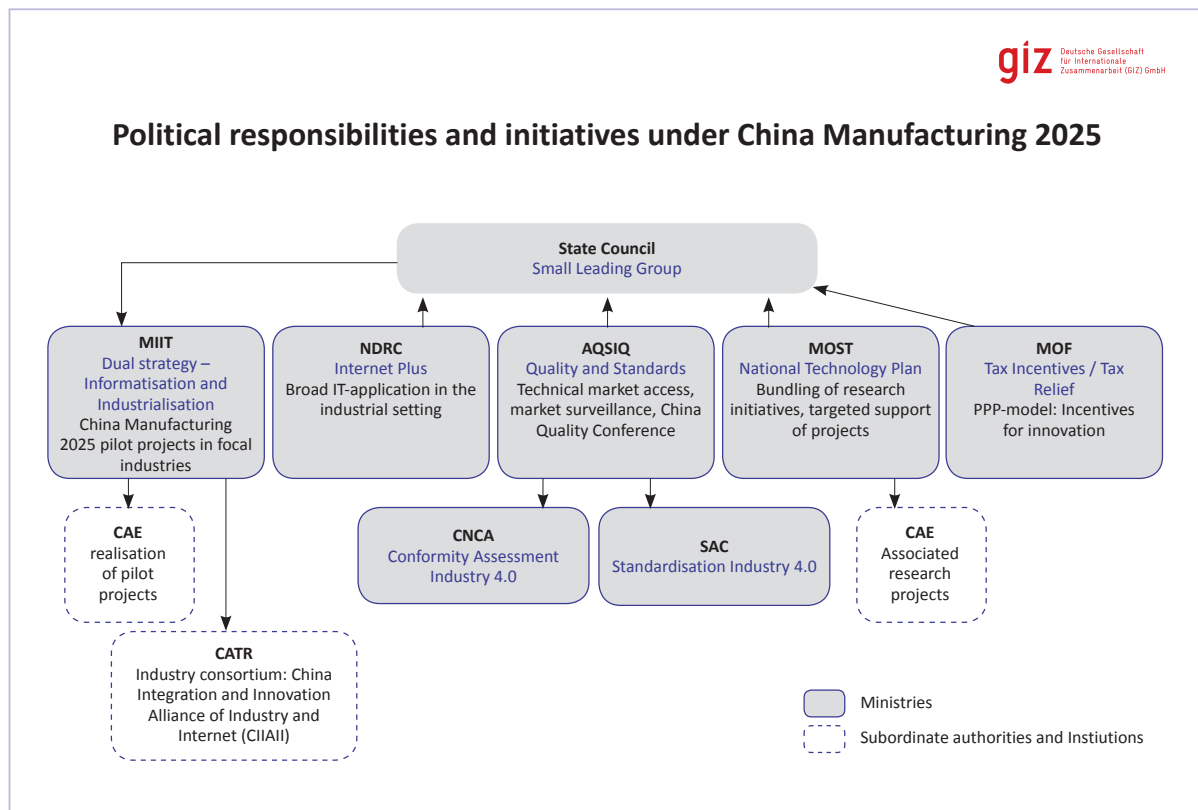
37 Zhao, Yinan, *China unveils ambitious plans to upgrade manufacturing power*, State Council, 26th March, 2015, viewed 7th December, 2016, <http://english.gov.cn/premier/news/2015/03/26/content_281475077781817.htm>

38 Government Work Report, The State Council, www.gov.cn, 16th March, 2015, viewed 9th January, 2017, <http://www.gov.cn/guowuyuan/2015-03/16/content_2835023.htm>

39 'Made in China 2025' Initiative Unveiled, *China Daily*, 19th May, 2015, viewed 6th December, 2016, <http://www.chinadaily.com.cn/bizchina/2015-05/19/content_20760528.htm>

40 *State Council: Notice on the Formation of China Strong Manufacturing Leading Small Group*, State Council, 24th June, 2015, viewed 12th October, 2016, <http://www.gov.cn/zhengce/content/2015-06/24/content_9972.htm>

41 Ibid



In addition to outlining nine key tasks as priorities,⁴² the CM2025 initiative also includes ten key sectors that receive special attention. Below they are listed in the same order that they are presented in the original plan:

- Next generation IT
- High-end numerical control machinery and robotics
- Aerospace and aviation equipment
- Maritime engineering equipment and high-tech maritime vessel manufacturing
- Advanced rail equipment
- Energy-saving vehicles and NEVs
- Electrical equipment
- Agricultural machinery and equipment
- New materials
- Biopharmaceuticals and high-performance medical devices

Some of the key targets outlined in CM2025 include the following:

- 40% of basic components and basic materials to be domestically manufactured by 2020, rising to 70% by 2025.
- 30% reduction in operating costs, production cycles and product defect rates by 2020, rising to 50% by 2025.
- 15 innovation centres to be established by 2020, with this number rising to 40 by 2025.

⁴² These ten areas are: improving manufacturing innovation; integrating IT and industry; strengthening the industrial base; fostering Chinese brands; enforcing green manufacturing; promoting breakthroughs in 10 key sectors; advancing restructuring of the manufacturing sector; promoting service-orientated manufacturing and manufacturing-related service industries; and internationalising manufacturing.

Industrial Policy for Technological Progress

The main targets of China Manufacturing 2025

	2013	2015	2020	2025
Innovation				
Share of R&D spending of operating revenue (%)	0.88	0.95	1.26	1.68
Invention patents per CNY 100 million total revenue	0.36	0.44	0.7	1.1
Quality				
Quality Competitiveness index	83.1	83.5	84.5	85.5
Growth of industrial value-added (%)	—	—	2	4
Productivity growth (% annual average)	—	—	7.5	6.5
Digitisation of Industry				
Broadband Internet (penetration %)	37	50	70	82
Use of digital design tools in R&D (penetration %)	52	58	72	84
Use of numerical control machines in key production processes (penetration %)	27	33	50	64
Environmental Protection				
Decrease in industrial energy intensity (% compared to 2015)	—	—	-18	-34
Decrease in CO ₂ emission intensity (% compared to 2015)	—	—	-22	-40
Decrease in water usage intensity (% compared to 2015)	—	—	-23	-41
Reuse of solid industrial waste (% of total waste)	62	65	73	79

In short, CM2025 represents a highly ambitious initiative.

Even though many Chinese companies are still operating according to the Industry 2.0 model and do not have the capacity to rapidly transition, in some ways China is well positioned to adopt Industry 4.0. This is due to the fact that in Baidu, Alibaba and Tencent, among other companies, China possesses strong and, in some areas, leading capabilities for digitisation and big data.

First outlined by Tencent's CEO Pony Ma in 2013, China's Internet Plus action plan focuses on upgrading established industries through enhanced integration with the Internet, and therefore complements CM2025.⁴³ As Premier Li stated during his 2015 Government Work Report, the Internet Plus action plan would be developed to "integrate mobile Internet, cloud computing, big data, and the Internet of Things with modern manufacturing."⁴⁴ However, in terms of the number of sub- and sector-specific plans, and the amount of funding attached to it, CM2025 remains the primary focus of the Chinese Government's approach to upgrading its manufacturing industry.

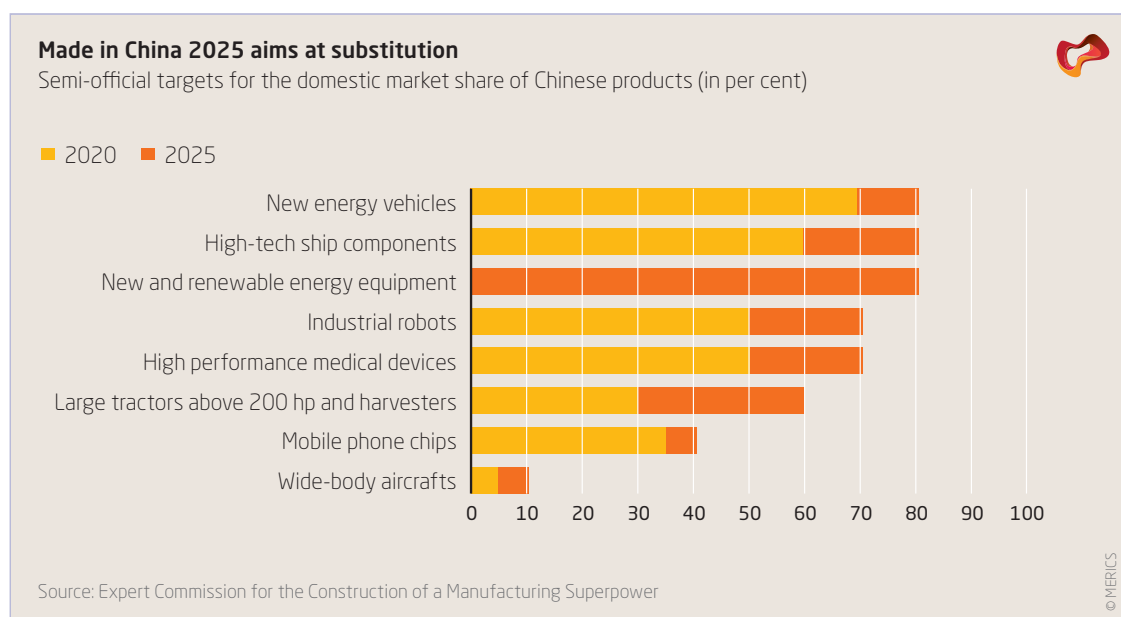
⁴³ *Guidance Opinion on Actively Promoting the "Internet+" Initiative*, State Council, 4th July, 2015, viewed 9th January, 2017, <http://www.gov.cn/zhengce/content/2015-07/04/content_10002.htm>

⁴⁴ Government Work Report, The State Council, www.gov.cn, 16th March, 2015, viewed 9th January, 2017, <http://www.gov.cn/guowuyuan/2015-03/16/content_2835023.htm>

4.2 Market share targets and 'indigenous innovation'

The State Council's original notification of CM2025 included market share targets to "realise guarantees of self-sufficiency" (实现自主保障) for sourcing 40 and 70 per cent of both core components and key basic materials by 2020 and 2025 respectively.⁴⁵ In line with President Xi's comments at the 2014 joint meeting with the CAS and the CAE, a ministerial-level government think tank, the State Council's notification of the initiative targets a "clear decline in China's dependence on foreign technologies" by 2025. Similarly, the 'interpretation' document for implementing CM2025 in the NEV industry that the MIIT published on its website included additional market share targets for indigenous electric vehicles and plug-in hybrid electric vehicles (PHEVs) to have more than 70 per cent domestic market share in 2020, and for NEVs to enjoy more than 80 per cent domestic market share by 2025.⁴⁶ The setting of these targets contradicts the statement found in the State Council's original announcement of CM2025 that the market would play the decisive role in allocating resources.

This attempt to actively steer the direction of the economy's development developed further with the formation of the Strategic Consulting Committee for the Establishment of a Strong Manufacturing Country, which oversaw the production of the *China Manufacturing 2025 Key Area Technology Roadmap (CM2025 Roadmap)* that was publicly released in October 2015.⁴⁷ This document was compiled by 48 academics and more than 400 technical specialists and representatives from industry under the guidance of the CAE. It includes hundreds of market share targets for 2020 and 2025, both domestic and international, as well as technologies and products to be developed in all ten industries covered by the initiative.⁴⁸ Clearly this is no mere domestic exercise: it has direct ramifications for European business, both in their home and third-party markets.



45 Notification on the Printing and Distribution of *Made in China 2025*, State Council, 8th May, 2015, viewed 7th December, 2016, <http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm>

46 Interpretation of 'Made in China 2025': Promoting the Development of Clean and New Energy Vehicles, www.gov.cn, 12th May, 2016, viewed 7th December, 2016 <http://www.gov.cn/zhuanti/2016-05/12/content_5072762.htm>

47 *China Manufacturing 2025 Key Area Technology Roadmap*, China Academy of Engineering, October 2015, viewed 9th September, 2016, <<http://www.cae.cn/cae/html/files/2015-10/29/20151029105822561730637.pdf>>

48 Ibid. For a summary of key points and market share targets, see: *U.S. Chamber of Commerce Analysis of Made in China Major Technical Area Roadmap*, US Chamber of Commerce, December 2015.



It is unclear whether market share will ultimately be measured by volume of products sold, the percentage of value added that Chinese components in the products account for, percentage of Chinese-owned intellectual property (IP), or some combination of these considerations.

The *CM2025 Roadmap* also includes numerous mentions of ‘indigenous innovation’ (自主创新) and ‘self-sufficiency’ (自主保障, 自给 and 自给率). As previously mentioned, while the exact meaning of ‘indigenous’ in the context of CM2025 is not clear, in the past—with the 2010 *Medium- and Long-term Plan for the Development of Science and Technology, 2006-2020 (MLP)* and the strategic emerging industries (SEIs)⁴⁹ initiative that emerged from it—it was found to only refer to technology and products developed in China with the MLP defining it as “enhancing original innovation through co-innovation and re-innovation based on the assimilation of imported technologies”.⁵⁰ For example, for energy-saving vehicles the *CM2025 Roadmap* states that by 2025, in terms of sales, China should have three of the top five companies with the reputation of ‘indigenous’ products surpassing that of JVs. For NEVs, it states that two of the top ten international brands should be ‘indigenous’. This explicitly indicates that Sino-foreign JVs in China in which European businesses have made significant investments will not qualify. Significantly, in September 2015, the state-run newspaper *China Daily* reported that the strategic advisory committee, led by Vice Premier Ma Kai, endorsed development approaches included in the *CM2025 Roadmap* for the NEV industry.⁵¹

These pronouncements are completely at odds with the both the 2013 *Decision* of the Third Plenum and the State Council’s original CM2025 announcement on the market playing the decisive role in allocating resources. Similarly, the focus on market share targets and ‘indigenous innovation’ directly contradicts the commitment made in the 13FYP to “comprehensively promote bilateral opening, encourage orderly international mobility in the country, the efficient allocation of resources, deep integration of markets and accelerate the nurturing of new advantages in international competition”.⁵²

What also remains unclear is how CM2025 can be reconciled with China’s plans to liberalise its investment regimes as indicated in both President Xi’s Davos speech and the State Council’s notice dated 17th January, 2017.⁵³

These contradictions indicate that CM2025 is in fact a large-scale import substitution plan aimed at nationalising key industries, or at least severely curtailing the position of foreign business in them, both as suppliers of key components and finished products.

4.3 Planning the Chinese economy’s future

During a dialogue that the European Chamber held with the MIIT in early 2016, the *CM2025 Roadmap* was presented as the Chinese Government’s plan for the manufacturing industry. However, during a subsequent meeting that the European Chamber participated in with senior officials from the MIIT on 27th October, 2016, questions about the significance of publicly-stated market share targets were downplayed – the *CM2025 Roadmap* was dismissed as merely representing the views of academics with no real influence on policymaking.

The European Chamber finds this response to be highly questionable for the following three reasons: first, there

49 *Decision on Accelerate and Develop Strategic Emerging Industries*, State Council, 18th October, 2010, viewed 9th January, 2017, http://www.gov.cn/zwqk/2010-10/18/content_1724848.htm; *Strategic Emerging Industries Likely to Contribute 8% of GDP by 2015*, *People’s Daily*, 19th October, 2010, viewed 6th December, 2016, <http://en.people.cn/90001/90778/90862/7170816.html>

50 *The National Medium- and Long-Term Plan for the Development of Science and Technology, 2006-2020*, State Council, 26th February, 2006, viewed 22nd December, 2016, http://www.most.gov.cn/mostinfo/xinxi/fenlei/gjkgjh/200811/t20081129_65774.htm

51 Hao, Yan, *New-Energy Vehicles to Get Renewed Push*, *China Daily*, 30th September, 2015, viewed 15th December, 2016, http://www.chinadaily.com.cn/business/motoring/2015-09/30/content_22017079.htm

52 *The 13th Five-Year Plan for Economic and Social Development of the People’s Republic of China*, www.gov.cn, 17th March, 2016, viewed 17th January, 2017, http://www.gov.cn/xinwen/2016-03/17/content_5054992.htm

53 *Notice of the State Council on Several Measures on Promoting Further Openness and Active Utilisation of Foreign Investment*, The State Council, 17th January, 2017, viewed 21st January, 2017, http://www.gov.cn/zhengce/content/2017-01/17/content_5160624.htm

is a clear alignment between the market share targets listed in the initial State Council notification for CM2025, the 'guidelines' listed on the MIIT's website and those in the *CM2025 Roadmap*; second, the CAE is a think tank that holds ministerial-level status; and third, the CAE's 2013 Strategic Research on Manufacturing Powers project reportedly provided part of the basis of CM2025.⁵⁴ This would suggest that the *CM2025 Roadmap* is, at the very least, a semi-official document. As a side note, it is also worth mentioning that industry-specific five-year plans have already been released, which make explicit reference to the implementation of CM2025.

Regardless, the priorities and targets that the *CM2025 Roadmap* outlines will have sent a strong message to provincial and local governments, SOEs and private Chinese companies regarding the central government's priorities. This will have given them a clear idea of where subsidies, other forms of support, and therefore near-term opportunities for profit, can be expected to flow.

4.4 Macro-level planning: the new thinking

In tandem with CM2025's overarching drive to comprehensively upgrade China's entire manufacturing sector by focusing on whole industrial value chains, detailed sub-plans and action guidelines were released in the summer and autumn of 2016.⁵⁵ They present opportunities for a diverse range of stakeholders to work together on research and other projects of relevance to industrial development. For example, the plan to establish Manufacturing Industry Innovation Centres. It is envisioned that these centres will focus on basic research and key technologies of relevance to multiple industries that will ultimately lead to outcomes that can be practically applied, as opposed to academic projects that cannot be monetised. As illustrated in the chart on page 9, detailing the organisational structure of roles and responsibilities for CM2025, there has also been a concerted effort to improve coordination among relevant government agencies for implementation of the initiative.

The CM2025 initiative's focus on upgrading the country's industrial base can also be understood as a top-down attempt by the Chinese Government to redirect the mindset and priorities of domestic companies toward a stronger focus on quality, efficiency, sustainability and capacity for both R&D and innovation. This is reflected in the targets included in the initiative for innovation, quality, digitisation of manufacturing and 'green development' which were outlined in 'Industrial Policy for Technological Progress: the main targets of China Manufacturing 2025' on page 10.

While this does not mean that Chinese companies necessarily share the same thinking and priorities as the government, this attempt at refocussing Chinese companies does at least reflect a more sophisticated and holistic approach than the *MLP* or the SEIs, which were more narrowly focused on acquiring and developing advanced technologies in targeted industries, with far less consideration for the broader ecosystem in which industries develop.⁵⁶

4.5 Who's in charge, masters or markets?

The State Council's original notification on CM2025 echoes the Third Plenum's *Decision* by stating that the decisiveness of the market should be fully utilised in allocating resources. Elsewhere it states that the mechanism through which the market establishes prices should be "perfected". It also includes language on addressing industrial overcapacity; promoting the development of SMEs, including through improved capital-raising channels; deepening SOE reform; establishing conditions for fair competition in the market; establishing

54 Zhou, Ji and Zhu Gaofeng, eds., *Research on the Manufacturing Power Strategy: Smart Manufacturing Volume*, Electronic Industry Publishers, Beijing, 2015, p. 6; *Strategic Vision and Outlook of Made in China 2025 (Part 1)*, Mizuho China Monthly, Mizuho Bank, July 2015, viewed 23rd November, 2016, <<https://www.mizuho.bank.com/service/global/cndb/economics/monthly/pdf/R512-0070-XF-0105.pdf>>

55 These are: Manufacturing Industry Innovation Centres; Strengthening the Industrial Base Project; Intelligent Manufacturing Project; Green Manufacturing Project; and High-end Equipment Project. *China Manufacturing 2025 Sub-plan Guidelines*, MIIT, 19th August, 216, viewed 12th October, 2016, <<http://www.miit.gov.cn/n1146290/n4388791/c5215611/content.html>>; As of 17th January, 2017, additional development guidelines for new materials, information technology industries, the pharmaceutical industry and manufacturing talent were still forthcoming.

56 McGregor, James, *China's Drive for 'Indigenous Innovation': A Web of Industrial Policies*, US Chamber of Commerce and APCO Worldwide, 2010, viewed 10th September, 2016, <https://www.uschamber.com/sites/default/files/legacy/reports/100728chinaireport_0.pdf>



improved IPR protection; and improving vocational education.⁵⁷ All of these aspirations have the potential to contribute to the development of China's manufacturing industry and its innovation environment more broadly. Their inclusion indicates that there are reformers within the Chinese Government who recognise that realising them will be crucial if China is to avoid the middle-income trap.

The battle of the Beijing University academics

There are significant differences of opinion within China regarding the country's reliance on industrial policy to drive economic development in some areas. In autumn 2016, two Western-trained economists from Beijing University, Zhang Weiying and Justin Lin Yinfu, engaged in an ongoing and high-profile debate regarding the value of industrial policy.

Professor Lin, a former World Bank Chief Economist, believes that for developing countries government-led industrial policy is necessary in order for them to catch up with more advanced economies. He says that he is unaware of any developing country having caught up with developed countries without utilising industrial policy, or of any developed country maintaining its leading position without having made the most of it.⁵⁸ As markets include inherent failures, he says, the government should play a role in fostering national development. Appropriate policies should therefore be used to guide the market through industrial policy with government giving more support to the industries that make the largest contributions to economic growth. He attributes past failures by developing and developed countries alike to poor government decisions.

By contrast, Professor Zhang has argued that "industry policy is the new look of Soviet-style planning economy", and that government intervention in the market brings nothing but industrial overcapacity and distortions. Treating some industries more favourably than others in terms of taxes, subsidies, credit, financing, land use and export licences also creates room for rent-seeking behaviour, or corruption, he argues. Furthermore, due to its own vested interests and biases, the state is not well equipped to "pick winners", with past failures in the NEV, solar and automotive industries pointed to as evidence. It should therefore be left to companies to determine their comparative advantage, he says, not the government.

4.6 Old wine in new bottles? Yes and no

While it in no way downgrades its importance, it should be recognised that in many ways CM2025 does not represent a fundamentally new approach to how the Chinese Government attempts to plan and steer the development of its economy.

The *MLP* and the SEIs that sprang from it also set out goals for developing high-technology industries through to 2020. For example, the *MLP* identifies 11 key sectors that should employ technology development to solve China's innovation problems and calls for China's overall reliance on foreign technology to decline from 60 per cent in 2006 down to 30 per cent by 2020, with domestically-produced products given preferable treatment in major government projects with the aim of supporting 'indigenous innovation'.⁶¹ Six of the seven industries that were originally ear-marked as SEIs reappear in CM2025 in one form or another.⁶² As with CM2025, the SEI initiative involved central and local governments establishing special subsidies and tax rebates to support R&D

⁵⁷ Notification on the Printing and Distribution of *Made in China 2025*, State Council, 8th May, 2015, viewed 7th December, 2016, <http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm>

⁵⁸ Tang, Frank, *To Embrace Market or State: Chinese Economists Debate the Country's Future*, *South China Morning Post*, 12th November, 2016, viewed 12th November, 2016, <<http://www.scmp.com/news/china/economy/article/2045438/embrace-market-or-state-chinese-economists-debate-countrys-future?spm=0.0.0.0.gOZ2MB>>; Yin, Xi, Xu Hao and Chen Weibin, *Lin Yifu vs Zhang Weiying: The Debate of the Century on Industrial Policy*, *China.com.cn*, 15th November, 2016, viewed 17th November, 2016, <http://www.china.com.cn/cppcc/2016-11/15/content_39705608.htm>

⁵⁹ Yin, Xi, Xu Hao and Chen Weibin, *Lin Yifu vs Zhang Weiying: The Debate of the Century on Industrial Policy*, *China.com.cn*, 15th November, 2016, viewed 17th November, 2016, <http://www.china.com.cn/cppcc/2016-11/15/content_39705608.htm>

⁶⁰ Tang, Frank, *To Embrace Market or State: Chinese Economists Debate the Country's Future*, *South China Morning Post*, 12th November, 2016, viewed 12th November, 2016, <<http://www.scmp.com/news/china/economy/article/2045438/embrace-market-or-state-chinese-economists-debate-countrys-future?spm=0.0.0.0.gOZ2MB>>

⁶¹ McGregor, James, *China's Drive for 'Indigenous Innovation': A Web of Industrial Policies*, US Chamber of Commerce and APCO Worldwide, 2010, viewed 10th September, 2016, pp. 14-15. <https://www.uschamber.com/sites/default/files/legacy/reports/100728chinaareport_0.pdf>

⁶² These are: next generation IT, biotechnology, high-end equipment manufacturing (which covers aviation and aerospace, rail and maritime engineering & equipment), new energy, new materials and NEVs.

in these industries. In spite of statements that foreign business would receive equal treatment from the NDRC,⁶³ in many instances these sources of support were inaccessible to European companies. Many of the industry-specific plans that came out of the 12th Five-Year Plan (12FYP) 2011–2015 also set out goals for developing industries covered by CM2025.

In some industries CM2025 also gathers together initiatives that were already underway as a result of previously released plans. For example, in the field of semiconductors the *National Integrated Circuit Industry Guidelines*, which were released in July 2014, are seen by industry as the most authoritative expression of the government's priorities – the content in CM2025 documents largely reiterates them, providing additional guidelines for their implementation.

The CM2025 initiative is therefore a continuation of decades of industrial policy instead, albeit with more government funding than previous initiatives and correspondingly higher aspirations for moving up industrial value chains. Put simply, at a macro level CM2025 represents a far more holistic and sophisticated approach to developing China's manufacturing base, while at the industry level it continues to make use of many policy tools that discriminate against foreign business in the Chinese market, thereby limiting their ability to contribute to the country's innovation ecosystem.

4.7 Industry-level planning: the old wine

When the focus is shifted to the 10 industries that CM2025 has identified as priorities for support and development, far more continuity with the authorities' past approaches to industry development can be found. The Director of the MIIT's Department of Planning has stated that while government will lead the plan it will leave implementation primarily to the market by protecting equal access and competition.⁶⁴ Unfortunately, the longstanding inclination among some government authorities and ministries to use central planning instead of market forces to drive the development of industries remains.

Many of the tools that were utilised in pursuit of the *MLP* and the establishment of the SEIs⁶⁵ are also being used to diminish the ability of European business to participate in the CM2025 initiative as a full and equal partner. For example, a longstanding feature of China's industrial policy is that foreign companies are often pushed to transfer technology as the price of market entry, which is in contravention of its commitments as a member of the World Trade Organisation (WTO). This situation is exacerbated by the fact that the Chinese authorities' ultimate aim is to absorb these technologies – to put it another way, as domestic companies begin to catch up technologically, market access for foreign companies will become increasingly difficult.

5. Policy tools used in support of CM2025

The 10 key policy tools that China's central and local governments are using in their pursuit of goals related to CM2025 are as follows:

1. Forced technology transfers in exchange for market access
2. Market access and government procurement restrictions for FIEs
3. Standards
4. Subsidies
5. Financial policy

63 Record of Discussion with the Deputy Director General of the NDRC on the Breeding and Development of Strategic Emerging Industries, Sina, 23rd July, 2013, viewed 6th December, 2016, <<http://finance.sina.com.cn/china/bwdt/20120723/111712642390.shtml>>

64 Wang, Liwei, *Gov't Announces Plan to Upgrade Factories over Next Decade*, Caixin, 20th May, 2015, viewed 8th July, 2016, <<http://english.caixin.com/2015-05-20/100810876.html>>

65 These include: subsidies; a focus on developing domestic intellectual property; 'indigenous innovation'; a strong role for SOEs; and, in a number of notable instances, the establishment of domestic industry standards; McGregor, James, *China's Drive for 'Indigenous Innovation': A Web of Industrial Policies*, US Chamber of Commerce and APCO Worldwide, 2010, viewed 10th September, 2016, <https://www.uschamber.com/sites/default/files/legacy/reports/100728chinaireport_0.pdf>



6. Government-backed investment funds
7. Support from local government
8. Technology-seeking investments abroad
9. SOEs: mergers and politicisation
10. Public-private partnerships

The first three have a direct impact on European business with the remaining seven having a more indirect, yet still highly significant, impact. Not all of these policy tools are necessarily relevant to all ten of the initiative's priority industries. However, taken together they demonstrate a consistent approach to industrial development driven by political masters, not markets. In this respect CM2025 represents a considerable step back from the Third Plenum's 2013 commitments to make the market the decisive force in China's economy.

Below is an overview of these policy tools, more detail can be found in the Appendix on page 58.⁶⁶

5.1 Forced technology transfers in exchange for market access

Forced technology transfer in exchange for market access in China is nothing new to FIEs. However, it is now an increasing requirement for more advanced technologies to be shared. In the past, some foreign companies managed to at least partially limit transfers to technology that was not on the leading edge, and therefore did not compromise their long-term competitiveness. But this has become increasingly difficult with some Chinese firms having moved up the value chain to compete directly with their foreign counterparts.

5.2 Market access and government procurement restrictions for foreign-invested enterprises (FIEs)

China is not a party to the plurilateral Agreement on Government Procurement (GPA) under the WTO, and its public procurement market remains largely closed to foreign suppliers. For some of the industries included in CM2025, government procurement has been observed to favour domestic producers. Information technology is arguably the clearest example. Other industries where this has been observed include rail equipment, new energy buses, medical devices and biopharmaceuticals. The section on medical devices on page 47 provides multiple examples.

5.3 Standards

In important areas like the development of 5G technology for the telecommunication industry, Chinese government ministries and companies have moved aggressively to participate in the development of international standards to ensure that Chinese-developed technology is included in them. Achieving this would serve to reduce the licensing fees that Chinese companies would have to pay to use foreign technologies in industries covered by CM2025.

However, MERICS has found that while there is a 70 per cent correlation between Chinese and international standards for basic smart manufacturing standards, for key smart manufacturing technology standards the correlation is only slightly over fifty per cent.⁶⁷ Furthermore, for selected key smart manufacturing technology standards that relate to data security—cloud computing, industrial software and big data—there is no alignment between international and Chinese standards.

5.4 Subsidies

In some industries covered by CM2025—and robotics and NEVs in particular—central and local governments provide direct and/or indirect support to favoured companies in priority industries. For example, loans from state-owned banks on non-commercial terms or a decision taken by local governments not to enforce environmental

⁶⁶ In addition to a short evaluation of each policy tool, the Appendix also provides additional background information on government-backed investment funds and SOEs.

⁶⁷ Wübbcke, Jost et al., *Made in China 2025: The Making of a High-Tech Superpower and Implications for Industrial Countries*, MERICS, December 2016, no. 2, p. 57, <<https://www.merics.org/en/merics-analysis/papers-on-china/made-in-china-2025/>>

standards both amount to subsidies. Government may also help to reduce the cost of companies' products by covering a percentage of their price or even the cost of installation for customers. As with policy tools two, five, six and seven, subsidies are an effective way of achieving the market share targets included in CM2025-related documents.

While the situation varies across industries and regions in China, in many cases this support is only made available to companies in which foreigners hold no equity or to companies that make purchases from domestic firms.

5.5 Financial policy

Announcements have been made that financial policy will be used to support the CM2025 priority industries. For example, *Several Opinions Regarding Finance to Support Stable Growth of Industry, Restructuring and Improving Profit*, issued by eight ministries in February 2016, calls for the financial industry to provide full-scale support to CM2025 by introducing financial regulations to contribute to building up China as a manufacturing power.⁶⁸

Similarly, the *Action Plan to Improve Information Sharing and Promoting Industry and Finance Cooperation*, jointly issued by the MIIT, the PBOC and the China Banking Regulatory Commission (CBRC) in March 2016, calls for the banking industry to support key enterprises and projects to boost CM2025.⁶⁹

5.6 Government-backed investment funds

Beyond the provision of subsidies, the central and local governments have established a large number of well-capitalised investment funds to support priorities outlined in CM2025, the SEIs and other major initiatives highlighted in the 13FYP. In some cases they focus on specific industries and in others on industrial upgrading more broadly. By the end of 2015, there were reportedly already 780 state-investment funds established with EUR 294 billion of capital, with 300 of them established in 2015 with EUR 202 billion of funds to invest.⁷⁰

Examples of general funds that were subsequently established in 2016 include the National New Venture Capital Fund for Emerging Industries, which Vice Chairman Lin Nianxiu of the NDRC stated would be established with EUR 5.5 billion of capital,⁷¹ and the National Advanced Manufacturing Industry Investment Fund that was set up in June 2016, which controls EUR 2.7 billion for investments in all industries covered by CM2025.⁷² Approved by the State Council and numerous other government bodies, the Advanced Manufacturing Industry Investment Fund was jointly established by the State Development Investment Corporation, CCI Capital and ICBC Credit Suisse, and includes contributions from the central government.⁷³

China Reform Holdings, a central government-owned state asset investment vehicle, has also set up a EUR 13.7 billion fund that specifically targets innovative SOEs in advanced manufacturing sectors like robotics, deep-sea engineering equipment and new materials.⁷⁴

Underlining the level of coordination going into many of these funds between different sections of the government,

68 *Several Opinions Regarding Finance to Support Stable Growth of Industry, Restructuring and Improving Profit*, The State Council Information Office, www.scio.gov.cn, 24th February, 2014, viewed 9th January, 2017, <<http://www.scio.gov.cn/xwfbh/xwfbh/yg/2/Document/1469592/1469592.htm>>

69 *Action Plan to Improve Information Sharing and Promoting Industry and Finance Cooperation*, MIIT, 3rd March, 2016, viewed 9th January, 2017, <<http://www.miit.gov.cn/n1146290/n4388791/c4655349/content.html>>

70 *Two Trillion Yuan in Guided Funds Ready to Go*, Xinhua, 7th April, 2016, viewed 24th September, 2016, <http://www.bj.xinhuanet.com/hbpd/jrpd/jrpd/2016-04/07/c_1118555182.htm>

71 *National Entrepreneurial Guidance Fund Start Functioning*, finance.ifeng.com, 26th August, 2016, viewed 17th January, 2017, <http://finance.ifeng.com/a/20160826/14813829_0.shtml>

72 *China Sets Up Advanced Manufacturing Industry Investment Fund*, finance.ifeng.com, 15th July, 2016, viewed 17th January, 2017, <http://finance.ifeng.com/a/20160715/14601620_0.shtml>

73 *China Has Established an Investment Fund for Advanced Manufacturing*, Caijing, 15th July, 2016, viewed 19th October, 2016, <http://www.mof.gov.cn/zhengwuxinxi/caizhengxinwen/201607/t20160715_2358336.htm> This article was also posted on the Ministry of Finance's website.

74 *Are SOEs Repaying Debt, Reducing Headcount and Revamping Businesses? Evidence from the Field*, UBS, 10th October, 2016, p. 8.



in November 2016, the MIIT and the China Development Bank (CDB) signed a strategic cooperation agreement for jointly implementing CM2025-related initiatives.⁷⁵ It was stated that the MIIT will provide the guidance policies while the CDB will provide no less than EUR 41 billion of financing support for significant projects and programmes during the 13FYP period.

5.7 Support from local government

Through a desire to support the development of their own local champions, local governments also provide subsidies, use government procurement strategically and establish their own investment funds or participate in sub-funds that are attached to national funds. It has been found that 24 provinces plus Beijing, Chongqing, Shanghai and Tianjin have either published or announced their own CM2025-related plans.⁷⁶

For example, Beijing Municipality's plan lists NEVs and smart vehicles, semiconductors, smart manufacturing systems and services, cloud computing and big data, new mobile internet technology, new healthcare technology and services as well as aviation and space technology as priority areas.⁷⁷ Sometimes local companies receiving this support will also be protected from competition from companies based in other regions of China.

This local government support is sometimes misguided and lacking in coordination. For example Jiangsu Province's *China Manufacturing 2025 Action Plan* lacks clarity and seems to "simply parrot national strategy rather than developing a clear and locally-relevant set of policies."⁷⁸

The scale of support available from subnational funds and subsidies is significant. For example, the total amount of funding available from local governments for the robotics industry surpasses that available from the central government with 40 industrial parks for the industry either having been established or announced.⁷⁹

5.8 Technology-seeking investments abroad

Over the course of 2015 and 2016, an unprecedented wave of outbound investments into firms in Europe and elsewhere in industries of relevance to CM2025 have either been successfully completed or attempted.⁸⁰ Significantly, many of these investments have been in areas where European business is unable to make equivalent investments in China,⁸¹ and have also enabled Chinese firms to access technology, brands and management expertise that they would not otherwise have been able to acquire. In some industries, such as semiconductors, attempted and completed investments have spanned entire industrial supply chains.⁸²

In July 2016, the State Council announced that state-owned capital investments should be strengthened in vital

75 *China Development Bank Will Provide No Less Than 300 Billion RMB Financing Support for China Manufacturing 2025 during the Period of 13th Five-year Plan*, *Sina Finance*, 11th November, 2016, viewed 13th November, 2016, <<http://finance.sina.com.cn/roll/2016-11-11/doc-iffxsmif2726858.shtml>>

76 *25 Provinces Districts and Cities, the MIC2025 Policy Has Been Implemented, the New 3 Lines is Going to Shape up*, *www.people.cn*, 18th August, 2016, viewed 7th January, 2017, <<http://finance.people.com.cn/n1/2016/0818/c1004-28644798.html>> Plans for Inner Mongolia and Tibet were not identified.

77 Beijing Municipality's Made in China Action Plan, *www.beijing.gov.cn*, 9th December, 2015, viewed 9th January, 2017, <<http://zhengwu.beijing.gov.cn/gzdt/gggs/t1413602.htm>>

78 *Nanjing Position Paper 2016/2017*, The European Union Chamber of Commerce in China, February 2017, p. 3. Please note, at the time of writing the *Nanjing Position Paper* had not been launched. For an online resource, please contact the European Chamber.

79 Wubbeke, Jost et al., *Made in China 2025: The Making of a High-Tech Superpower and Implications for Industrial Countries*, MERICS, December 2016, no. 2, p. 24, <<https://www.merics.org/en/merics-analysis/papers-on-china/made-in-china-2025/>>

80 *A New Record Year for Chinese Outbound Investment in Europe*, Merics and Rhodium Group, February 2016, viewed 28th June, 2016, <http://www.merics.org/fileadmin/user_upload/downloads/COFDI_2016/A_New_Record_Year_for_Chinese_Outbound_Investment_in_Europe.pdf>; Hanemann, Thilo and Mikko Huotari, *Record Flows and Growing Imbalances: Chinese Investment in Europe in 2016*, MERICS and Rhodium Group, 10th January 2017, no. 3, p. 5, <<http://rhg.com/reports/record-flows-and-growing-imbalances-chinese-investment-in-europe-in-2016>> SOEs are defined as companies that are at least 20 per cent owned by the government, sovereign entities and central SOEs.

81 *European Business in China 2016/2017—Executive Position Paper*, The European Union Chamber of Commerce in China, pp. 25-28, <http://www.europeanchamber.com.cn/en/publications-archive/459/Executive_Position_Paper_2016_2017>

82 *Chinese Investment in the United States*, Rhodium Group, November 2016, pp. 77-80, <http://origin.www.uscc.gov/sites/default/files/Research/Chinese_Investment_in_the_United_States_Rhodium.pdf>

and major fields, such as forward-looking industries.⁸³ It went on to state that “SOEs should be encouraged to carry out acquisitions and mergers with a focus on developing strategies and a goal for attaining key technologies and core resources.” This raises a valid question: *does CM2025 in part amount to a shopping list of technologies that the country has not been able to develop at home?* While it is perfectly standard for private business to make strategic acquisitions, their decisions should ultimately be informed by the profit motive. Investments made by firms in response to their government’s industrial policies or strategic interests may be completely at odds with the interests of the country into which the investment is made.

5.9 SOEs: mergers and politicisation

Mergers

In addition to leading a significant number of outbound investments, as a result of a series of mergers in 2015 and 2016, ‘super SOEs’ in industries like nuclear, rail, shipping, materials and grains have emerged.⁸⁴ The State Council stated their intention to regroup a number of parent SOEs into 80 pro-innovation and internationally-competitive ‘national enterprises’.⁸⁵ This trend has brought the number of central-level SOEs that are controlled by the State-owned Assets Supervision and Administration Committee (SASAC) down from 117 in early 2014, to 102 in January 2017, with this figure reportedly set to decline further.⁸⁶ This does not mean that the size of these firms has been shrinking along with their numbers. On the contrary, in August 2016, the State Council noted that while the number of SOEs controlled by the SASAC dropped from 196 in 2003 down to 105 at that time, during the same period their total assets increased sevenfold.⁸⁷ Evidently size still matters in China.

Instead of moving forward with market-based reforms, new SOEs and major new subsidiaries of existing ones are also being established in industries that are covered by CM2025.⁸⁸ The most notable aspect of CM2025-related mergers is that they strengthen the ability of SOEs to win business in international markets by reducing the need for them to compete with each other abroad. Responding to fears that competition between SOEs would be reduced overall, the State Council stated that “competition should be kept among central SOEs which mainly focus on the domestic market, as simply regrouping them will create domestic monopolies and push up prices.”⁸⁹ No such concerns appear to exist regarding their place in international markets.

Politicisation

In 2016, these mergers took place in an environment in which the management of SOEs was being further politicised. This was highlighted by a major article in the Chinese Communist Party journal *Seeking Truth* on 31st May, 2016, which called for strengthening party-building work in the state-owned sector. This was to be done, it said, by enhancing the role of the party committees that are embedded in SOEs.⁹⁰ One method put forward to

- 83 *Major Tasks Set for Promoting SOE Restructure*, State Council, 27th July, 2016, viewed 12th December, 2016, <http://english.gov.cn/policies/policy_watch/2016/07/27/content_281475402813390.htm>
- 84 *China Approves Shipping Giants’ Merger*, *Xinhua*, 11th December, 2015, viewed 23rd December, 2016, <http://news.xinhuanet.com/english/2015-12/11/c_134907868.htm>; *China Nuclear Power Firms Merge to Fuel Global Clout*, *Reuters*, 30th May, 2015, viewed 23rd December, 2016, <<http://www.reuters.com/article/us-china-nuclear-m-a-idUSKBN0OF06W20150530>>; Zhong, Nan, *Two Railway Giants Announce Merger*, *China Daily*, 31st December, 2014, viewed 23rd December, 2016, <http://www.chinadaily.com.cn/business/2014-12/31/content_19206058.htm>; *China Plans New Wave of State Firm Consolidation*, *China Daily*, 3rd December, 2015, viewed 23rd December, 2016, <http://www.chinadaily.com.cn/business/2015-03/12/content_19789485.htm>
- 85 *China to Further Regroup Central State-owned Enterprises*, State Council, 23rd August, 2016, viewed 12th December, 2016, <http://english.gov.cn/policies/policy_watch/2016/08/23/content_281475423704259.htm>
- 86 *The Number of SOEs Will Soon be in the Double-digits and is Currently Decreasing to 102*, *finance.ifeng.com*, 20th December, 2016, viewed on 9th January, 2017, <http://finance.ifeng.com/a/20161220/15089133_0.shtml>; *The Merger and Acquisition of SOEs, It is Not as Simple as Just a Reduction of Numbers*, *www.news.cn*, 18th January, 2017, viewed 23rd January, 2017, <http://news.xinhuanet.com/finance/2017-01/18/c_1120338997.htm>
- 87 *China to Further Regroup Central State-owned Enterprises*, State Council, updated 23rd August 2016, viewed 12th December, 2016, <http://english.gov.cn/policies/policy_watch/2016/08/23/content_281475423704259.htm>
- 88 *Chinese Defense Company Aircraft Engine Corp of China Incorporated in Beijing With 50 Billion in Registered Capital*, *People’s Daily*, 13th June, 2016, viewed 23rd December, 2016, <<http://en.people.cn/n3/2016/0613/c90000-9071242.html>>; *Rui Xiaowu Met with Mu Degui, the Vice-governor of Guizhou Province, and Jointly Inaugurate ‘Great Wall on Cloud Technology Co., Ltd’*, *China Electronics Corporation*, 28th May, 2016, viewed 23rd December, 2016, <<http://www.cec.com.cn/News-Center/Corporation/18102.aspx>>
- 89 *China to Further Regroup Central State-owned Enterprises*, State Council, 23rd August, 2016, viewed 12th December, 2016, <http://english.gov.cn/policies/policy_watch/2016/08/23/content_281475423704259.htm>
- 90 *State-owned Assets Supervision and Administration Commission, Strengthening Party Building Work in Deepening the Reform of State-Owned Enterprises*, *Seeking Truth*, 31st May, 2016, viewed 23rd December, 2016, <http://www.qstheory.cn/dukan/qs/2016-05/31/c_1118938354.htm>



accomplish this was to require that key decisions be reviewed and approved by the company's Party Committee before they go to the SOE's board for review. It also posited that senior members of the Party Committee and the SOEs' management should be rotated on an ongoing basis in order to form a stronger connection between the two sides. Political interference in core business functions like investment decisions may therefore be increasing in industries covered by CM2025.⁹¹

5.10 Public-private partnerships (PPPs)

Public-private partnerships (PPPs) have been put forward as an important channel for attracting private investment into a wide range of projects initiated by government in areas like infrastructure and public services. They were promoted by Premier Li Keqiang throughout 2016, and have also been presented as a significant model for funding projects to support CM2025 in the State Council's announcement of the initiative.⁹²

Unfortunately, to date, limited progress has been made in establishing a clear legal environment, with the PPP Law still not in place at the end of 2016. The MOF and the NDRC also continue to compete for a leadership position on PPPs and utilise different standards in their respective reviews of projects. This challenge is exacerbated by the fact that many provincial and local governments' departments lack the capacity to administer PPPs over the 10 to 40 year timespan that they often last for.

In China, PPPs are still not attractive to private enterprises: companies have doubts over their prospects of joining projects, and are uncertain about the legal, regulatory and political environment.⁹³ Regulatory and political risk will persist while the possibility remains that potential government intervention might affect the contractual agreement entered into between public and private entities.⁹⁴

6. Inbound and outbound investment

6.1 Highly unbalanced bilateral investment relations in 2016

It has been reported in Chinese government-run media outlets that European investment in China grew at a rate of 43.9 per cent in 2016.⁹⁵ As this includes announced deals that have not yet moved forward, some of which may not ultimately reach fruition, this is highly misleading. The number of European investments in China that were actually completed was far less encouraging.

European investment in China declined to EUR 8 billion in 2016 from over EUR 10 billion in 2015.⁹⁶ This amounts to a drop of 23 per cent. While compounded by concerns related to industrial overcapacity and a less favourable outlook for China's economy, this is largely attributable to the restrictions European business continues to face in the Chinese market. This was highlighted in the European Chamber's *European Business in China—Business Confidence Survey 2016*, in which 55 per cent of respondents reported that they would be more likely to increase investment if greater market access were to be granted in their industry.⁹⁷ Going forward, the domestic market

91 Xi Boosts Party Say in China's \$18 Trillion State Company Sector, Bloomberg, 8th July, 2016, viewed 23rd December, 2016, <<http://www.bloomberg.com/news/articles/2016-07-07/xi-boosts-party-say-in-china-s-18-trillion-state-company-sector>>

92 Premier Li Keqiang Promotes Public Private Partnerships Model: Utilize Fully the Capital Leverage, Hedging the Downward Pressure of the Economy, State Council, 14th May, 2015, viewed 10th January, 2017, <http://www.gov.cn/zhengce/2015-05/14/content_2861796.htm>

93 A Sponge Wrung Dry, *The Economist*, 17th September, 2016, viewed 10th January, 2017, <<http://www.economist.com/news/finance-and-economics/21707192-chinas-private-investors-keep-their-hands-their-pockets-sponge-wrung-dry>>

94 Thieriot, Hubert, and Carlos Dominguez, "Public-Private Partnerships in China", Discussion Paper, IISD, April 2015, p. 9.

95 Year-end Summary of Commercial Work in 2016 (8th) Establish a New System of Foreign Capital, Create an Open Pattern, Ministry of Commerce of the People's Republic of China, 4th January, 2017, viewed 6th January, 2017, <<http://www.mofcom.gov.cn/article/ae/ai/201701/20170102495493.shtml>>

96 Hanemann, Thilo and Mikko Huotari, Record Flows and Growing Imbalances: Chinese Investment in Europe in 2016, MERICS and Rhodium Group, 10th January 2017, no. 3, <<http://rhg.com/reports/record-flows-and-growing-imbalances-chinese-investment-in-europe-in-2016>>; EU-China FDI Monitor 4Q 2016 Update: Public Version, Rhodium Group, January, 2017, viewed 17th January, 2017, <http://trade.ec.europa.eu/doclib/docs/2017/january/tradoc_155234.pdf>. While the European Chamber's Business Confidence Survey 2016 stated the figure for 2015 to be EUR 9.3 billion, this has been updated to EUR 10 billion in the latest available figures.

97 European Business in China—Business Confidence Survey 2016, The European Union Chamber of Commerce in China, p. 49. <<http://www.europeanchamber.com.cn/en/publications-business-confidence-survey>>

share targets outlined in various documents related to CM2025 present an additional reason for European business to carefully consider whether there is a business case for making further investments.

All of this is in stark contrast to the more than EUR 35 billion of investments that Chinese firms made in the EU in 2016 – more than four times the amount of investment flowing in the opposite direction. Chinese investment in the EU leaped by more than 77 per cent from 2015.⁹⁸ Over a third of investment in 2016 was also made in areas related to advanced manufacturing, with much of this in industries covered by CM2025.

As the European Chamber outlined in its *Executive Position Paper 2016/2017*, this imbalance is politically unsustainable and underlines the lack of reciprocity in bilateral investment relations.⁹⁹ For the good of its own economy, China should significantly improve market access for European business. The European Chamber therefore hopes that the authorities will rapidly act upon the State Council's January 2017 commitment to deepen reforms concerning the management of foreign investment and streamline approval.¹⁰⁰

6.2 New restrictions on outbound foreign direct investment of limited importance to CM2025

Partly due to the new wave of capital flight that commenced during the third quarter of 2016, some of it taking the form of investments abroad, additional pressure was placed on the Chinese yuan (CNY) exchange rate. In response, documents that were leaked in late November 2016 implied that the PBOC was strengthening restrictions on outbound foreign direct investment (OFDI). Specifically, investments by SOEs in real estate above USD 1 billion, investments above USD 1 billion outside of the acquiring companies' core areas of business and deals larger than USD 10 billion in size and other types of deals were reportedly to be subject to enhanced scrutiny.¹⁰¹ While it was paired with a statement that it would maintain the 'going out' strategy of encouraging foreign investment, several days later it was reported that the State Administration of Foreign Exchange (SAFE) would also carry out more stringent reviews of large outbound investments.¹⁰²

While this significant development has contributed to uncertainty regarding the ability of Chinese entities to complete investments, there is no reason to conclude that outbound investments that are not disguised capital flight or tainted by corruption will be brought to a halt, especially in sectors that have been identified as strategic priorities by the government. This conclusion is supported by a 26th December statement made at the 2016 National Commerce Work Conference by Minister of Commerce Gao Hucheng that the government "will promote the healthy and orderly development of outbound investment and cooperation" in 2017.¹⁰³ During his January 2017 speech at the World Economic Forum in Davos, President Xi also stated that he expected outbound Chinese investment to amount to USD 750 billion over the next five years.¹⁰⁴

These strengthened controls may actually motivate more Chinese companies to look for ways to align their investment plans with government priorities outlined in CM2025, since presenting investments to the authorities that support their priorities—for example those outlined in CM2025 or the Belt and Road Initiative (BRI)—can be expected to achieve a higher rate of approval.

98 Hanemann, Thilo and Mikko Huotari, *Record Flows and Growing Imbalances: Chinese Investment in Europe in 2016*, MERICS and Rhodium Group, 10th January 2017, no. 3, p. 4, <<http://rhg.com/reports/record-flows-and-growing-imbalances-chinese-investment-in-europe-in-2016>>

99 *European Chamber Executive Position Paper 2016/2017*, The European Union Chamber of Commerce in China, 2016, <http://www.eurochamber.com.cn/en/publications-archive/459/Executive_Position_Paper_2016_2017>

100 *Notice of the State Council on Several Measures on Promoting Further Openness and Active Utilisation of Foreign Investment*, The State Council, 17th January, 2017, viewed 21st January, 2017, <http://www.gov.cn/zhengce/content/2017-01/17/content_5160624.htm>

101 Wei, Lingling, *China Issuing 'Strict Controls' on Overseas Investment*, *The Wall Street Journal*, 25th November, 2016, viewed 25th November, 2016, <<http://www.wsj.com/articles/china-issuing-strict-controls-on-overseas-investment-1480071529>>; Back to Big Brother: New Capital Controls and Chinese Outbound FDI, Rhodium Group, 2nd December, 2016.

102 *China Forex Regulator Tightens Controls to Stem Capital Outflows – Sources*, *Reuters*, 29th November, 2016, viewed 1st December, 2016, <<http://www.reuters.com/article/uk-china-economy-capitalflows-idUSKBN13O1E2>>

103 *2016 National Commerce Work Conference is Convened in Beijing*, Ministry of Commerce of the People's Republic of China, 26th December, 2016, viewed 9th January, <<http://www.mofcom.gov.cn/article/ae/ai/201612/20161202376117.shtml>>

104 President Xi's speech to Davos in full, World Economic Forum, 17th January, 2017, viewed 19th January, 2017, <<https://www.weforum.org/agenda/2017/01/full-text-of-xi-jinping-keynote-at-the-world-economic-forum>>



7. Impact of CM2025 on European business

Many European companies in industries covered by CM2025, for example those in the rail industry, have seen market access become increasingly difficult. This is due to Chinese firms closing the technological gap as a result of mandated technology transfers from foreign companies to JVs, improvements to their internal R&D efforts or simply because they enjoy preferential access to China's large domestic market.

Despite these kind of challenges, though, there are important opportunities for European business. At least in the near to medium term, European companies that provide advanced capital equipment, as well as key components and technologies that China is not yet able to produce itself, stand to benefit. Opportunities can also already be seen emerging from the partnerships that numerous prominent European companies have established with Chinese companies in industries relevant to CM2025 and Industry 4.0.¹⁰⁵ As some domestic firms will have a better understanding of the needs of Chinese customers in industries included under the initiative, such partnerships can create real value if they are well structured.

In some fields, European business can benefit from using their facilities in China to do contract manufacturing and R&D for domestic firms. In others, they can secure new business by providing components, services and expertise to SOEs and private Chinese firms that are doing projects relevant to CM2025 in third-party markets.

Service providers that can assist Chinese firms in integrating industrial robotics, sensors and advanced software systems into their assembly lines also stand to gain from Industry 3.0 and 4.0 upgrades. Despite the limitations they continue to face in the Chinese market, the government's priorities may also produce new opportunities for testing, inspection and certification (TIC) companies.

The fact that some private Chinese firms are rapidly upgrading their capabilities and making major investments in R&D—some having initiated efforts to do so before CM2025 was announced—also provides European firms with an additional impetus to continue to innovate, with the aim of improving their own value propositions for customers.

As innovation is largely driven by consumers' preferences, and China is expected to drive a significant percentage of demand for many of the industries covered by the initiative, participating in the Chinese market can be of great value to European companies that are improving their products and business models. Their participation may also serve to put to rest any lingering misconceptions they may have that private Chinese firms are unable to innovate or that they can afford to become complacent.¹⁰⁶

Finally, while China's R&D environment continues to pose challenges, like restricted and slow Internet and poor IPR protection,¹⁰⁷ European business can form R&D partnerships with Chinese universities. They can also gain from exposure to new business models that are evolving due to the high penetration of smart-phone connectivity among Chinese consumers.

7.1 Outlook by industry

The following section outlines the opportunities and challenges that European business faces in five of the ten industries covered by CM2025:

¹⁰⁵ Huawei, in Cooperation with SAP, Establishes Joint Innovation Efforts to Deepen Cooperation in Industry 4.0 and the Internet of Things, Huawei, 17th March, 2015, viewed 16th December, 2016, <<http://pr.huawei.com/en/news/hw-417738-cebit.htm>>; Sino-German Smart Manufacturing Cooperation Pilot Projects 2016 Bosch's Expertise in Smart Manufacturing Recognised by MIIT Only Project Applied by German Company to be Listed, Bosch, 5th August, 2016, viewed 16th December, 2016, <http://www.bosch.com.cn/en/cn/newsroom_4/news_4/news-detail-page_41666.php> ; and, Siasun Robots, Schneider Electric to Establish Smart Manufacturing Plant, Xinhua, 16th February, 2016, viewed 16th December, 2016, <http://news.xinhuanet.com/english/2016-02/19/c_135114220.htm>

¹⁰⁶ Studwell, Joe, *Actually China Can Innovate*, *China Economy Quarterly*, September 2016, vol. 20, no. 3, pp. 49-53.

¹⁰⁷ *European Business in China—Business Confidence Survey 2016*, The European Union Chamber of Commerce in China, 2016, pp. 21, 40 and 50-51, <<http://www.eurochamber.com.cn/en/publications-business-confidence-survey>>

1. Next generation IT (including cloud computing, telecommunications equipment and semiconductors)
2. Robotics¹⁰⁸
3. Advanced rail equipment
4. Energy-saving vehicles and NEVs
5. Biopharmaceuticals and high-performance medical devices

The sections on semiconductors, robotics and energy-saving vehicles and NEVs form longer case studies, as they respectively serve to highlight the role of government-backed investment funds, the overcapacity that results from poorly designed government subsidies and pressures on European business to transfer technology.

7.1.1 Next generation IT

Concern

Announcements made at the highest political level indicate that China is attempting to nationalise many aspects of its IT industry by substituting products manufactured by FIEs with indigenous technology that is 'secure and controllable'.

Assessment

China's IT industry presents an increasingly challenging business environment. Requirements that equipment used in domestic IT systems be 'secure and controllable' pose near- and long-term challenges to the position of European business. For example, President Xi Jinping stated during a 9th October, 2016, Politburo meeting on cyber and IT issues—attended by most of the Leading Small Group for Cybersecurity and Informatisation that President Xi leads¹⁰⁹—that China "must accelerate the advancement of domestic production, indigenous and controllable substitution plans, and the building of secure and controllable information technology systems."¹¹⁰ This sent a clear signal that rapid progress on these issues continues to be a top priority of the Party. It also fit with language included in the Science and Technology Innovation FYP, released on 8th August, 2016, that focuses on the importance of strengthening indigenous innovation capabilities and safeguarding national security through innovation in science and technology.¹¹¹

The Cybersecurity Law, which was subsequently passed in November 2016 and takes effect in June 2017,¹¹² also includes several new clauses that can be expected to add to the regulatory burden of foreign companies that sell telecommunications and other types of high-technology equipment and services in China. For example, it requires operators of critical infrastructure to ensure any products and services that they purchase to have gone through a security review in advance of being put into service. This follows on from the 2014 announcement that a Cybersecurity Review Regime would be established. While as of mid-January 2017 no official materials have publicly been released on such a review, the authorities have reportedly already approached foreign IT firms to submit to reviews of this nature.¹¹³

Near the end of December 2016, the country's top Internet regulator released a new national *Cyberspace Security Strategy*.¹¹⁴ By including cyber networks of relevance to industry and manufacturing, as well as other areas, the strategy extends beyond the fields explicitly included in the Cybersecurity Law. While its definition remains unclear,

108 While high-end numerical control machinery is placed in the same category, it is not addressed in this report.

109 Triolo, Paul and Feng, Chucheng, *China – Industrial Policy*, Eurasia Group, 11th October, 2016, p. 1.

110 *Politburo Meeting on the Implementation of the Strategy of the Network Power Thirty-sixth Collective Learning*, www.gov.cn, 9th October, 2016, viewed 12th January, 2017, <http://www.gov.cn/xinwen/2016-10/09/content_5116444.htm>; Martina, Michael, *Xi Says China Must Speed Up Plans for Domestic Network Technology*, Reuters, 9th October, 2016, viewed 4th January, 2017, <<http://www.reuters.com/article/us-china-internet-security-idUSKCN1290LA>>

111 *Notice on Science and Technology Innovation 13th FYP*, State Council, 8th August, 2016, viewed 9th January, 2017, <http://www.gov.cn/zhengce/content/2016-08/08/content_5098072.htm>

112 Cybersecurity Law of People's Republic of China, National People's Congress of the People's Republic of China, 7th November, 2016, viewed 9th January, 2017, <http://www.npc.gov.cn/npc/xinwen/2016-11/07/content_2001605.htm>

113 Triolo, Paul and Feng, Chucheng, *China – Industrial Policy*, Eurasia Group, 2nd November, 2016, p. 2.

114 *Cyberspace Security Strategy*, Cyberspace Administration of China, 27th December, 2016, viewed 16th January, 2017, <http://www.cac.gov.cn/2016-12/27/c_1120195926.htm>



one of the tasks included in the strategy is the need to protect critical information infrastructure. On how this should be accomplished, the National Cyberspace Security Strategy refers to security inspections for important technological products and services purchased by, and used in, Party and government bodies, as well as focus sectors covered by the strategy. The need to raise the degree to which products are 'secure and controllable' is included as well. Paradoxically, the strategy also states that the authorities should vigorously create a policy environment beneficial to technological innovation.

It appears likely that as the strategy is implemented companies will have to submit information on their products' design and source codes to government-affiliated review organisations. If these organisations attempt to mandate companies to hand over their source codes the legal options that would be available to them are currently unclear.¹¹⁵

The combination of the market share targets included in the *CM2025 Roadmap* and this focus on technology substitution raises serious questions regarding the authorities' willingness to allow European business to play anything other than a shrinking role in China's IT industry. The resulting reduction in market-driven competition would have serious ramifications for China's capacity to drive innovation and adopt the best technologies available internationally. Chinese companies across a range of industries may also see their ability to enter into international markets seriously compromised by requirements that they adopt 'secure and controllable' technology that may not serve their business needs.

While every country has legitimate security interests in industries related to IT, the approach that the Chinese authorities have taken is distorting the market and will carry a real economic cost. For example, it has been calculated that the potential de-globalisation of China's ICT industry more broadly could lead to a 1.8 to 3.4 per cent reduction in China's GDP. Based on 2015 figures, this amounts to EUR 190 billion per year, and by 2025 could amount to a cumulative reduction of EUR 2.85 trillion.¹¹⁶ This would result in part from a reduction in transfers of knowhow and the related decline in efficiencies and domestic innovation as a consequence of reducing openness to foreign business.

Recommendations

- Permit firms to select the best IT products available internationally that align with their business needs.
- Limit security measures of IT products to reviews in controlled environments with no requirements for firms to reveal their proprietary source codes.
- Remain open to the global IT industry in order to benefit from exposure to innovation and to avoid diminishing the ability of domestic firms to successfully enter international markets.
- Lead on international discussions addressing states' legitimate interests in cybersecurity at the United Nations and in other fora.

7.1.1.1 Cloud computing

Concern

Limitations on European business' access to China's cloud computing market for the Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) segments have been formalised,¹¹⁷ and European business remains unable to attain the Internet Data Centre (IDC) licence necessary to participate with a JV partner. This limits the ability of European companies operating in China to choose the service provider most aligned with their needs.

Furthermore, requirements that cloud service operators locate their service facilities and network data within Chinese territory are likely to hamper entrepreneurship and prevent innovative products and services from being created or adopted within the country.

¹¹⁵ Triolo, Paul, *China/Cybersecurity: Industrial Policy*, Eurasia Group, 12th January, 2017.

¹¹⁶ *Preventing Deglobalisation: An Economic and Security Argument for Free Trade and Investment in ICT*, US Chamber of Commerce, Rhodium Group and Covington & Burling LLP, 1st September, 2016, viewed 4th January, 2016, p. 8, <<http://rhg.com/reports/preventing-deglobalization>>

¹¹⁷ As of mid-January 2017, it appears that new draft guidelines will not have an impact on most of the Software as a Service (SaaS) segment.

Assessment

While definitions vary, cloud computing can be broadly understood as “the delivery of on-demand computing resources—everything from applications to data centers—over the internet on a pay-for-use basis”.¹¹⁸ This model allows companies to scale up their use or demand depending on their needs, and can even save them from having to run their own IT department. The development of the industry has been a longstanding priority for the Chinese authorities having been a focus of the *MLP* and the SEIs.

The analysis and application of information from one stage of the manufacturing process to another is a key driver of Industry 4.0. Cloud computing can therefore be characterised as being part of Industry 4.0's circulatory system. However, before companies are able to make use of this capacity, they have to be fully confident that their cloud service provider is able to protect their proprietary data at all times. As competitiveness, efficiency and innovation in entire industry value chains can be expected to be increasingly dependent upon management and use of this data, the potential cost of losing control over it cannot be overstated.

Regulatory approach

China's approach to regulating this industry fits with the rationale of 'secure and controllable'. First, in practice, European business has only been able to participate in the industry by forming a JV in which a local company controls a majority stake.

In March 2016, amendments to the country's *Telecom Catalogue* also came into effect that formalised and expanded restrictions on the ability of European business to participate in this industry in China.¹¹⁹ It includes a new subcategory of Internet Data Centre (IDC) services called 'internet-based resources collaboration services', which covers internet-based data storage, application development, application deployment and operation management. While the practical ramifications are not immediately clear, it is likely that at least some cloud computing services will have to apply for new licences.¹²⁰

The latest draft notice

Following this, in November 2016, the MIIT released a draft notice¹²¹ which places new restrictions on the ability of European business to participate in the IaaS and PaaS industry segments. It also includes a requirement that Internet-based resources collaboration services apply for an IDC VATS licence. For companies that possess an IDC licence and cooperate with a partner that does not, the draft notice stipulates that “technical cooperation between cloud service operators and other relevant organisations shall be reported to telecommunications administrations in written form”. However, it does not provide further details on how the reporting should be carried out. As cloud service-related technical cooperation often involves the sharing of confidential business information, this would pose a serious challenge for regular business activities. Provision of cloud computing services under the brand or trademark of a foreign partner is also banned.

For services provided to domestic users, it is required that cloud service operators locate their service facilities and network data within Chinese territory, and ensure that their cross-border operation services and data flows comply with relevant national regulations. Companies are also barred from using a virtual private network (VPN) that might otherwise enable them to access cloud computing services offered abroad.

Combined with the Cybersecurity Law's requirement for localisation of personal information and data collected

118 *What is Cloud Computing?*, IBM, viewed 13th January, 2017, <<https://www.ibm.com/cloud-computing/learn-more/what-is-cloud-computing/>>. This page also provides explanations of the IaaS, PaaS and SaaS segments.

119 *Notice on the Publication of <Telecom Service Catalogue (2015)>*, MIIT, 28th December, 2015, viewed 16th January, 2017, <<http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057709/n3057714/c4564270/content.html>>

120 Li, Barbara, *China's New Telecom Catalogue Comes into Effect on March 1 2016*, Norton Rose Fulbright, February 2016, viewed 16th January, 2017, <<http://www.nortonrosefulbright.com/knowledge/publications/137503/chinas-new-telecom-catalogue-comes-into-force-on-march-1-2016>>

121 *Notice on Regulating Business Behaviors in the Cloud Service Market*, MIIT, 24th November, 2016, viewed 13th January, 2017, <<http://www.miit.gov.cn/n1278117/n1648113/c5381374/content.html>>



by critical information infrastructure, the risk of setting restrictions based on traditional security norms—such as containing business activities within national borders or requiring intrusive monitoring of user activities—is that it will hamper entrepreneurship and prevent innovative products and services from being created or adopted in China. These restrictions can also present technical difficulties and operational burdens to both Chinese domestic enterprises and FIEs, while creating limited added-value to security. With Industry 4.0 set to further contribute to the importance of international linkages in business, it would be preferable to focus on how data is processed, stored and maintained, rather than forcibly restricting cross-border flows. Given the global nature of cloud services, an effective approach would be to enhance international coordination and cooperation in this regard.

For example, requirements for data localisation may prevent engineers that are employed by the same Chinese firm, but located separately in Europe and China, from effectively communicating on how to rapidly address a problem. This would provide a particular challenge given that they would be competing in international markets with companies that do not face this limitation. More broadly, with cloud computing powering many Industry 4.0 processes, these kind of restrictions negatively impact China's overall ability to accomplish its goals in the other nine industries included in CM2025.

Is it safe for 4.0 in China?

Due to the importance of maintaining control of their proprietary data, European companies conducting manufacturing in China need to be free to choose their own service providers. As companies often prefer to select one from their own home country, there is a risk that fewer of them will bring their most cutting-edge Industry 4.0 operations to China.¹²² Any indications that their cloud computing service provider might become a direct competitor in the future would seriously complicate their operations and would only have a negative impact on China's innovation ecosystem.

Recommendations

- Align industry standards with international best practices.
- Desist from requiring companies to reveal confidential business information regarding their industry partnerships.
- Rescind requirements for firms to localise their servers in China in order to avoid hampering entrepreneurship and focus instead on how data is stored, processed and maintained.
- Permit companies to select from a wide range of cloud computing service providers in order to ensure that they are able to identify one that they are comfortable with, and therefore are not prevented from introducing the most advanced Industry 4.0-related business practices to the Chinese market.

7.1.1.2 Telecommunications equipment

Concern

The level of export credits that leading Chinese telecommunications equipment manufacturers receive from government agencies allows them to win contracts in international markets on the basis of price, which runs the risk of depressing innovation in the industry globally.

Assessment

The Chinese Government has used a variety of policy instruments to support the development of its domestic telecommunications equipment industry. One of the most prominent has been the use of catalogues of domestic high-technology products, as well as an equivalent list for exports. Firms whose products are included in these catalogues receive benefits, such as preferential tax rates and low-interest loans from state-owned banks. The provision of preferential access to sell to the three large domestic telecom operators, all of which are SOEs, has also served as an important additional source of support.¹²³

¹²² Wee, Dominik et al, *Industry 4.0: How to Navigate Digitisation of the Manufacturing Sector*, McKinsey & Co., 2015, p. 47, viewed 5th December, 2016, <https://www.mckinsey.de/files/mck_industry_40_report.pdf>

¹²³ Background Material for US-China Economic and Security Review Commission, US-China Economic and Security Review Commission, 6th June, 2012, viewed 13th January, 2017, pp. 4-8, <<http://www.uscc.gov/sites/default/files/6.14.12McCarthy.pdf>>

This has allowed leading Chinese telecommunications equipment companies to make a significant investment in R&D and basic research. For Huawei, this now amounts to 15 per cent of its sales revenue, which is in line with international industry leaders. The company has also benefitted from its open approach to innovation and integration with global industry, which involves relations with partners around the world with its 16 R&D centres and 36 joint innovation centres that focus on both basic and applied research.¹²⁴

Trends in China's domestic market

China's overall domestic market is not characterised by an equally open approach, with the amount of market share that European firms are able to attain seemingly manipulated by government authorities. Although Europe has been far more open than the US to the participation of Chinese telecommunications equipment companies in its market, it is not clear that this openness has resulted in any reciprocal benefits for European business in China.

International Markets

In international markets, many of the gains that China's industry has made have also partially resulted from Chinese government support – support that European governments are barred from providing to their own domestic companies under OECD export financing rules. These rules were developed in order to regulate and make transparent government support. As China is not currently a party to these rules, although OECD membership is not required to join and other countries have done so, it places its companies at a competitive advantage. Two recent examples follow below.

When Huawei and Turkcell Group announced that they were expanding their strategic partnership with a focus on 4.5G and 5G telecommunications technology in June 2016,¹²⁵ OECD-noncompliant credits constituted an important source of government support for the partnership. This is reflected in loans amounting to EUR 1.25 billion that the CDB offered Turkcell. Contrary to OECD rules, which stipulate a maximum repayment period of 8.5 years, with an initial six-month grace period before payments have to commence, the CDB loan extends these to 10 and three years respectively.¹²⁶ The loan is also partly for refinancing earlier loans, something that is also not permitted under OECD rules.

Additionally, in April 2015, Oger Telecom, a Dubai-based provider of telecommunications and technology services with subsidiaries in Turkey, South Africa and the Middle East, signed two loan agreements with the CDB to finance it and its subsidiaries' purchases from Chinese vendors. The total amount was EUR 191 million. Its nine-year maturity and grace period of two years are above the maximum of eight and a half years and six months set by the OECD.¹²⁷

In highly competitive markets, this sort of support can be the decisive factor in successfully winning contracts. In light of the fact that Europe has maintained an open market that Chinese telecommunication equipment companies compete in, this is concerning. It could slow down the pace of innovation in the industry globally, by diminishing the ability of international firms to invest in R&D in the long term.

Recommendations

- Allow market share in China's domestic market to be driven by market forces in order to incentivise firms to improve their service offerings and technological capacity.
- Join the OECD's export financing rules and align with best practices.

124 Chan, Vincent et al, *Ecosystem of Innovation and Technology in China*, Credit Suisse, 26th October, 2016, p. 23.

125 *Turkcell Group and Huawei Signed a MoU to Activate the Customer Business Partnership Program*, Huawei, 8th August, 2016, viewed 4th January, 2017, <<http://www.huawei.com/en/news/2016/8/MoU-to-activate-the-Customer-Business-Partnership-Program>>

126 *Turkey's Turkcell Signs 1.25 Bln Loan with CDB*, Reuters, 29th September, 2015, viewed 4th January, 2017, <<http://www.reuters.com/article/turkcell-loan-idUSL5N11Z1Q920150929>>

127 *3 April 2015 dated Regulatory Disclosure - Long Term Loan Agreements*, Oger Telecom, 3rd April, 2015, viewed 4th January, 2017, <<http://www.ogertelecom.com/press-room-link-tti-30.html>>



7.1.1.3 Semiconductors

Concern

By attempting to upgrade the technological capabilities of its domestic semiconductor industry with support from enormous, government-backed investment funds at the central, provincial and city level, China risks creating overcapacity, which could depress profit margins and technological development in the global industry.

The government-driven scheme to acquire controlling stakes in international semiconductor companies and technologies is also highly troubling. Given that these are areas where European business is barred from making equivalent investments in China, it runs the risk of provoking push-back from abroad, which will diminish the exposure to international industry that China needs to develop its own capabilities.

Assessment

State of China's industry

Semiconductors, or integrated circuits (ICs), power processing in a wide range of industries and products, including smartphones, software, high-speed rail (HSR), electricity grids, automobiles and aerospace. It is one of the world's most research-intensive industries with new generations of technology often requiring the reinvestment of billions of euros of profit from existing products into ongoing R&D.

It is also an industry of long-standing interest to the Chinese authorities. This was recently highlighted in the June 2014 release of the *National Semiconductor Industry Development Guidelines*,¹²⁸ which provide the foundation for the government's efforts to direct its development. They include highly ambitious targets for 2020, to upgrade the domestic industry's design and manufacturing capacity, packaging and testing technology, as well as equipment and materials of importance to its supply chain. This encompasses the three stages of manufacturing: design, fabrication and assembly, packaging and testing (APT).

Provincial governments have released their own guidelines for the implementation of the national ones, which outline development goals and additional financial support measures.¹²⁹ The *CM2025 Roadmap* also builds on the national guidelines' targets for 2020 and 2030, with additional information for their implementation.

In 2015, 29 per cent of semiconductors sales worldwide were to companies headquartered in China, although the percentage of the global sales China accounts for varies by product.¹³⁰ At present, the country relies on imports for roughly 90 per cent of the semiconductors that it consumes,¹³¹ with the figure higher for the most advanced devices. Domestic capabilities for producing goods like chip wafers often lag two generations behind the cutting edge. As a result, the gap between China's production and consumption in the industry reached EUR 114 billion in 2013, and is projected to rise to EUR 144 billion in 2017.¹³²

A large percentage of the semiconductors that China imports also serve as components for products that are sold abroad.¹³³ While roughly half of electronics globally are manufactured or assembled in China, purchasing decisions for a large percentage of their semiconductor components are made by international companies with manufacturing

128 *Guidelines for the Development and Promotion of National Integrated Circuits Industry*, State Council, 24th June, 2014, viewed on 9th January, 2017, <http://www.gov.cn/xinwen/2014-06/24/content_2707360.htm>

129 For example: *Chinese Regional Governments Release New Rules/Guidelines to Accelerate Implementation of IC Support Measures*, Semiconductor Industry Association, 12th August, 2014, viewed 7th January, 2017, <http://www.semiconductors.org/news/2014/08/12/trade_article/chinese_regional_governments_release_new_rules_guidelines_to_accelerate_implementation_of_ic_support_measures/>

130 *Top Market Report Semiconductors and Semiconductor Equipment Case Study: China*, US Department of Commerce International Trade Administration, 2016, viewed 8th January, 2017, <http://trade.gov/topmarkets/pdf/Semiconductors_China.pdf>

131 Ibid

132 Ernst, Dieter, *From Catching Up to Forging Ahead: China's New Role in the Semiconductor Industry*, Solid State Technology, May 2016, viewed 7th January, 2017, p. 17, <https://www.eastwestcenter.org/sites/default/files/filemanager/Research_Program/Ernst%202016.pdf>

133 *Top Market Report Semiconductors and Semiconductor Equipment Case Study: China*, US Department of Commerce International Trade Administration, 2016, viewed 8th January, 2017, pp. 4-5, <http://trade.gov/topmarkets/pdf/Semiconductors_China.pdf>

facilities or contractors in China. Chinese government institutions and SOEs are therefore not strong drivers of demand.

As the country is a leading consumer for the global industry, which in turn feeds into many other fields, it is understandable that the Chinese authorities want to strengthen its technological capabilities and position in the global value chain. However, the policy tools they are employing to achieve this aim, and the likely impact it will have on the global industry, is of great concern to European business. That said, it should also be recognised that some international companies that provide equipment and materials for manufacturing, as well as design software, may see China's attempt to upgrade the industry as an opportunity that presents only limited costs to their individual businesses.¹³⁴

Domestic Consolidation

One of the primary policy tools that the Chinese Government has used is the promotion of consolidation in its domestic industry, which in the recent past was highly fragmented. For example, in mid-2014, China had more than 600 fabless design companies, many of them small.¹³⁵ In 2013, 223 of these firms reportedly lost money with only 124 having posted revenue above EUR 14 million.¹³⁶ Many of these companies had also been focused on older generations of technologies, which require far smaller investments in R&D.

The aim of this consolidation drive has been to create larger companies capable of making significant investments in R&D. One of the most prominent companies in this drive has been Tsinghua Unigroup (Unigroup), a majority-owned subsidiary of Tsinghua University's government-owned Tsinghua Holdings. In 2015, it was reported that in order to become a top-three global chipmaker it planned to invest more than EUR 41 billion over five years.¹³⁷ Domestically, Unigroup has acquired the Chinese fabless design companies Spreadtrum Communications and RDA Microelectronics.¹³⁸ It also merged its memory chipmaking operations with the government-run company XMC, which is involved in a new EUR 22.8 billion manufacturing complex for memory chips in Hubei province.¹³⁹ This is in addition to the memory chip factory Unigroup has announced that it will build in Nanjing at a cost of EUR 28 billion.¹⁴⁰ Significantly, in 2016, Unigroup's head, Zhao Weiguo, was quoted as saying, "Our goal is to build a pacific fleet for China's information technology industry. It not only needs a strong defense power to fuel China's economic growth, it's our responsibility to help the country grow high-technology capacity."¹⁴¹

By consolidating the industry, and therefore the sources of demand for international suppliers in the industry's value chain, the authorities also aim to strengthen China's market power. However, while scale is important for building R&D capacity, larger firms will not necessarily be more innovative or well managed. Synergies are also more difficult to realise for IP and R&D than for manufacturing operations.¹⁴²

134 Ernst, Dieter, *A New Grand Strategy for Semiconductors*, *China Economic Quarterly*, September 2016, vol. 20, no. 3, p. 19.

135 A fabless design company is one that focuses on design of microchips with fabrication contracted out to a manufacturer with a semiconductor foundry.

136 Goering, Richard, *China Fabless Semiconductor Panel: Don't Pack Your Bags Just Yet*, Cadence Industry Insight Blog, 18th June, 2014, viewed 7th January, 2017, <https://community.cadence.com/cadence_blogs_8/b/ii/archive/2014/06/18/china-fabless-semiconductor-panel-don-t-pack-your-bags-just-yet>

137 Carsten, Paul and Yimou Lee, *China's Tsinghua Unigroup to Invest \$47 Billion to Bld Chip Empire*, *Reuters*, 16th November, 2015, viewed 7th January, 2017, <<http://www.reuters.com/article/us-china-tsinghua-m-a-idUSKCN0T50DU20151116>>

138 Junko, Yoshido, *Merger Pits Mysterious Unigroup vs. MediaTek*, *EE Times*, 14th November, 2013, viewed 7th January, 2017, <http://www.eetimes.com/document.asp?doc_id=1320091>. It should also be noted that the American firm Intel holds a 20 per cent investment in Spreadtrum Communications.

139 *Unigroup and XMC Combine their Chip Assets*, *China Daily*, 28th July, 2016, viewed 8th January, 2017, <http://www.chinadaily.com.cn/business/tech/2016-07/28/content_26248586.htm>

140 *Tsinghua Unigroup's Semiconductor Plant, New Investment in IT and R&D Headquarters to be Launched in Nanjing*, Tsinghua Unigroup, 19th January, 2017, viewed 23rd January, 2017, <<http://www.unigroup.com.cn/newscenter/jtxw/2017/0119/287.html>>; Shah, Agam, *How Does China Respond to US Chip Threats? With a \$30 Billion Factory*, *PC World*, 20th January, 2017, viewed 23rd January, 2017, <<http://www.pcworld.com/article/3159718/technology-business/how-does-china-respond-to-us-chip-threats-with-a-30-billion-factory.html>>

141 *Western Digital Urges China to Tread Carefully on Chip Ambitions*, *Bloomberg*, 8th September, 2016, viewed 7th January, 2017, <<https://www.bloomberg.com/news/articles/2016-09-08/western-digital-urges-china-to-tread-carefully-on-chip-ambitions>>

142 Thomas, Christopher, *A New World Under Construction: China and Semiconductors*, McKinsey & Company, November 2015, viewed 7th January, 2017, <<http://www.mckinsey.com/global-themes/asia-pacific/a-new-world-under-construction-china-and-semiconductors>>



Government-backed investment funds

The creation of enormous government-backed investment funds for M&A and upgrading facilities is another important policy tool deployed in the semiconductor industry. The EUR 19 billion China Integrated Circuit Industry Investment Fund (CICIIF) was first established in September 2014, with more than 60 per cent of it slated to be directed to the manufacturing segment of the industry.¹⁴³ In the *CM2025 Roadmap*, it was stated that the scope of this fund would gradually be expanded, or that phase two and three funds would be created with a view to providing strategic support for fulfilment of domestic market share targets. An announcement of plans to do so was subsequently made in March 2016.¹⁴⁴ Significantly, the national fund is led by a former head of the MIIT's Bureau for ICT who left the ministry less than half a year before the fund was formally established.¹⁴⁵

Dozens of local investment funds have also been established with total capital under management exceeding that in the national fund and its sub-funds, with many of them modelled on the EUR 4.1 billion Beijing IC Industry Equity Fund. In most cases these funds include capital from both government sources and private investors. Significantly, they focus largely on M&A and building and upgrading foundries for manufacturing, not on the long-term investments in R&D that are needed to strengthen technological capacity. Xiamen Municipality's Development and Reform Commission signed a strategic agreement with Unigroup in March 2016 to invest EUR 6.9 billion for cooperation in the area of IC design, IC testing and packaging, as well as other industries.¹⁴⁶

In total, announced funding for the industry during the decade following the establishment of the CICIIF amounts to over EUR 140 billion, a figure equal to almost half of the international industry's total global sales in 2015.¹⁴⁷ After government funds and related firms spent about EUR 66 billion on chip design in 2015 and 2016, including EUR 9.6 billion by the CICIIF, further funds are reportedly to be directed toward this segment in 2017.¹⁴⁸

A significant number of these investments are made in Chinese companies that are involved in overseas acquisitions. For example, in February 2015, it was estimated that over five years CICIIF would invest EUR 1.4 billion in Unigroup, with the CDB also to co-sign with the company in financial products worth EUR 2.8 billion.¹⁴⁹ While its subsequent proposal to acquire the American chipmaker Micron Technology failed, it has also looked to acquire multiple Taiwanese firms. Another subsidiary of Tsinghua Holdings, Tsinghua Unisplendour, attempted to acquire a 15 per cent stake in Western Digital.¹⁵⁰

A recent report by Rhodium Group highlights just how large the scale of rumoured, attempted and successful international acquisitions in the industry by Chinese entities has been in recent years. It found that, in the US alone, from 2013 through November 2016, there were 27 such investments with a total value of USD 37 billion made by Chinese interests. Of these, 18 were made by SOEs or state-backed funds, and three by private firms backed by state support. One additional attempt that enjoyed state support was made by a company whose ownership

143 Zhu, Shenshen, *More Cash Promised to China's IC Fund*, *Shanghai Daily*, 16th March, 2016, viewed 7th January, 2017, <<http://www.ecns.cn/business/2016/03-16/203115.shtml>>

144 Ibid

145 *Live Broadcast: MIIT's Bureau Chief for ICT, Ding Wenwu, Resigns*, *www.tech.163.com*, 10th April, 2014, viewed 7th January, 2017, <<http://tech.163.com/14/0410/15/9PFRIQ6800094OIH.html>>; Li, Chunjun, *Ding Wenwu: In Two Years the National Integrated Circuit Industry Investment Fund has Invested 70 Billion RMB, Using Microchips to Assist in Promotion of the Development of Smart Software*, *www.finance.china.com.cn*, 7th November, 2016, viewed 7th January, 2017, <<http://finance.china.com.cn/news/20161107/3974987.shtml>>

146 Chan, Vincent et al, *China-HK Chronicles*, Credit Suisse, 27th July, 2016, p. 23.

147 *Top Market Report Semiconductors and Semiconductor Equipment Case Study: China*, US Department of Commerce International Trade Administration, 2016, pp. 2-3, <http://trade.gov/topmarkets/pdf/Semiconductors_China.pdf>

148 Zhu, Shenshen, *Government to Invest More in Chip Design*, *Shanghai Daily*, 21st December, 2016, viewed 7th January, 2017, <<http://www.shanghaidaily.com/business/it/China-to-invest-more-in-chip-design/shdaily.shtml>>

149 *Tsinghua Unigroup Acquires \$4.77b Financing*, *China Daily*, 28th February, 2015, viewed 8th January, 2017, <http://www.chinadaily.com.cn/m/beijing/zhongguancun/2015-02/28/content_19678668.htm>

150 *Unisplendour Shelves Stake Purchase in Western Digital*, *Shanghai Daily*, 24th February, 2016, viewed 8th January, 2017, <<http://www.shanghaidaily.com/business/it/Unisplendour-shelves-stake-purchase-in-Western-Digital/shdaily.shtml>>

was unclear, with the remaining five being private firms without state backing.¹⁵¹ This contrasts starkly with the six investments made in the US prior to 2013, which had a total value of USD 214 million.

In recent years, the global industry has also been going through a major period of consolidation. However, this has resulted from attempts by private companies to address slowing growth, the rising cost of R&D and declining funding from venture capital in some segments.¹⁵² It is therefore distinct from attempts by Chinese entities that are making acquisitions in pursuit of government-driven objectives.

It is not clear how fund managers who are tasked with meeting government-set goals for market share and indigenous innovation can make rational investment decisions. Industry expert Dieter Ernst has argued that vested interests often causes government agencies to overrule advice received from industry experts. This may lead, he says, to officials who lack a full understanding of the “real and continuously evolving needs of diverse private firms in terms of global knowledge sourcing”.¹⁵³ This is especially concerning in light of the fact that competition between well-funded efforts by multiple Chinese provinces and cities—which are primarily focused on near-term economic growth and developing their own local champions—may lead to politically-driven and duplicative investment decisions.

The case of Aixtron

After the German semiconductor equipment manufacturer Aixtron had a major order from San'an Optoelectronics in Xiamen, Fujian Province, dropped at the last minute in late 2015, the firm saw its stock price fall precipitously. Since the company had already been facing difficulties, it began to look for a new investor and Fujian Grand Chip Investment (Fujian Grand), a fund based in Fujian Province, made an offer to acquire the company. A private businessman named Liu Zhendong, who reportedly invested primarily in the mining sector in the past,¹⁵⁴ is listed as controlling a 51 per cent interest in the fund, with the remainder controlled by Xiamen Bohao. The latter firm is a local government investment fund that has been found to have links to San'an Optoelectronics.

For example, a financial filing from the end of 2014 indicated that San'an owed Xiamen Bohao EUR 40.5 million, with a filing from the following year indicating that it still owed it EUR 32.4 million.¹⁵⁵ Furthermore, a subsidiary of CICIF, Sino Integrated Circuit Leasing, offered to provide a EUR 500 million loan to Fujian Grand in support of the acquisition.¹⁵⁶ San'an Group, San'an Optoelectronics' parent company, also held a minority share in Sino Integrated Circuit Leasing.

After receiving new information from the US authorities, the German Government cancelled a certificate stating that it did not object to the sale and commenced with a review of the bid.¹⁵⁷ This is required by law when information indicating that a takeover could jeopardise energy security, defence or financial stability is received. Citing national security concerns, President Obama declined to overrule a decision by the Committee on Foreign Investment in the United States (CFIUS) to block the sale of Aixtron's American assets after Fujian Grand did not drop its acquisition bid in response to the committee's decision.¹⁵⁸

While there is no definitive evidence that San'an deliberately dropped its order with the goal of providing Fujian Grand with an opportunity to acquire Aixtron at a more favourable price, it does highlight the risks involved in being overly dependent on any one customer in an industry of strategic interest. This is especially the case as unscrupulous entities will potentially view the sequence of events in the lead up to the attempted Aixtron acquisition as a model that they can adopt themselves.

151 *Chinese Investment in the U.S.*, Rhodium Group, viewed 7th January, 2017, pp. 80-81, <http://origin.www.uscc.gov/sites/default/files/Research/Chinese_Investment_in_the_United_States_Rhodium.pdf>; Fourteen of these 27 attempted investments were completed with four still pending as of November 2016.

152 Meehan et al, *China Chases Chip Leadership*, Bain & Co., p. 5, <http://www.bain.com/Images/BAIN_BRIEF_China_Chases_Chip_Leadership.pdf>

153 *China's Bold Strategy for Semiconductors—Zero-sum Game or Catalyst for Cooperation?*, East-West Centre, East-West Centre Working Papers, no. 9, September, 2016, viewed 7th January, 2017, p. 6, <http://www.eastwestcenter.org/system/tdf/private/iegwp009_0.pdf?file=1&type=node&id=35798>

154 Bocking, David, *Chinesischer Aixtron-Investor: Herr Liu versteht die Deutsche Angst Nicht*, *Der Spiegel*, 4th October, 2016, viewed 7th October, 2016, <<http://www.spiegel.de/forum/wirtschaft/chinesischer-aixtron-investor-herr-liu-versteht-die-deutsche-angst-nicht-thread-520458-1.html>>

155 Fahrion, Georg, *Aixtron – Chinas Staatsstreich*, *Capital*, 24th October 2016, viewed 26th October, 2016, <<http://www.capital.de/dasmagazin/aixtron-chinas-staatsstreich.html>>; Mozur, Paul and Paul Ewing, *Rush of Chinese Investment in Europe's High-tech Firms is Raising Eyebrows*, *The New York Times*, 16th September, 2016, viewed 16th September, 2016, <<http://www.nytimes.com/2016/09/17/business/dealbook/china-germany-takeover-merger-technology.html>>

156 *Reasoned Statement of the management board and the supervisory board of Aixtron SE on the voluntary publicly takeover offer (cash offer) by Grand Chip Investment GmbH*, US Securities and Exchange Commission 2016, 4th August, 2016, viewed 27th October, 2016, <https://www.sec.gov/Archives/edgar/data/1089496/000104746916014937/a2229459zex-99_a1.htm>

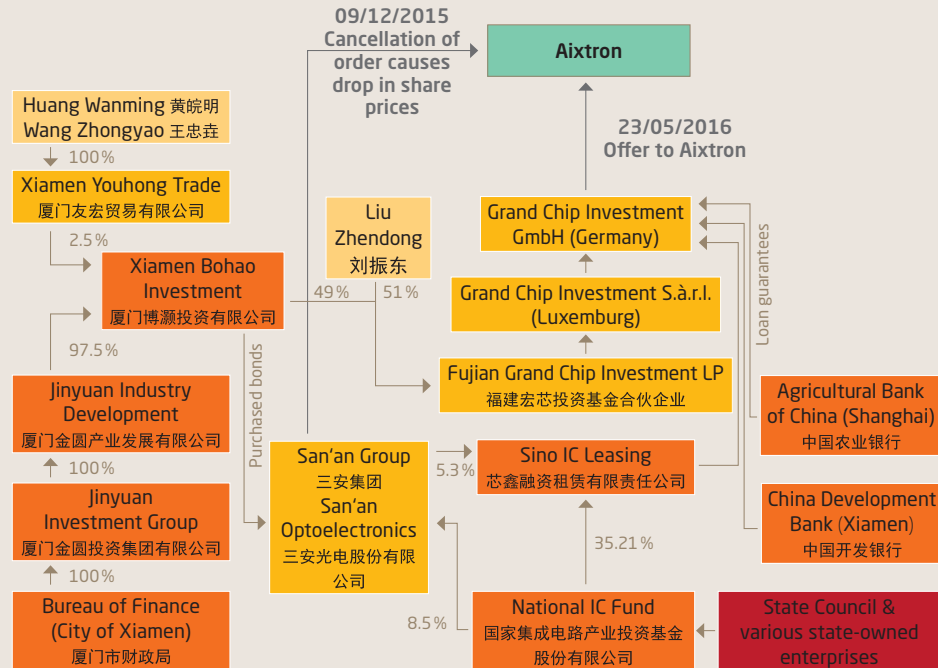
157 Chazan, Guy, *Germany Withdraws Approval for Chinese Takeover of Tech Group Aixtron*, *Financial Times*, 24th October, 2016, viewed 24th October, 2016, <<https://www.ft.com/content/f1b3e52e-99b0-11e6-8f9b-70e3cabccfae>>

158 Chazan, Guy, *Fujian Drops Aixtron Offer After U.S. Blocks Deal*, *Financial Times*, viewed 7th January, 2017, <<https://www.ft.com/content/b880ba3a-bd4a-11e6-8b45-b8b81dd5d080?ypr=yahoo&ref=yfp>>

The Fujian connection

The network of potential state and private investors behind the bid for machine maker Aixtron

private investors Mostly privately-owned Mostly state-owned



Source: Capital, MERICS

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The sale of Silex Microsystems

A move by multiple Chinese investors and companies to acquire the leading Swedish micro-electro-mechanical system (MEMS) chip maker Silex Microsystems (Silex) also highlights the dynamics driving international acquisitions by Chinese entities. It began when it was disclosed that a previously unknown Hong Kong-based investment holding company called GAE, which was created to invest in the semiconductor industry, purchased 98 per cent of the company in July 2015, and was constructing a wafer fab in Beijing to expand the company's production capacity, with the first chips expected to be released by mid-2017.¹⁵⁹ This took place shortly after Silex had completed EUR 11.3 million of upgrades to its facilities in Sweden. At the time of the acquisition, it was announced that no changes had been made to the organisational structure or business operations of Silex.

After Beijing Ruitong Xinyuan Semiconductor Technology Co acquired GAE's interest in Silex,¹⁶⁰ it was reported in January 2016, that it, in turn, was being acquired by Beijing Navgnss Integration. This was expected to make a significant contribution to the latter's ability to develop as a navigation service provider.¹⁶¹ In August 2016, it was then publicly reported that Beijing Navgnss Integration had established a JV with a unit of the People's Liberation Army with an aim toward further localising this technology.¹⁶² It is not yet clear that the original plant in Sweden will be kept open.

159 Clarke, Peter, *China Buys MEMS Foundry, Builds Fab*, *EE Times*, 23rd September, 2015, viewed 7th, January, 2017, <http://www.eetimes.com/author.asp?section_id=36&doc_id=1327793>; *Silex' Strategic Acquisition by China*, Semiconductor Design and Manufacturing Community, 25th September, 2015, viewed 7th January, 2017, <<http://semind.com/eds-threads/2015/09/25/silex-strategic-acquisition-by-china/>>

160 *Environmental Impact Assessment Public Announcement: Beijing Ruitong Xinyuan Semiconductor Technology Co. Eight Inch MEMS International OEM Threat Construction Program Environmental Assessment Report*, China Electronics Engineering Design Institute, 12th December, 2015, viewed 7th January, 2017, <<http://www.ceedi.com.cn/templates/second/index.aspx?nodeid=125&page=ContentPage&contentid=2606>>

161 *Beijing Navgnss Integration to Acquire Majority Control of Swedish MEMS Chip Maker for \$115m*, *Chinagoabroad.com*, 4th January, 2016, viewed 7th January, 2017, <http://www.chinagoabroad.com/en/recent_transaction/beijing-navgnss-integration-to-acquire-a-majority-control-of-sweden-s-mems-chip-maker-for-115m>

162 *Navgnss Technology: Report Concerning the Establishment of a Holding Subsidiary for Outbound Investment*, *Sina*, 12th August, 2016, viewed 7th January, 2017, <http://money.finance.sina.com.cn/corp/view/vCB_AllBulletinDetail.php?stockid=300456&id=2649237>

A technology plan in the plan?

It is unclear whether all of these measures are being undertaken according to a technology plan that has been well thought out. The fact that one of the industry's most cutting edge technologies, dynamic random access memory (DRAM)—which necessitates enormous investments and a huge capacity for R&D—is an area of focus seems to suggest that they are not.¹⁶³ In other words, by spreading their efforts too thinly and simultaneously pursuing every segment of a highly competitive and R&D-intensive industry value chain—including all major technologies—the authorities may ultimately fail to reach many of their goals to have all segments of the domestic industry reach advanced international standards by 2030, with a group of companies joining the international first tier.

Purchasing multiple firms with lagging technology, among which there are limited synergies, will not necessarily improve the country's technological position. For example, when Taiwan attempted to enter the memory segment of the industry in the late 1990s and early 2000s, it ultimately spent EUR 38 billion without producing significant results,¹⁶⁴ and this was at a time when the market was less consolidated and barriers to entry were therefore lower. Due to the fact that barriers to entry are now even higher, there are multiple industry segments where globally only one or two companies account for 100 per cent of the profits in that segment. All other companies lose money.¹⁶⁵ As McKinsey has argued, it is very difficult to displace well established leaders in a science and technology-based industry like semiconductors – with the top-three companies globally having remained unchanged in the last two decades, the barriers to entry are extremely high.¹⁶⁶ Success therefore requires long-term investments in R&D and exposure to the international industry.

If China does not enact market-driven reforms—including enhancing IP protection and increasing investment in the labour force—and narrow its focus to segments where its domestic industry is better positioned to make progress, much of this investment may be wasted. This would furthermore represent a high opportunity cost – there are many other areas where such funding *could* be productively utilised. The Chinese industry may well end up with a large number of fragmented and weak follower positions, as failing to partner with the right firms can be expected to place a ceiling of 10 per cent on their influence in the global industry.¹⁶⁷

However, as countries begin to respond to the wave of China's government-backed overseas acquisitions abroad that are being driven by state planning, there is a risk that China will eventually find itself with less exposure to the international industry.¹⁶⁸ Creating overcapacity at the lower and middle tier of the market can be expected to drive down profit margins globally. This would reduce revenue streams from earlier generations of products, which firms could draw from to reinvest in R&D, which in turn can be expected to slow down the overall pace of innovation. Some might view this as being of benefit to China's industry. This would be short-sighted. Ultimately, such a development could only be expected to provoke a negative response from foreign governments.

Recommendations

- Focus government support on facilitating R&D and innovation instead of through government-backed investment funds.
- Allow private industry and investors to determine in which market segments the industry is best positioned to

163 *China's Bold Strategy for Semiconductors—Zero-sum Game or Catalyst for Cooperation?*, East-West Centre, September, 2016, viewed 7th January, 2017, p. 14, <http://www.eastwestcenter.org/system/tdfs/private/iegwp009_0.pdf?file=1&type=node&id=35798>

164 Meehan et al, *China Chases Chip Leadership*, Bain & Co., p. 6, <http://www.bain.com/Images/BAIN_BRIEF_China_Chases_Chip_Leadership.pdf>

165 Thomas, Christopher, *A New World Under Construction: China and Semiconductors*, McKinsey & Company, November 2015, viewed 7th January, 2017, p. 6, <<http://www.mckinsey.com/global-themes/asia-pacific/a-new-world-under-construction-china-and-semiconductors>>

166 Woetzel et al, *The China Effect on Global Innovation*, McKinsey Global Institute, p. 31, <<http://mckinseychina.com/the-china-effect-on-global-innovation/>>

167 Meehan et al, *China Chases Chip Leadership*, Bain & Co., 2016, viewed 8th January, 2016, <http://www.bain.com/Images/BAIN_BRIEF_China_Chases_Chip_Leadership.pdf> and Ramli, David, *China's \$100 Billion Chip Supremacy Bid Unrealistic: Bain, Bloomberg*, 24th August, 2016, viewed 9th February, 2017 <<https://www.bloomberg.com/news/articles/2016-08-24/china-s-100-billion-chip-supremacy-bid-unrealistic-bain-says>>

168 *US Secretary of Commerce Penny Pritzker Delivers Major Policy Address on Semiconductors at CSIS*, US Department of Commerce, 2nd November, 2016, viewed 3rd November, 2016, <<https://www.commerce.gov/news/secretary-speeches/2016/11/us-secretary-commerce-penny-pritzker-delivers-major-policy-address>>; *Report to the President: Ensuring Long-Term US Leadership in Semiconductors*, Executive Office of the President, President's Council of Advisors on Science and Technology, January 2017, viewed 8th January, 2017, <https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_ensuring_long-term_us_leadership_in_semiconductors.pdf>; Talley, Ian, *Chinese Access to U.S. Semiconductor Industry May be Curbed*, *The Wall Street Journal*, 2nd January, 2017, viewed 8th January, 2017, <<http://www.wsj.com/articles/chinese-access-to-u-s-semiconductor-industry-may-be-curbed-1483397701>>



move up the value chain.

- Avoid creating overcapacity in the industry which would run the risk of slowing down innovation globally.
- Refrain from politically-driven acquisition bids that distort the industry's global M&A market and run the risk of creating a global pushback from the industry.

7.1.2 Robotics

Concern

Serious overcapacity is emerging in the low and mid-tiers of the industrial robotics market, largely as a result of central and local government subsidies. This represents a gross misallocation of resources and will not effectively support the domestic industry in moving up the value chain.

Assessment

Government plans

Industrial robotics is one of the industries in which CM2025 represents an ongoing attempt by the Chinese authorities to improve their industry position.¹⁶⁹ In December 2013, the MIIT released the *Guidance Promoting the Development of the Robot Industry*, which included goals through to 2020.¹⁷⁰ After CM2025 was announced, the first FYP for the robotics industry was also released by the MIIT, the NDRC and the MOF in April 2016.¹⁷¹ These are just two of the state plans that have been formulated for the industry over the last decade that demonstrate a persistent and determined approach by the authorities towards developing it.

Government officials have also made significant public announcements regarding their intentions for the industry. For example, Liu Tao from the Equipment Department of the MIIT stated: "policies [concerning the robotics industry] will include subsidies for companies who buy local brand robots, and a national merger and acquisition fund to help Chinese makers acquire world-advanced technologies from foreign companies."¹⁷²

Reported state of the industry

Partly spurred by subsidies, industrial robotics has recently become a hot industry in China, with the authorities encouraging domestic companies to automate parts of their production processes. According to the IFR, China was the largest market in the world for industrial robotics in 2015, accounting for 27 per cent of total demand, with this figure projected to grow to 40 per cent by 2019.¹⁷³ According to the Chinese Robot Industry Alliance, in 2015, domestic Chinese producers supplied about 20,400 units with sales volumes up 29 per cent over 2014 levels. However, it is possible that firms have exaggerated these numbers as industry experts based in the market have not been able to identify where all of these robots have ended up.¹⁷⁴

International producers, including their China-based production, supplied the remaining 48,100 of the total of about 68,600 units sold in 2016, and saw their total sales in the market increase 17 per cent year-on-year.¹⁷⁵

¹⁶⁹ While service robotics is a separate field and includes those used in the service industry and the home, it is not addressed in this report. Some of the primary sources for this section of the report were found in, Tai et al, *Planning for Innovation: Understanding China's Plans for Technological, Energy, Industrial and Defense Development*, US-China Economic and Security Review Commission, p. 231, viewed 5th October, 2016, <<http://www.uscc.gov/Research/planning-innovation-understanding-china%E2%80%99s-plans-technological-energy-industrial-and-defense>>

¹⁷⁰ *Guidance Promoting the Development of the Robot Industry*, MIIT, 30th December, 2013, viewed 10th January, 2017, <<http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057585/n3057589/c3616479/content.html>>

¹⁷¹ *Notification of Three Ministries Releasing Robotics Industry Development Plan, 2016-2020*, MIIT, 27th April, 2016, viewed 9th January, 2017, <<http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757018/c4746362/content.html>>

¹⁷² Tan, Yangzi, *China to Give Robot Makers Subsidies and Funding*, *China Daily*, 16th September, 2015, viewed 2nd January, 2017, <http://www.chinadaily.com.cn/regional/chongqing/liangjiang/2015-09/16/content_21908074.htm>

¹⁷³ *World Robotics Report 2016: European Union Occupies Top Position in the Global Automation Race*, International Federation of Robots, 29th September, 2016, viewed 2nd December, 2016, p. 2, <<http://www.ifr.org/news/ifr-press-release/world-robotics-report-2016-832/>>

¹⁷⁴ Interview with industry experts from InterChina Consulting, 1st November, 2016.

¹⁷⁵ *Executive Summary, World Robotics Industrial Robots*, International Federation of Robots, 11th September, 2016, viewed 3rd January, 2017, p. 12, <http://www.ifr.org/fileadmin/user_upload/downloads/World_Robotics/2016/Executive_Summary_WR_Industrial_Robots_2016.pdf>

Government subsidies and the industry's response

Chinese companies in the industry have to compete with foreign ones with stronger technological capabilities. Furthermore, their ability to move up the value chain has been complicated by government support that is often poorly designed and coordinated. By mid-2016, 28 provinces and provincial-level cities had designated robotics as a priority sector.¹⁷⁶ Multiple cities and provinces have also set up funds through which their local industry can be supported. For example, Guangdong Province established a fund of CNY 16.8 billion with the goal of having more than 1,950 companies replace workers with robots during the period 2015 to 2017.¹⁷⁷ During the period 2014 to 2016, Dongguan in Guangdong also budgeted EUR 27.4 million per year for technological transformation through a plan to substitute workers with machines. Similarly, for the period 2014 to 2020, Shenzhen has budgeted EUR 68.6 million per year for the robotics, wearables and intelligent equipment industry.¹⁷⁸

In total, in 2014 and 2015, 77 local governments were found to have policies in place to provide support to local robotics companies and their customers.¹⁷⁹ For example, in Dongguan, companies can receive a subsidy of up to EUR 274,000 for 10 per cent of their investment in replacing workers with robots. In Foshan, companies receive a one-time subsidy of EUR 137,000 for the first purchase of domestic robots, while in Wuhu city companies have reportedly been able to receive a 100 per cent subsidy for the first purchase of locally-produced robots.¹⁸⁰

Chinese academics, journalists and industry experts have analysed in great detail the problems that this situation is creating. For one, funding for basic research and the development of advanced skills in the workforce has been generally found to be lacking.¹⁸¹ This makes it harder for Chinese companies to strengthen their own capacity while they simultaneously face intense competition at the low end of the market that has resulted from the subsidies that have attracted new domestic entrants into the market.

This is reflected in a 2016 report, which stated that nearly half of the 800 companies in the industry, at that time, were empty brands that lacked products.¹⁸² As much as 70 to 80 per cent of the other half were said to be agents for other companies' products, with only about 100 companies actually able to produce components or finished robots themselves. This number is likely highly conservative given that by April 2016, there were more than 3,400 companies in the robotics industry according to MIIT figures.¹⁸³ In Dongguan alone, 400 companies purport to be in the industry.¹⁸⁴

Even of those that do sell robots, many are primarily involved in assembling components produced by foreign companies. For example, for critical components 80 to 90 per cent reportedly use foreign reducers, 60 to 70 per cent use foreign motors and 40 to 50 per cent use foreign controllers.¹⁸⁵ This is particularly significant in the case of more advanced equipment like six-axis articulated robots, which require high levels of precision and therefore include six reducers. As a result, the total value of the finished product accounted for by domestic companies is

176 *Domestic Robots Only Account for 8% of the Market, How can Indigenous Brands Break out of Encirclement?*, Finance Sina, 9th July, 2016, viewed 2nd January, 2017, <<http://finance.sina.com.cn/roll/2016-07-11/doc-iftwchx8429881.shtml>>

177 *Supporting the Robotics Industry, the Influence of Government Capital Must be Proper*, Business Sohu, 4th September, 2016, viewed 2nd December, 2016, <<http://business.sohu.com/20160904/n467569700.shtml>>

178 Feng, Qingyan, *Investigation of Chaos with Robot Subsidies, Local 'Great Leap Forward' Pulls Toward Overcapacity Alert*, Economic Observer, 30th April, 2016, viewed 2nd January, 2017, <<http://www.eeo.com.cn/2016/0430/285698.shtml>>

179 Hu, Jiayuan, *Subsidies for the Robotics Industry Must Guard Against the Risk of Overcapacity*, Economic Observer, 21st May, 2016, viewed 2nd January, 2017, <<http://www.eeo.com.cn/2016/0521/287597.shtml>>; *Domestic Robots Only Account for 8% of the Market, How can Indigenous Brands Break out of Encirclement?*, Finance Sina.

180 *Supporting the Robotics Industry, the Influence of Government Capital Must be Proper*, Business Sohu, 4th September, 2016, viewed 2nd December, 2016, <<http://business.sohu.com/20160904/n467569700.shtml>>

181 Ibid

182 *Domestic Robots Only Account for 8% of the Market, How can Indigenous Brands Break out of Encirclement?*, Finance Sina, 9th July, 2016, viewed 2nd January, 2017, <<http://finance.sina.com.cn/roll/2016-07-11/doc-iftwchx8429881.shtml>>

183 He, Huifang, *How the World's Largest Market for Industrial Robotics is Allegedly Propped up by Deceit*, South China Morning Post, 31st May, 2016, viewed 2nd December, 2016, <<http://www.scmp.com/tech/china-tech/article/1960763/how-worlds-largest-market-industrial-robots-allegedly-propped-deceit>>

184 *Xinhua Insights: Chinese Manufacturing Hub on Frontlines of Robot Revolution*, Xinhua, 1st March, 2016, viewed 2nd January, 2017, <<http://icbc.com.cn/icbc/investment/financial%20news/XinhuaInsightChineseManufacturingHubonFrontLinesofRobotRevolution.htm>>

185 *Sale of Robots in China Ranked Number One, but All Core Components Are Imports*, Sina Military, 16th January 16, 2015, viewed 9th January, 2017, <<http://mil.news.sina.com.cn/2015-01-16/1007818423.html>>; Chen, Nick, *Rise of the Machines: Robot Industry Leads China Manufacturing 2025 Strategy*, EURObiz, 6th December, 2016, viewed 2nd January, 2017, <<http://www.eurobiz.com.cn/rise-of-the-machines-robot-industry-leads-china-manufacturing-2025-strategy/>>



often very low, especially in higher-end market segments.

Too many industrial parks

To make matters worse, this industry overexpansion is accompanied by the more than 40 industrial parks for the robotics industry that have either already been established, or at least announced, at a cost of tens of billions of euros.¹⁸⁶ With a limited number of companies available to occupy these parks, despite the incentives offered, they often do not justify the government investments that brought them into being. The Chinese Robot Industry Alliance (CRIA) has stated that planning for local industrial parks for the robotics industry lacks scale, with enterprises left scattered, chaotic and with limited differentiation between them in terms of their products' technology.¹⁸⁷ Similar conclusions have been drawn in the Chinese business press.¹⁸⁸ MERICS has calculated that cumulative 2020 targets at the provincial and city level for the domestic industry amount to roughly six times the projected domestic demand, with associated pledges for subsidies amounting to nearly EUR 5.5 billion.¹⁸⁹

Overcapacity and wrongdoing result

Yao Zhiju, Deputy Secretary General of the CRIA,¹⁹⁰ has stated that the robotics industry has experienced a 'great leap forward' due to enthusiasm among local governments and the ensuing subsidies.¹⁹¹ While central-government programmes tend to have more stringent requirements, some of the support for the domestic industry has been wasted. Some domestic companies have found ways to cheat the system in order to receive subsidies—despite the fact that their production levels are lower than stated—even though they merely assemble components produced by other companies, or even purchase finished goods and rebrand them as their own.¹⁹² Others have reportedly established multiple shell companies in order to gain more subsidies.¹⁹³ Even though many local authorities attempt to evaluate companies before they receive support, they do not always possess the industry-specific expertise necessary to do so. The sheer number of companies currently operating in the industry also complicates these efforts.

Wang Cairong, Executive Director of the China Artificial Intelligence Industry Robot Alliance, has stated that "the industry is in a subsidies-driven bubble" and that "it is time to launch a nationwide campaign to investigate these companies which have received subsidies through deceit or illicit connections."¹⁹⁴ Song Shaogong, Secretary General of China's Robot Industry Alliance, has also stated that the government should focus on establishing an environment in which fair competition can take place.¹⁹⁵

There have been reports that some SMEs that lack government connections find themselves unable to access subsidies while companies that provide a larger source of tax revenues for local governments are able to do so

- 186 *Domestic Robots Only Account for 8% of the Market, How can Indigenous Brands Break out of Encirclement?*, Finance Sina, 9th July, 2016, viewed 2nd January, 2017, <<http://finance.sina.com.cn/roll/2016-07-11/doc-iftwchx8429881.shtml>>; Hu, Jiayuan, *Subsidies for the Robotics Industry Must Guard Against the Risk of Overcapacity*, Economic Observer, 21st May, 2016, viewed 2nd January, 2017, <<http://www.eeo.com.cn/2016/0521/287597.shtml>>; Tai et al, *Planning for Innovation: Understanding China's Plans for Technological, Energy, Industrial and Defense Development*, US-China Economic and Security Review Commission, p. 219, viewed 5th October, 2016, <<http://www.uscc.gov/Research/planning-innovation-understanding-china%E2%80%99s-plans-technological-energy-industrial-and-defense>>
- 187 Feng, Qingyan, *Investigation of Chaotic Subsidies for Robots, Local 'Leap Forward' Pulls Toward Warning of Overheating*, Economic Observer, 30th April, 2016, viewed 3rd December, 2016, <<http://www.eeo.com.cn/2016/0430/285698.shtml>>
- 188 Ibid
- 189 Wubbeke, Jost et al., *Made in China 2025: The Making of a High-Tech Superpower and Implications for Industrial Countries*, MERICS, December 2016, no. 2, p. 25, <<https://www.merics.org/en/merics-analysis/papers-on-china/made-in-china-2025/>>
- 190 *Domestic Robots Only Account for 8% of the Market, How can Indigenous Brands Break out of Encirclement?*, Finance Sina, 9th July, 2016, viewed 2nd January, 2017, <<http://finance.sina.com.cn/roll/2016-07-11/doc-iftwchx8429881.shtml>>
- 191 Feng, Qingyan, *Investigation of Chaotic Subsidies for Robots, Local 'Leap Forward' Pulls Toward Warning of Overheating*, Economic Observer, 30th April, 2016, viewed 3rd December, 2016, <<http://www.eeo.com.cn/2016/0430/285698.shtml>>
- 192 *Supporting the Robotics Industry, the Influence of Government Capital Must be Proper*, Business Sohu, 4th September, 2016, viewed 2nd December, 2016, <<http://business.sohu.com/20160904/n467569700.shtml>>
- 193 *Domestic Robots Only Account for 8% of the Market, How can Indigenous Brands Break out of Encirclement?*, Finance Sina, 9th July, 2016, viewed 2nd January, 2017, <<http://finance.sina.com.cn/roll/2016-07-11/doc-iftwchx8429881.shtml>>
- 194 He, Huifang, *How the World's Largest Market for Industrial Robotics is Allegedly Propped up by Deceit*, South China Morning Post, 31st May, 2016, viewed 2nd December, 2016, <<http://www.scmp.com/tech/china-tech/article/1960763/how-worlds-largest-market-industrial-robots-allegedly-propped-deceit>>
- 195 *Supporting the Robotics Industry, the Influence of Government Capital Must be Proper*, Business Sohu, 4th September, 2016, viewed 2nd December, 2016, <<http://business.sohu.com/20160904/n467569700.shtml>>

despite not necessarily possessing strong technology.¹⁹⁶ In other instances, local governments may award some of the subsidies to local SOEs regardless of their technological capacity.¹⁹⁷

There are reports that some leading companies depend on government subsidies for 30 to 68 per cent of their profits¹⁹⁸ – were it not for subsidisation of manufacturing and sales, many of these smaller companies would simply have to exit the market. Instead, with multiple sub-regions having invested significant resources into developing their local industries, the market is left fragmented with Chinese companies in a poor position to scale up in the face of local protectionism, or for the industry as a whole to consolidate. This situation makes it difficult to establish the nationwide industry standards across competing sub-regions that would allow for more efficient development of the industry, and that would also support the broader manufacturing industry.¹⁹⁹

Industry ramifications

Due to the number of domestic companies that have entered the market, and the overcapacity at the lower end of the market that has resulted, it is difficult even for leading Chinese companies to reach a scale of operations that would allow them to purchase key components at a price comparable to that available to large international companies who make orders on a far larger scale.²⁰⁰ Domestic companies therefore find themselves paying twice as much for reducers, which can account for well over a third of the cost structure of their six-axis robots.²⁰¹ This renders it difficult for them to compete in higher-value segments and leaves them primarily focused on areas like handling, loading and unloading, welding and brazing, and assembly and disassembly.

Outlook

Some of these problems have already been publicly recognised by the Chinese authorities. Xin Guobin, Deputy Minister of the MIIT, has stated that concerns about overcapacity in the industry are not unfounded – the top ten domestic companies also face this issue, which makes it difficult to benefit from scaling up production.²⁰² While government can be expected to continue to provide support in the near term, domestic manufacturers need to get their products into service, both to improve their quality and to prove that they can operate to a higher standard in a manufacturing environment. As prices in multiple segments of the industry are on a downward trend, they will eventually become more commoditised in these areas. The ability of manufacturers to maintain and service installed robots to high standards is therefore of increasing importance. Overcapacity makes none of these tasks easier.

This also means that the software is just as important as the hardware that it runs. The motion management and control parameters needed to reach manufacturing requirements, as well as safety and industry standards, are difficult to meet. Assembling the components in a robotic arm is therefore the ‘easy’ part. The Internet of Things (IoT) and analytical applications deriving from it are drivers of many of the most advanced Industry 4.0 manufacturing processes. The capacity required to integrate robots into manufacturing and to have them work with all other equipment and systems is one issue. Going forward the larger challenge will be to ensure that they can be easily programmed, connected and run together as well as to analyse and make use of all the data they produce. Otherwise, only a fraction of their potential capacity will be utilised.

196 Feng, Qingyan, *Investigation of Chaotic Subsidies for Robots, Local ‘Leap Forward’ Pulls Toward Warning of Overheating*, *Economic Observer*, 30th April, 2016, viewed 3rd December, 2016, <<http://www.eeo.com.cn/2016/0430/285698.shtml>>

197 He, Huifang, *How the World’s Largest Market for Industrial Robotics is Allegedly Propped up by Deceit*, *South China Morning Post*, 31st May, 2016, viewed 2nd December, 2016, <<http://www.scmp.com/tech/china-tech/article/1960763/how-worlds-largest-market-industrial-robots-allegedly-propped-deceit>>

198 Dai, Chunchen, *National Industrial Robot 100 Million RMB Club Scan: Going Toward the Trap of Commodification*, *Sina.com*, 14th September, 2016, viewed 2nd December, 2016, <<http://finance.sina.com.cn/roll/2016-09-14/doc-ixvueif6741297.shtml>>; Hu, Jiayuan, *Subsidies for the Robotics Industry Must Guard Against the Risk of Overcapacity*, *Economic Observer*, 21st May, 2016, viewed 2nd January, 2017, <<http://www.eeo.com.cn/2016/0521/287597.shtml>>

199 Hu, Jiayuan, *Subsidies for the Robotics Industry Must Guard Against the Risk of Overcapacity*, *Economic Observer*, 21st May, 2016, viewed 2nd January, 2017, <<http://www.eeo.com.cn/2016/0521/287597.shtml>>

200 *Chinese Industrial Automation Primer*, InterChina Consulting, 27th October, 2015, p. 18.

201 Ibid; Dai, Chunchen, *National Industrial Robot 100 Million RMB Club Scan: Going Toward the Trap of Commodification*, *Sina.com*, 14th September, 2016, viewed 2nd December, 2016, <<http://finance.sina.com.cn/roll/2016-09-14/doc-ixvueif6741297.shtml>>

202 *Domestic Robots Only Account for 8% of the Market, How can Indigenous Brands Break out of Encirclement?*, *Finance Sina*; *Chinese Industrial Automation Primer*, InterChina Consulting, 27th October, 2015, p. 18.



This does not mean that China will not become an increasingly important actor in the industrial robotics industry. With China only having 49 robots installed per 10,000 workers in 2015, compared to 531 in Korea, 301 in Germany, 212 in Sweden, 188 in Denmark and the global average sitting at 69, there is obviously a great deal of room for growth.²⁰³ With the cost of robots dropping while wages in many regions of China rise there are also market-driven reasons for companies to invest in automation with the payback period falling to just two years.²⁰⁴ It is therefore possible that one or two of the top four private Chinese firms in the industry will eventually join the first tier of international firms. Their success, though, would certainly come despite, not because of, the overcapacity and chaos that have resulted from subsidisation.

Against this background, the Chinese authorities' latest goal is to raise the installation of industrial robots to 150 per 10,000 workers by 2020.²⁰⁵ This would necessitate bringing an additional 600,000 to 650,000 robots into use during the period 2016 to 2020, a number roughly two and a half times the global sales in 2015.²⁰⁶ A continuation of the current approach in a blind attempt to meet this target would lead to the installation of more robots of questionable quality. This would not effectively support China's overall CM2025 initiative, nor would it strengthen the technological capacity of the domestic robotic industry.

Parallels between the acquisition of Kuka and the proposed acquisition of Syngenta

In mid-2016, the private Chinese white goods manufacturer Midea acquired the German industrial robotics company Kuka for EUR 4.6 billion in a deal that was alleged to have been financed privately.²⁰⁷

In February 2015, the SOE China National Chemical Corporation (ChemChina)—which recently acquired leading Italian tyre company Pirelli for EUR 7.1 billion and German rubber machinery manufacturer KraussMaffei Group for EUR 925 million—agreed to pay EUR 41 billion to acquire the Swiss company Syngenta AG.²⁰⁸

The latter's focus on seed technology and pesticides aligns with the CM2025 priorities for the agricultural industry.

At first, these two transactions appear to have little in common. However, they do raise important questions for European business.

In both cases, the Chinese party was looking to make an acquisition outside their core business focus. SinoChem Group—who, significantly, may merge with ChemChina²⁰⁹—has operations in seeds, fertilisers and agrochemicals, a line of business that would create synergies with Syngenta. Certainly more so than ChemChina, it must be said, whose focus is on chemicals, oil processing, tyre and rubber products and chemical equipment.

This attempted deal could well reflect the CEO of ChemChina's desire to continue building an empire. However, at the same time it also raises the question of whether there may have been government encouragement for it to step forward as acquirers, in order to avoid potential antitrust reviews in Europe that could have taken place if a company from the same industry had made an approach. This same question was asked of the Kuka acquisition.

In the cases of both Kuka and Syngenta, the Chinese parties also made an offer that provided a significant premium on the market capitalisation of their desired acquisitions. While this represented an attractive deal for shareholders—and no doubt eased their acceptance of the offers made—it does not mean that the Chinese companies have overpaid. If the acquired companies, which possess highly competitive technologies, ultimately find their access to the Chinese market improves greatly—and does so at the expense of other foreign businesses—these deals would be viewed as good value. However, this outcome would likely have a negative impact on their respective industries more broadly.

Though no clear conclusions can be drawn at present, these cases merit serious consideration.

203 *World Robotics Report 2016: European Union Occupies Top Position in the Global Automation Race*, International Federation of Robots, 29th September, 2016, viewed 2nd December, 2016, p. 2, <<http://www.ifr.org/news/ifr-press-release/world-robotics-report-2016-832/>>

204 *Chinese Industrial Automation Primer*, InterChina Consulting, 27th October, 2015, p. 6.

205 Sheahan, Maria, *China Seeks Top-10 Automation Ranking by 2020: Robot Industry Group*, Reuters, 22nd July, 2016, viewed 4th January, 2017, <<http://www.reuters.com/article/us-china-robots-forecast-idUSKCN102104>>

206 *World Robotics Report 2016: European Union Occupies Top Position in the Global Automation Race*, International Federation of Robots, 29th September, 2016, viewed 2nd December, 2016, p. 2, <<http://www.ifr.org/news/ifr-press-release/world-robotics-report-2016-832/>>

207 Hopner, Axel and Buchenau, Martin-Werner, *In Kuka Deal, Door Opens to China*, Handelsblatt, 29th June, 2016, viewed 4th January, 2017, <<https://global.handelsblatt.com/edition/460/ressort/companies-markets/article/kuka-backs-chinese-bid>>

208 The ultimate outcome of this deal is still unclear, due to the highly complex funding structure and the number of jurisdictions in which regulatory approvals are required.

209 Yang, Ziman, *ChemChina, SinoChem to be Merged, Sources Disclose*, China Daily, 15th October, 2016, viewed 4th January, 2017, <http://www.chinadaily.com.cn/business/2016-10/15/content_27069571.htm>

Recommendations

- Stop local governments from providing subsidies to the robotics industry.
- Prevent additional duplicative industrial parks from being established by local governments in locations where there is no clear business case for doing so.
- Focus government support on facilitating R&D instead of sales subsidies.

7.1.3 NEVs

Concern

In a move that contravenes China's WTO obligations, European business is being pressured to transfer core technology in exchange for near-term market access. Furthermore, foreign companies face serious constraints on market access for NEV batteries, and a high percentage of the subsidies that the central and local authorities have provided to the industry have been directed to favoured domestic companies that often lack strong technological capacity. The recent move to establish a carbon credit trading system also fails to establish an even playing field between foreign and domestic companies.

Assessment

Industry Background

The Chinese authorities began to direct attention towards the NEV industry—which broadly includes plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs)—well in advance of the launch of CM2025. This includes through the 2009 *Guidelines for Adjusting and Promoting the Automobile Industry* and more recently the 2012 *Energy Saving and New Energy Vehicle Industry Development Guidelines*.

The 2009 guidelines and other measures have been accompanied by significant financial support. For example, a report prepared for the US-China Economic and Security Review Commission (USCESRC) found that from the early 1990s onwards, China has invested over EUR 5.1 billion in the electric vehicle industry.²¹⁰ However, while some Chinese companies in this field enjoy strong capabilities,²¹¹ the support that the central and local authorities have provided has posed a range of problems.

Pressure for technology transfers

It is already established that foreign companies are only been able to control up to 50 per cent of JVs in the industry, that the JV's production has to be sold under a new brand name instead of foreign companies' existing one and that the Chinese party to the JV must control at least one of three key technologies.

However, the recently passed *Administrative Regulations on Market Access of New-energy Automobile Manufacturers and Products* includes additional requirements that will make the prerequisites to qualify as a NEV manufacturer in China significantly more stringent.²¹² It will require NEV manufacturers to demonstrate that they have mastered the development and manufacturing technology for the complete NEV, not just for one of three core technologies as stipulated in the earlier rules, and possess core NEV-specific R&D capabilities.

In practice this would mean that foreign original equipment manufacturers (OEMs) will need to disclose and transfer

210 Tai et al, *Planning for Innovation: Understanding China's Plans for Technological, Energy, Industrial and Defense Development*, US-China Economic and Security Review Commission, p. 231, viewed 5th October, 2016, <<http://www.uscc.gov/Research/planning-innovation-understanding-china%E2%80%99s-plans-technological-energy-industrial-and-defense>>

211 It is true that BYD produced more NEVs than Tesla in 2015 and also had a stronger position in the battery storage industry. Fickling, David and Tim Culpán, *Take That, Tesla*, *Bloomberg*, 21st July, 2016, viewed 5th January, 2017, <<https://www.bloomberg.com/gadfly/articles/2016-07-21/take-that-tesla>> However, it should be recognised that in the case of BYD, this is in part due to large government subsidies. For example, during the five-year period ending 31st December, 2015, the company received a total of EUR 400 million of direct support against profits of EUR 880 million during the same period. In 2012 and 2014, subsidies also outstripped its total profits. Clifford, Mark, *Chinese Government Subsidies Play Major Part in Electric Car Maker BYD's Rise*, *Forbes*, 16th July, 2016, viewed 5th January, 2017, <<http://www.forbes.com/sites/mclifford/2016/07/26/with-a-little-help-from-its-friends-lavish-chinese-government-help-for-top-electric-car-maker-byd/#5e097b961533>>

212 *Administrative Regulations on Market Access of New-energy Automobile Manufacturers and Products*, MIIT, 17th January, 2017, viewed 17th January, 2017, <<http://www.miit.gov.cn/newweb/n1146295/n1146557/n1146624/c5462995/content.html>>



critical know-how to the JV and, presumably, localise it. Disclosure and localisation requirements will be particularly applied to: whole vehicle control systems; interfaces and boundaries between NEV core components; engine and powertrain control systems; and trial production/assembly and testing. Importing any parts that rely on sensitive IP into China, instead of having the JV and its domestic suppliers produce them, will therefore be prohibited.

Unfortunately, while the law permits Chinese parent companies' NEV competence to be attributed to its subsidiary in a Sino-foreign JV, this treatment is not afforded to foreign companies. It is therefore only the foreign partner who is required to transfer core technology to the JV.

With adoption taking place on 30th December, 2016, less than a month after the draft was released, it did not fulfil China's WTO accession commitments to afford a 60-day comment period; as the law enters into force on 1st July, 2017, there is also no reason to believe that there were ever any plans to seriously consider any comments received. Furthermore, OEMs will only have six months to come into compliance with its wide-reaching requirements.

Ultimately, the law is also contrary to China's WTO commitment to not condition investment on technology transfer. Unfortunately, this development is yet another example that European business is not being permitted to fully participate in China's ecosystem for innovation as an equal partner in this industry.

Market access

At the same time, market access for foreign business is seen to be shrinking. Samsung SDI and LG Chem are two of the world's leading producers of lithium ion NEV batteries, the only class of NEV battery that is eligible for subsidies in China. In October 2015, both of them established plants in China with the capacity to produce 40,000 and 50,000 thousand units per year respectively. However, in July 2016, they were left off a list of 31 companies included in the fourth round of certifications for approved battery suppliers which the MIIT oversees.²¹³ The relevant authorities stated that this was due to the fact that their Chinese factories had been in operation for less than a year, a requirement that had not previously been announced.²¹⁴ Both companies were ultimately also left off the list resulting from a fifth round of battery certifications on 29th December, 2016.²¹⁵

It may not ultimately matter for these companies, as a draft law released by the MIIT in November 2016 would, if ultimately implemented unchanged, stipulate a minimum annual production requirement for NEV battery plants of eight gigawatt hours (GWh).²¹⁶ This is well above the capacity in Samsung SDI and LG Chem's respective facilities in China.

This has led at least one Chinese firm which has previously sourced from Samsung to discontinue models until they are once again designated as approved suppliers.²¹⁷ Due to engineering and cost considerations, OEMs also only want to use one battery globally per NEV model. This raises the question of whether in the longer term, as the competitiveness of Chinese batteries improves, OEMs will be pushed to use them in exchange for market

213 Cho, Jin-young, *The Real Reason Samsung SDI, LG Chem Failed to Get EV Certification Due to Short Period of Operation*, *Business Korea*, 23rd June, 2016, viewed 5th January, 2017, <<http://www.businesskorea.co.kr/english/news/industry/15067-real-reason-samsung-sdi-lg-chem-failed-get-ev-battery-certification-due-short>>; Deign, Jason, *South Korean Battery Makers Face a Surprising Challenge in China*, *Green Tech Media*, 30th June, 2016, viewed 5th January, 2017, <<https://www.greentechmedia.com/articles/read/South-Korean-Battery-Makers-Face-a-Surprise-Challenge-in-China>>

214 Cho, Jin-young, *The Real Reason Samsung SDI, LG Chem Failed to Get EV Certification Due to Short Period of Operation*, *Business Korea*, 23rd June, 2016, viewed 5th January, 2017, <<http://www.businesskorea.co.kr/english/news/industry/15067-real-reason-samsung-sdi-lg-chem-failed-get-ev-battery-certification-due-short>>

215 *Notice on the Adjustment of Financial Subsidies for the Promotion and Application of New Energy Vehicles*, MIIT, 30th December, 2016, viewed on 12th January, 2017, <<http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057585/n3057590/c5449526/content.html>>; *The List of Subsidies for Chinese Electric Vehicles is Released, Samsung and LG are Left Off*, *www.0car0.com*, 4th January, 2017, viewed on 12th January, 2017, <<http://www.0car0.com/xnynews/xnysc/2017/0104/258463.html>>

216 Call for comments on <Regulations on Auto Power Battery Industry (2017)>, MIIT, 22nd November, 2016, viewed on 10th January, 2017, <<http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057585/n3057589/c5375253/content.html>>

217 *Samsung Left off China EV List Spooks Jianghuai Auto*, *Bloomberg*, 10th July, 2016, viewed 5th January, 2017, <<https://www.bloomberg.com/news/articles/2016-07-11/samsung-left-off-china-battery-list-spooks-ev-maker-jianghuai>>; Cho, Jin-young, *Samsung SDI, LG Chem Ready for China's Fifth Battery Certification*, *Business Korea*, 22nd August, 2016, viewed 5th January, 2017, <<http://www.businesskorea.co.kr/english/news/industry/15606-battery-certification-china-samsung-sdi%E2%80%A2lg-chem-ready-china%E2%80%99s-fifth-battery>>

access.²¹⁸

Subsidies

Subsidies and government procurement have been used as important tools for supporting the development of the NEV industry.²¹⁹ For example, the State Council released guidelines in September 2015, which required that government-funded organisations source NEVs for more than 30 per cent of their buses and cars. Local governments that fail to meet this requirement will see the subsidies they receive for fuel and operating expenses reduced.²²⁰ While the US and other countries have also offered tax credits and other forms of support for NEVs, in China only domestically- and, in some cases, only locally-produced vehicles are eligible for support.

Subsidies led to enormous year-on-year sales growth of 343 per cent to 331,000 units in 2015.²²¹ However, they also contributed to a situation in which a large number of domestic companies rely on them to stay in business. After trailing manufacturing throughout the year, sales also only caught up that December when the public sector stepped in to make large purchases. The same trend was observed in 2016,²²² a year in which total sales ultimately surpassed 500,000 units.

No doubt in part due to that dynamic, the NDRC has publicly stated that this support is increasingly unsustainable as the scale of NEV sales has increased.²²³ For example, Bernstein has calculated that based on a conservative assumption of EUR 8,200 in total subsidies per unit, the total cost for 2016 would amount to at least EUR 2.2 billion, a number that will only rise in subsequent years. This is reflected in the MIIT's target to sell two million NEVs by 2020, with a total of 5.58 million units to be sold during the period 2016 to 2020.²²⁴

Chinese experts have publicly commented on the negative impact that these subsidies have had. For example, Chinese People's Political Consultative Congress member and NEV expert Ouyang Minggao has stated that annual electric minibus sales worldwide only amount to 20,000 units. However, Chinese producers "can reach that in one month", as the "current new-energy vehicle development has been motivated by subsidies," he said.²²⁵ Under policies that were still in place in the autumn of 2016, it was possible to gain total per-unit subsidies for buses from the central and local governments as high as EUR 82,000. As this is almost equivalent to total production costs, companies were incentivised to overbuild manufacturing capacity for a product for which the market is already saturated.

The Chinese authorities have already recognised that a large percentage of subsidies has been misallocated to companies that defrauded the government by overstating their production figures or their technological capacity. In the past manufacturers have also been able to qualify by making minor changes in order to convert models with internal combustion engines into hybrids,²²⁶ demonstrating how subsidies often did not drive the development of technological capacity.

218 Zhu, Robin, *Chinese Autos and Energy Storage: Inferiority Complex, or Strategic Imperative? Auto Industry Views on China's EV Protectionism*, Bernstein, 3rd August, 2016, p. 6.

219 As the section on the industrial robotics industry outlines dynamics and outcomes related to subsidies and local protectionism at length, less detail is provided regarding the same dynamics in the NEV industry.

220 Hao, Yan, *New-Energy Vehicles to Get Renewed Push*, *China Daily*, 30th September, 2015, viewed 15th December, 2016, <http://www.chinadaily.com.cn/business/motoring/2015-09/30/content_22017079.htm>

221 Chan, Vincent et al, *Ecosystem of Innovation and Technology in China*, Credit Suisse, 26th October, 2016, p. 76.

222 Zhu, Robin, *Chinese Autos: What's Going on in China? Our Latest Channel Checkers and (Finally) New Data Tracking Underlying Sales*, Bernstein, 1st November, 2016, pp. 12-13.

223 Zhu, Robin et al, *Chinese Autos: Carbon Credit Trading Confusion – Untangling the Facts, the Known Unknowns, and Potential Opportunities*, Bernstein, 24th November, 2016, p. 3.

224 Ibid, p. 1.

225 An, Limin et al, *China Hammers Out Tougher Subsidy Plan for Electric Vehicles*, *Caixin*, 30th September, 2016, viewed 5th January, 2017, <<http://english.caixin.com/2016-09-30/100993627.html>>

226 Woetzel et al, *The China Effect on Global Innovation*, McKinsey Global Institute, October 2015, viewed 10th February, 2017, p. 89, <<http://mckinseychina.com/the-china-effect-on-global-innovation/>>



Ultimately, in 2016, a number of companies were fined for fraud and requirements for receiving support were tightened.²²⁷ The Chinese press also reported that in some cases the companies punished may have actually been coordinating with local authorities in order to fraudulently receive these subsidies. This conclusion was drawn due to the fact that local government is required to review production certificates, sales records and vehicle registration before applications for subsidies could be handed over to the central government for final approval.

Under a new policy issued at the end of December 2016, subsidies for passenger vehicles are scheduled to drop by 20 per cent over 2017 to 2018 versus 2016 levels; and from 2019 to 2020, subsidies for all NEVs, except fuel cell vehicles, will be decreased by a further 20 per cent versus 2016 levels, before being entirely phased out in 2020.²²⁸ The policy also limits local government subsidies to 50 per cent or less of the value of those offered by the central government, making the overall decrease in subsidies even more pronounced. The market for NEVs is therefore likely to grow at a far slower pace as a higher percentage of their total price will be paid by consumers. Adjustments to subsidies in the near term are also making it difficult for manufacturers to make necessary market projections years in advance of future production.

This is not to say that government support is being brought to an end. As in the semiconductor industry, government-backed funds will support the development of the industry, including through the National Advanced Manufacturing Industry Fund that made a EUR 200 million investment in the Chinese NEV producer BYD,²²⁹ the National SME Fund and the Venture Capital Guiding Fund for Emerging Industries.²³⁰

Local protectionism

Due to attempts by multiple regions to build their own NEV industries, and the protectionism that is associated with it, it is difficult for most Chinese companies with strong technology and products to scale up to a size that will allow them to compete in international markets. Even before CM2025 was announced, there were reports in the Chinese press that local protectionism made it difficult for domestic enterprises to enter the majority of other Chinese cities' markets. The state-run newspaper *People's Daily* concluded that local protectionism in the industry was slowing down the development of high-quality local products, as local governments are not willing to extend subsidies to products from other regions.²³¹ There is no evidence that this dynamic has subsequently changed.

Credit trading system

Recognising the drawbacks of the subsidy-driven approach and associated local protectionism for developing the industry, in January 2016, then Finance Minister Lou Jiwei publicly stated: "Credit trading is the most effective way to ensure government neutrality on the technologies' development. The market should be able to choose the technological route."²³²

On 5th December, 2016, the MIIT released the *Tentative Administrative Rules on Enterprises Average Fuel Consumption and New Energy Vehicle Credits (Tentative Administrative Rules)* for comments. They define the compliance mechanism for corporate average fuel consumption (CAFC) and a NEV quota scheme for manufacturers and importers of conventional vehicles. Under it, the NEV quota that companies will have to meet will already be eight per cent in 2018, rising to 10 and 12 per cent in 2019 and 2020 respectively. Companies that fail to do so will be required to purchase credits from those that do. This is well above the penetration rate of 3.6

227 An, Limin et al, *China Hammers Out Tougher Subsidy Plan for Electric Vehicles*, Caixin, 30th September, 2016, viewed 5th January, 2017, <<http://english.caixin.com/2016-09-30/100993627.html>>

228 *Notice on the Adjustment of Financial Subsidy for the Promotion and Application of New Energy Vehicles*, MIIT, 30th December, 2016, viewed 23rd January, 2017, <<http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757018/c5449722/content.html>>

229 *The National Fund Announces a Billion RMB Private Placement in BYD, Samsung Also Appears*, finance.sina.com, 22nd July, 2016, viewed 23rd January, 2017, <<http://finance.sina.com.cn/stock/hkstock/ggscyd/2016-07-22/doc-ifuuhukv7190727.shtml>>

230 *Everything Old is NEV Again*, Cp.Signal, China Policy, 20th January, 2017, <<http://www.policy.cn.com>>

231 *The Popularisation of NEVs Faces Three Challenges: The Most Difficult is Local Protectionism of Companies*, *People's Daily*, 9th August, 2015, viewed 17th January, 2017, <<http://auto.people.com.cn/n/2015/0809/c1005-27432276.html>>

232 Spring, Jake, *As China Cuts Green Car Subsidies, Automakers' Electric Dreams Differ*, *Reuters*, 23rd January, 2016, viewed 5th January, 2017, <<http://www.reuters.com/article/us-china-subsidies-idUSKCN0V106D>>

per cent that NEVs reached in Beijing, Shanghai and Guangdong during the first nine months of 2016. Elsewhere in China it was only 0.31 per cent over the same period.²³³

The European Chamber would applaud a move toward a more market-driven approach to promoting the industry's development. However, there is a need to plan future production three to four years in advance. The fact that only one year's advance notice has been granted is therefore highly problematic.

Furthermore, under the *Tentative Administrative Rules* CAFC credits can only be transferred between JV/subsidiaries of the Chinese shareholder. By contrast, foreign shareholders are not able to do so between JVs in which they are a partner. This prevents them from taking advantage of the benefits of product specialisation and economies of scale between multiple JVs. On top of this considerable restriction, while Chinese purchase subsidies for NEVs are only granted to locally-made NEVs with imported ones ineligible, importers are still subject to the same NEV quotas as local manufacturers. This places them at a clear disadvantage and further undercuts market-driven competition and innovation.

Alignment with consumer demand and environmental impact

Finally, there is an important question regarding the NEVs being produced in China – *will they ultimately be both too costly and poorly aligned with what Chinese consumers actually want?* The fact that Beijing, Shanghai and Guangdong alone—all of which promote incentives for consumers to buy NEVs—accounted for 67 per cent of total sales during the first nine months of 2016 is certainly not a positive sign.²³⁴ Consumer demand elsewhere currently remains low.

While international companies have favoured a gradual transition, which includes the development of both more fuel-efficient combustion engines and hybrid models, Chinese manufacturers have adopted a different approach.²³⁵ The Chinese company Geely has announced that it aims for 90 per cent of its sales to be in NEVs by 2020, and GAC reportedly wanted to be able to produce 400,000 units per year by the end of 2016. This approach is problematic from an environmental perspective. As a high percentage of the electricity used to power NEVs in China results from burning coal, at current levels of efficiency these vehicles do not contribute to the greening of the country's economy. Instead, they actually produce more pollution than cars with fuel-efficient combustion engines.²³⁶ Bernstein concludes that “efforts to subsidise electric vehicles before de-carbonisation of the energy mix are counterproductive”.²³⁷ The European Chamber agrees.

Recommendations

- Repeal the requirement for FIEs to transfer core technology in exchange for near-term market access.
- Permit domestic companies and JVs in which FIEs are a partner to select the best components for their vehicles, regardless of who holds equity in the companies that produce them.
- Provide domestic companies and FIEs with equal treatment under the carbon credit trading system.
- Focus government support on facilitating R&D instead of sales subsidies.

7.1.4 Advanced rail equipment

Concern

Discrimination against FIEs has increased in procurement for rail contracts and market access has continued to decrease.

²³³ Zhu, Robin, *Chinese Autos: What's Going on in China? Our Latest Channel Checkers and (Finally) New Data Tracking Underlying Sales*, Bernstein, 1st November, 2016, p. 13.

²³⁴ Beveridge, Neil et al, *Bernstein Energy: Oops – Hong Kong (and China) EV Subsidies are Leading to More CO₂ Emissions, Not less*, Bernstein, 13th April, 2016, p. 13.

²³⁵ Spring, Jake, *In China's Electric Car Boom, Global Automakers Select Different Gear*, Reuters, 1st September, 2016, viewed 5th January, 2017, <<http://www.reuters.com/article/us-china-autos-green-idUSKCN11767X>>

²³⁶ Beveridge, *Bernstein Energy: Oops – Hong Kong (and China) EV Subsidies are Leading to More CO₂ Emissions, Not less*, Bernstein, 13th April, 2016, p. 13.

²³⁷ Ibid, p. 6.



Assessment

High-speed Rail

The rail industry presents examples of the sort of negative consequences that Chinese industrial policy can have for European business that may be repeated in other industries covered by CM2025. The Chinese high-speed rail (HSR) industry benefited greatly from the technology that leading international firms transferred during the late 2000s in exchange for near-term market access as China constructed its HSR network.²³⁸ With the procurement process centralised under the Ministry of Railways (MOR), the Chinese authorities were able to maximise technology transfers without licensing requirements.

As the Chinese industry has innovated on its own since it digested this foreign technology,²³⁹ European, Japanese and Canadian firms in the industry have subsequently seen their market access decline rapidly. While foreign companies are not able to have direct relations with Chinese clients, instead serving as subcontractors for Chinese partnerships, over time they have seen their percentage of the value of contracts decline precipitously. Their Chinese competitors have simultaneously moved into international markets.

Recent communications with foreign companies by Chinese authorities that have not been officially published or announced have also stated that in order to maintain market access R&D must be conducted locally and placed in a JV that can operate globally, not just in China or Asia.²⁴⁰ As multinational companies will usually have other units operating in the same industry in other regions, this is an extremely difficult requirement to meet.

The re-merging of China South Locomotive and Rolling Stock Corporation (CSR) and China CNR Corporation (CNR) (which until 2000 had been one company) to form CRRC Corporation Ltd, has created a national champion that is in a position to push profit margins down globally as it continues to benefit from state funding. As CSR and CNR respectively held 30 and 18 per cent global market shares at the time of their merger, the recombined company is far and away the global industry's largest.²⁴¹ Ongoing international expansion ensures that it will be well positioned to use domestic suppliers and technology in new markets.

China is not the only country that provides financial support for its rail industry in international markets. However, the fact that projects have sometimes been taken on for political reasons has meant that Chinese SOEs in the industry have been willing to complete some of them without a margin of profit. This is something that private firms who have to answer to their shareholders cannot do.

Metro systems

In August 2016, the Board Chairman of Knorr-Bremse's Asia Pacific arm stated that over the previous two years there had been a trend in China towards giving preference to domestic companies over FIEs. In the past, FIEs had already had to demonstrate that 70 per cent of their supply chain for metro systems was in China. However, in a move that contravenes China's WTO commitments, in 2015 Knorr-Bremse received tender documents from 11 Chinese cities, including Guangzhou and Kunming, which included new bidding rules that marked FIEs down against firms that were 100 per cent domestically owned.²⁴² In some cases, JVs with a foreign partner are also barred from obtaining necessary licences and qualifications.

Investment in Europe

In November 2016, a Chinese consortium had reached terms for the purchase of GMH Railway Systems, which

²³⁸ Chan, Vincent et al, *Ecosystem of Innovation and Technology in China*, Credit Suisse, 26th October, 2016, pp. 45-46.

²³⁹ Ibid, p. 46.

²⁴⁰ European Chamber communication with multiple industry leaders in the autumn of 2016.

²⁴¹ Tai et al, *Planning for Innovation: Understanding China's Plans for Technological, Energy, Industrial and Defense Development*, US-China Economic and Security Review Commission, 28th July, 2016, viewed 5th October, 2016, p.237, <<http://www.uscc.gov/Research/planning-innovation-understanding-china%E2%80%99s-plans-technological-energy-industrial-and-defense>>

²⁴² Goh, Brenda, *Foreign Rail Firms Shunted as 'Made in China' Mantra Gathers Pace*, Reuters, 2nd August, 2016, viewed 3rd August, 2016, <<http://www.reuters.com/article/us-china-railways-idUSKCN10D2ME>>

includes the HSR and subway wheelsets-manufacturer Bochumer Verein, from its German parent company.²⁴³ One of the participants in the consortium was a private investor whose company makes interior fittings for train carriages. A potential acquisition of the company had first become public about a month earlier, at which time the bidder had instead been a subsidiary of CRRC. It was reported at the time that the benefit to Bochumer Verein would be improved access to the Chinese market while the consortium wanted to use its acquisition's international sales channels to sell its own products abroad.²⁴⁴ While the business case is clear, it also serves to highlight the lack of reciprocity in bilateral investment relations.

As opportunities for European business in China in this industry have simultaneously continued to decline, it is hoped that the Chinese authorities will live up to the pledge Premier Li Keqiang made during a State Council Executive Meeting on 28th December, 2016, to remove access barriers in the railway equipment industry.²⁴⁵ This was subsequently reiterated in article three of the State Council's January 2017 announcement on promoting openness to foreign investment.²⁴⁶ This would be very much in China's own interests, as preventing its own firms from facing competition in their home market cannot be expected to drive innovation.

Recommendations

- Improve market access for FIEs in the rail equipment industry, as per the commitments recently made by Premier Li and the State Council.
- Repeal bidding rules that discriminate against firms that are not 100 per cent domestically owned.
- Remove market access barriers that prevent foreign advanced rail equipment companies from participating in the Chinese market.
- Withdraw the requirement for JVs to be able to operate independently of their FIE parent company in international markets.
- Refrain from using SOEs as commercial tools for achieving political aims in international markets.

7.1.5 Biopharmaceuticals and medical devices

7.1.5.1 Biopharmaceuticals

Concern

In some regions of China, biopharmaceuticals produced by FIEs are put at a clear disadvantage in bids for public procurement tenders. The slow pace of drug approvals also hinders innovation in the industry.

Assessment

Biopharmaceuticals are made from living organisms and are manufactured through biotechnology, or, in some cases, produced synthetically. They "are isolated from a variety of natural sources—human, animal, or microorganism—and may be produced by biotechnology methods and other cutting-edge technologies".²⁴⁷ In 2014 they accounted for 20 per cent of the global pharmaceutical market, with six of the top-ten best selling drugs globally being biopharmaceuticals, and the market is expected to grow rapidly.²⁴⁸

243 Crossland, David, *Chinese Investors Reach Terms to Buy German Rail Company*, *Handelsblatt*, 2nd November, 2016, viewed 12th January, 2017, <<https://global.handelsblatt.com/chinese-investors-buy-german-rail-engineering-firm-675841>>; *Wheel and Axle Group to Be Sold to Chinese Investor*, *Railway Gazette*, 8th November, 2016, viewed 12th January, 2017, <<http://www.railwaygazette.com/news/news/europe/single-view/view/wheel-and-axle-group-to-be-sold-to-chinese-investor.html>>

244 Crossland, David, *Chinese Investors Reach Terms to Buy German Rail Company*, *Handelsblatt*, 2nd November, 2016, viewed 12th January, 2017, <<https://global.handelsblatt.com/chinese-investors-buy-german-rail-engineering-firm-675841>>

245 *Li Keqiang: Promote the Modernisation of Education to Provide Support of Talent for the Construction of China*, news.sina.com, 29th December, 2016, viewed 23th January, 2017, <<http://news.sina.com.cn/china/xlxw/2016-12-29/doc-afxzczzf3411988.shtml>>

246 *Notice of the State Council on Several Measures on Promoting Further Openness and Active Utilisation of Foreign Investment*, The State Council, 17th January, 2017, viewed 21st January, 2017, <http://www.gov.cn/zhengce/content/2017-01/17/content_5160624.htm>

247 *What are Biologics? Questions and Answers*, US Food & Drug Administration, viewed 6th January, 2017, <<http://www.fda.gov/AboutFDA/CentersOffices/OfficeofMedicalProductsandTobacco/CBER/ucm133077.htm>>

248 Khan, Natasha, *China, Korea Eye the Latest Multibillion Blockbuster Drug Market*, *Bloomberg*, 13th October, 2016, <<http://www.bloomberg.com/news/articles/2016-10-13/the-foxconn-of-pharma-two-asia-companies-aspire-to-do-just-that>>



The development of biopharmaceuticals requires long-term investments due to the time involved in developing a new drug. Chinese Contract Research Organisations (CROs)—firms in the industry who fulfil research contracts for other companies—are eligible to receive government grants and subsidies if they are able to demonstrate that their R&D is innovative.²⁴⁹ They also benefit from the disaggregation of the industry's global value chain. By competing to win contracts from, and partnerships with, international pharmaceutical firms, they have gained exposure to global innovation networks that has enabled them to build their own capacity and thereby expand their service offerings.²⁵⁰

Market access for FIEs

However, Guangdong Province's new drug trading regulations outline the barriers that European business faces in bringing this market-driven development to the Chinese market.²⁵¹ In a move that applies to the entire pharmaceutical industry, European companies have been asked to accept mandatory price cuts of at least five per cent before price negotiations for tenders will even proceed. This is in addition to the pressure on pricing that results from requirements in public tenders: more expensive originator drugs—a class into which many European companies' products fit—have to compete with generics that are less expensive due to the fact that their development has not necessarily involved as much R&D.

As there are no generic biopharmaceuticals, only biosimilars²⁵² that are not exactly the same, bidding processes should not just take price into consideration. Instead, they should also consider approved indications and safety data, as well as product profiles, in order to ensure that biosimilars will have the same therapeutic benefit as biopharmaceuticals.²⁵³ This can be done by completing Quality Consistent Evaluations in order to ensure that only comparable drugs are made to compete. Doing so will also serve to incentivise firms to develop innovative and high-quality biopharmaceuticals.

This has a direct impact on the innovativeness of China's pharmaceutical industry, as companies are not incentivised to make the long-term investments in R&D that would enable them to develop drugs that can compete on the basis of quality. It also runs contrary to China's commitment to expedite access to innovative drugs for patients, as outlined in the China Food and Drug Administration's (CFDA's) New Drug Registration Scheme.²⁵⁴ As one industry expert has concluded: "While China's tendering policies, such that they are, do have a pronounced bias in favor [sic] of domestic manufacturers, these same policies harm innovators from both domestic and foreign markets because the tendering process is unpredictable and gives too little, if any, weight to innovation."²⁵⁵

Streamlining review and approval processes

The Chinese authorities at the CFDA and elsewhere do have a way of unlocking innovation in the industry – by reducing the time involved in getting new biopharmaceuticals approved. The existing approval process is lengthy due to the inefficiency of China's dual registration system for new drug applications (NDAs). It requires drug manufacturers to first present evidence of market approval from the relevant body in their country of origin, which confirms the drug has been approved to be listed and sold in that country, before they can apply for clinical trial authorisation (CTA) in China.

249 Chan, Vincent et al, *Ecosystem of Innovation and Technology in China*, Credit Suisse, 26th October, 2016, p. 57.

250 Wong, Joseph and Xiaoru Fei, "Life Science Innovation in China", *The Rise of Chinese Innovation in the Life Sciences*, The National Bureau of Asian Research, #56, April 2016, pp. 13-15, <http://nbr.org/publications/specialreport/pdf/Free/06032016/SR56_ChinaLifeScience_April2016.pdf>

251 *Guangdong Province's Regulation of Drug Trading in Medical Institutions (Revised Draft)*, Guangdong Province Health and Family Planning Commission, 15th February, 2016, viewed 6th January, 2017, <<http://www.gdwst.gov.cn/a/zcwj/2016021714991.html>>

252 A biosimilar is a biologic drug that has been demonstrated to be highly similar to a biopharmaceutical, referred to as the reference drug in this case, that has already been approved by relevant authorities.

253 For more details, see: *Pharmaceutical Working Group Position Paper 2016/2017*, *European Business in China – Position Paper 2016/2017*, The European Union Chamber of Commerce in China 2016, viewed 19th October, 2016, pp. 292-293, <http://www.europeanchamber.com.cn/en/publications-archive/440/Pharmaceutical_Working_Group_Position_Paper_2016_2017>

254 *Notice of the Programme of Reform on the Registration and Classification of Chemical Drugs*, State Food and Drug Administration, 4th March, 2016, viewed 6th January, 2017, <<http://www.sda.gov.cn/WS01/CL0087/146140.html>>

255 Shobert, Benjamin, *Priming the Pump: Applying the Lessons Learned from High-Tech Innovation to the Life Sciences in China*, *The Rise of Chinese Innovation in the Life Sciences*, The National Bureau of Asian Research, April 2016, #56, p. 37, <http://nbr.org/publications/specialreport/pdf/Free/06032016/SR56_ChinaLifeScience_April2016.pdf>

As China's import procedure for all pharmaceutical products requires this evidence of market approval to be submitted together with the import registration application, it therefore requires any foreign drug product to be already approved in its country of origin before entering China. This greatly delays the time to market for new drugs in China and prevents Chinese patients from accessing the most innovative drugs on the global market. By contrast, in other countries clinical trials can take place in parallel with equivalent clinical trials being undertaken in the country of origin.

The approval process also involves a large number of administrative departments, including provincial drug supervision departments, the provincial Institute for Drug Control, the Centre for Drug Evaluation (CDE), and the CFDA. By contrast, many countries (including the US) adopt a much looser review and approval system. For example, applicants may carry out tests on new drugs provided they do not receive an objection notice from the US Food and Drug Administration within 30 days of their application receipt date.

Recommendations

- Refrain from establishing a bidding policy that is primarily focused on price.
- Cease the practice of mandating price cuts before entering into tender negotiations with foreign pharmaceutical companies.
- Streamline the industry's review and approval process in order to ensure that firms are able to develop and sell innovative biopharmaceuticals in the Chinese market.
- Establish a balance between the affordability of biopharmaceuticals with high standards for quality and safety controls.

7.1.5.2 Medical Devices

Concern

At the highest political level, a directive to 'nationalise' China's medical device industry has been publicly delivered. This has resulted in many instances of medical devices produced by European companies being prevented from competing for public procurement contracts on a level playing field, and often includes devices manufactured in China by European companies. This limits choice in the market and prevents hospitals from the key task of purchasing equipment that is best suited to meeting the clinical needs of patients.

Assessment

China's market for medical devices is growing rapidly and is projected to expand at an annual rate of 12 to 14 per cent through to 2020.²⁵⁶ In recent years it has also seen a boom in domestic M&A activity, as companies looked to expand their product lines or to enter an additional segment of the healthcare industry's value chain.²⁵⁷ Although Chinese companies currently account for less than three per cent of the global market, they have been gaining in sectors that have lower technological barriers to entry and fewer dominant players, such as X-ray machines.²⁵⁸

Many European companies manufacture medical devices in China, employing Chinese nationals and conducting R&D in the country. However, there is doubt over whether European companies are welcome to play a role in developing the industry in the longer term. For example, the *CM2025 Roadmap* states that among high-performance medical devices, more than 90 per cent are foreign brands, and that this is one of the reasons why medical services are so expensive.²⁵⁹ It also stipulates that medical devices that are made in China shall reach a

256 Woetzel et al, *The China Effect on Global Innovation*, McKinsey Global Institute, October 2015, viewed 10th February, 2017, p. 88, <<http://mckinseychina.com/the-china-effect-on-global-innovation/>>

257 Ying, Luo and Jessie Xie, *Getting a Grip on the Booming M&A Market in China's Medtech Industry*, The Boston Consulting Group, September 2016, viewed 10th February, 2017, p. 11, <<http://www.bcg.com.cn/en/newsandpublications/publications/reports/report20160927001.html>>

258 Woetzel, J., et al, *China's Choice: Capturing the \$5 Trillion Productivity Opportunity*, McKinsey Global Institute, June 2016, viewed 10th February, 2017, p. 74, <<http://www.mckinsey.com/global-themes/employment-and-growth/capturing-chinas-5-trillion-productivity-opportunity>>

259 *China Manufacturing 2025 Key Area Technology Roadmap*, China Academy of Engineering, October 2015, viewed 9th September, 2016, <<http://www.cae.cn/cae/html/files/2015-10/29/20151029105822561730637.pdf>>



market share of 50 per cent in county-level hospitals by 2020, and 70 per cent by 2025.

This fits with a statement given in May 2014 by President Xi Jinping during a visit to Shanghai Lianying Medical Technology Co Ltd, which produces medical imaging and treatment equipment. At that time, he said: “Medical devices are a necessary means for the development of the modern medical industry. As at the grassroots level high-end medical devices are unaffordable, and ordinary people are not able to use them, it is necessary to accelerate localisation of high-end medical devices, to decrease production costs and to promote the continuous development of national enterprises.”²⁶⁰

Unfortunately, President Xi’s comments align with subsequent developments in the industry since Premier Li first announced CM2025, and well after associated planning studies commenced. Released on 9th May, 2015, the *State Council Notice on Deepening Healthcare Reform 2014 Work Summary and 2015 Key Work Priorities* states that “publicly-owned hospitals will preferentially equip and utilise domestic medical equipment and apparatus.”²⁶¹ Subsequently, on 31st August, 2015, the MIIT and the National Health and Family Planning Commission (NHFPC) jointly held a meeting in Beijing to promote the development of domestic medical equipment, and signed a cooperation agreement.²⁶²

It is necessary to recognise that European companies produce low-, medium- and high-end medical devices in order to cater to the needs of different kinds of hospitals, and that purchasing costs are also less important to them than lifecycle costs. While some products from ‘foreign brands’ may have higher initial prices, they often can be kept in service for considerably longer than cheaper local alternatives. Putting medical devices of poor quality in service may also result in poor treatment outcomes for patients that create additional costs.

Catalogues of domestic products to be favoured have also been established. On 16th March, 2015, the China Association of Medical Equipment (CAME), which is authorised by the NHFPC, issued the first portion of the *Outstanding Domestic Equipment Catalogue*,²⁶³ covering digital X-ray, colour ultrasound and fully automatic biochemical analyser machines. Of the 218 products submitted for consideration by 57 companies, 95 products from 27 companies were selected. Despite many applications for products manufactured in China by the local factories of multinational companies, all of the products selected were from Chinese-owned brands.

In February, 2016, the CAME issued the second catalogue of outstanding products, including MRI, computer tomography (CT), automatic blood cell analysers, respirators, anaesthesia machines, blood dialysis machines and automatic medicine dispensing machines. Of the 209 applications submitted, 153 products were approved, once again with no domestically-produced equipment made by a FIE being approved. While the catalogue is not explicitly tied to procurement, the NHFPC is still directly making recommendations of ‘outstanding products’, which has been observed to impact the purchasing behaviour of hospitals and local authorities.

All of this has resulted in actions taken at the provincial and municipal level that prevent the market and fair competition from driving innovation. At the provincial level, in June 2014, the Shanghai Municipal HFPC issued the *Notice on Strengthening the Administration of the Deployment of Large Medical Equipment of Class B*, requiring that “medical institutions at district level shall in principle choose domestic-made, large medical equipment from the second unit onward, those at municipal level from the third unit onward.”²⁶⁴

²⁶⁰ Xi Jinping: Accelerate the Localisation Process of High-end Medical Devices, money.163.com, 26th May, 2014, viewed 6th January, 2017, <http://money.163.com/14/0526/15/9T6AC9L400253B0H_all.html>; Xi Jinping Visited Shanghai Lianying Medical Technology Co. Ltd., Praised its X-ray Device for Being Light and Handy, eastday.com, 24th May, 2014, viewed 6th January, 2017, <<http://sh.eastday.com/m/20140524/u1a8108499.html>>

²⁶¹ Notice on Deepening Healthcare Reform 2014 Work Summary and 2015 Key Work Priorities, The State Council, 9th May 2015, viewed 6th January, 2017, <http://www.gov.cn/zhengce/content/2015-05/09/content_9716.htm>

²⁶² Two Ministries Jointly held a Forum in Beijing to Promote the Development of Domestic Medical Equipment and Signed a Cooperation Agreement, MIIT, 1st September, 2015, viewed 6th January, 2017, <<http://www.miit.gov.cn/n1146290/n1146402/n1146435/c3882165/content.html>>

²⁶³ Notice on Publicising the Selection Result of Outstanding Domestic-made Medical Equipment, National Health and Family Planning Commission, published 21st May, 2015, viewed 6th January, 2017, <<http://www.nhfpc.gov.cn/guihuaxxs/s3586/201505/9a0309e8b4ee4e05816428127051bc1c.shtml>>

²⁶⁴ Notice on Strengthening the Administration of the Deployment of Large Medical Equipment of Class B, Shanghai HFPC, entered into force 1st July, 2014, viewed 1st June, 2015, <<http://www.wsjsw.gov.cn/wsj/n429/n432/n1487/n1504/u1ai134123.html>>

In April 2015, the Anhui HFPC issued the *Notice on Application for Deployment of Domestic-Made Medical Image Diagnosis Equipment*, which specified that "...the applied products shall be chosen from domestic-made equipment".²⁶⁵

In November, 2015, the Fujian Provincial Health and Family Planning Commission issued a bulletin that it was planning to purchase medical equipment for the project Distribution of Medical Equipment for Imaging Diagnostic Centres at County Level in Fujian Province from one single supplier. One Chinese company was selected to supply 58 units of various medical devices for a budget of EUR 19.4 million. It was explained in the bulletin that this purchasing was going ahead in the spirit of the comprehensive reform of Fujian's county public hospitals, and the promotion of the use of large-scale domestic medical equipment in the province.²⁶⁶

The European Chamber is not aware of another country where medical devices manufactured domestically are not classified as local products. This practice is misaligned with the State Council's 2017 commitment that procurement will be reformed; that the principles of openness, transparency and free competition will be adhered to; and that products manufactured in China by FIEs will be treated equally in the bidding for government procurement.²⁶⁷

From the industry's perspective, exclusion of products from European brands will not only limit choice in the market, it will also result in domestic enterprises losing their competitiveness and innovation capability. By encouraging public hospitals to purchase equipment based only on the perceived nationality of the brand, the policies will also divert hospitals from the key task of purchasing the devices that are best suited to meet the clinical needs of patients. Finally, these policies dramatically reduce the appeal of China as an investment destination for companies producing medical equipment.

There is a huge variety of medical devices on the market – more than 500,000 on the European market alone. To develop a large number of different products requires enormous development resources from all disciplines in medicine, natural science and engineering. This is not something that can be achieved by protecting firms from competition.

Recommendations

- Implement the commitment made by the State Council to reform procurement as well as to adhere to the principles of openness, transparency and free competition in this area.
- Refrain from using industry catalogues to discriminate against foreign products.
- Permit hospitals to procure the equipment that is best aligned with their needs.
- Direct state support towards facilitating the long-term investments in R&D that the industry requires in order to become more competitive.
- Allow private firms to determine the market segments in which they are best positioned to move up the value chain.

8. The broader implications of CM2025

8.1 China's labour market

A fundamental challenge China faces is a lack of the advanced workforce skills needed to succeed with CM2025, something that the technical experts who compiled the plan reportedly did not focus on.²⁶⁸

²⁶⁵ *Notice on Application for Deployment of Domestic-Made Medical Image Diagnosis Equipment*, Anhui HFPC, 2015, published on 2nd April, 2015, <<http://www.ahwjw.gov.cn/ghxx/tzgg/201504/7de4ab97666c45e0a602b2bdd0849e6a.html>>

²⁶⁶ *Fujian Provincial HFPC bulletin on purchasing medical equipment for imaging diagnostic centres at county level in Fujian province*, Fujian HFPC, published on 9th November, 2015, viewed 6th January, 2017, <http://www.ccgp.gov.cn/cggg/dfgg/dlygg/201511/20151109_6108496.htm>

²⁶⁷ *Notice on Several Measures on Promoting Further Openness and Active Utilisation of Foreign Investment*, The State Council, 17th January, 2017, viewed 21st January, 2017, <http://www.gov.cn/zhengce/content/2017-01/17/content_5160624.htm>

²⁶⁸ Ernst, Dieter, *Advanced Manufacturing and China's Future for Jobs*, East-West Centre, Innovation and Economic Growth Series no. 8, August 2016, pp. 20-21.



Dieter Ernst of the East-West Centre has argued that the dearth of robust data on employment, skills and labour market issues is arguably the biggest weakness of CM2025.²⁶⁹ While automation also results in new types of jobs, it is not clear whether the Chinese Government has fully evaluated the impact that this shift on employment will have.

The significance of this potential shift is highlighted by a 2015 study, which found that over the next decade in Germany—a country with a far more mature vocational education system—Industry 4.0 would lead to the loss of 610,000 jobs and the creation of 960,000 new ones in fields like analytics, R&D and new positions resulting from revenue growth opportunities.²⁷⁰ China's vocational educational system needs to prepare for exactly this kind of scenario.

China faces no shortage of talented software engineers. However, in other areas it is conceivable that the top companies in a given industry will exhaust the pool of skilled workers, with very few left for smaller companies to employ. The challenge that this potentially poses is highlighted by a 2015 survey of more than 2,000 China-based employers with a total of four million employees. In it, 45 per cent of respondents stated that a severe skills shortage had the potential to hinder effective operation of their companies in the Chinese market.²⁷¹ In light of this, it was concluded that educational institutions should focus on developing broader skillsets in graduates and should offer new formats for continuing education with a system that supports ongoing requalification.

This is a serious problem – the 2016 Global Manufacturing Competitiveness Index, which is based on input from a diverse group of executives from across industries, concluded that talent is the top driver of manufacturing competitiveness, with cost competitiveness and productivity ranked second and third respectively.²⁷² While the 2016 index ranked China, the US and Germany in first, second and third place respectively, it concluded that by 2020, China and the US would switch places with Germany remaining stable in third.

In recognition of the importance of talent, the Chinese Government has announced plans to reform and upgrade its vocational education system,²⁷³ with a target of enrolling 23.5 million students in secondary vocational schools and 14.8 million in two-year, college-level vocational schools by 2020. Unfortunately, China continues to face challenges in terms of the practicality of the training that students receive in its vocational institutions.²⁷⁴ Acknowledging this, the Vice Chairman of the Chinese Society of Vocational and Technical Education, Liu Zhanshu, stated that many experts predict that by 2020 the talent gap in the ten key industries covered by CM2025 will reach 19 million, growing to 29 million by 2025.²⁷⁵

Ultimately, without sufficient skilled labour it will prove difficult for China to effectively compete on the basis of quality. For example, without enough skilled workers who are able to perform ongoing maintenance of industrial robots, the value that they can contribute to manufacturing lines will quickly be lost. Another hugely significant consideration is that, as China struggles to create millions of new jobs every year, industrial automation will simultaneously pose a threat to social equality and stability.

269 Ibid, p. 12.

270 *Man and Machine in Industrie 4.0*, Boston Consulting Group, September 2015, viewed 16th December, 2016, <<https://www.bcgperspectives.com/content/articles/technology-business-transformation-engineered-products-infrastructure-man-machine-industry-4/>>

271 *China's Tight Talent Market: The Skills Shortage May Hinder Growth Warns Hays*, Hays, 14th April, 2016, viewed 15th December, 2016, <https://www.hays.cn/en/press-releases/HAYS_248696>

272 *Global Manufacturing Competitiveness Index*, Deloitte and the US Council of Competitiveness, 2016, <<https://www2.deloitte.com/us/en/pages/manufacturing/articles/global-manufacturing-competitiveness-index.html>>

273 Zhao, Yinan and Luo Wangshu, 'Reform Needed' for Vocational Education, *China Daily*, 24th June, 2016, viewed 2nd December, 2016, <http://www.chinadaily.com.cn/china/2014-06/24/content_17610342.htm>

274 Klorer, Elena and Matthias Stepan, *Off Target: China's Vocation Education and Training System Threatens the Country's Rise to Industrial Superpower Status*, MERICS, China Monitor #24, 2nd October, 2015, viewed 2nd December, 2016, <https://www.merics.org/fileadmin/templates/download/china-monitor/China_Monitor_No_24_EN.pdf>

275 *A Big Country's Treasure and Sharp Tools: the Cultivation of Higher and Lower-level Talents under "Made in China 2025"*, www.guangdong.eol.cn, 29th August, 2016, viewed 9th January, 2017, <http://www.eol.cn/guangdong/guangdongnews/201608/t20160829_1443807.shtml>

8.2 Increased overcapacity

Because overcapacity has previously resulted when the Chinese Government has directed subsidies toward developing industries,²⁷⁶ the European Chamber rightly wonders if CM2025 indicates the new industries in which overcapacity can be expected to emerge. As previously outlined on page 36, this is already an issue for industrial robotics.

Because overcapacity depresses profit margins, in the short term some Chinese companies with access to subsidies and/or funding on non-commercial terms may make incremental steps toward catching up to more technologically advanced competitors who suddenly find themselves with less profit to reinvest in ongoing R&D. However, as outlined in the European Chamber's 2016 study on industrial overcapacity,²⁷⁷ misallocation of the fundamental factors of production, land, labour and capital will result in significant costs to China's economy in the mid and long term.

Xin Guobin, Vice Minister of the MIIT, has publicly acknowledged that it has become very common for companies to rush into industries related to initiatives of national importance. He cautioned: "We must guard against this trend when it comes to the Made in China 2025 drive because it will affect our capacity to upgrade manufacturing power and boost the quality of industrial products."²⁷⁸ It is hoped that the Chinese authorities will take the necessary measures to avoid more repetitions of past problems with overcapacity that also resulted from government support for industry.

8.3 Potential global pushback

There is a real risk that the Chinese authorities' top-down approach to attempting to drive industrial development with state support, through policy tools like subsidies and state-backed investment funds, will lead to a negative response from the country's international trade and investment partners. There are already early indications that this has begun to happen.²⁷⁹

A member of the German Council of Economic Experts explains why: "It is astonishing that economists who are sceptical about the state playing an active role in the economic process have no reservations when leading German technology companies are acquired by Chinese investors." He said, "Even though these are companies that are privately owned, it is quite possible that the Chinese state is active in the background."²⁸⁰

Allowing overcapacity to expand into additional industries is very much not in China's interests – it would likely lead to the same tensions that have plagued China's trade relations with Europe and others over overcapacity in sectors like steel and aluminium. As China's trade and investment partners potentially looked to protect themselves from the emergence of overcapacity in advanced industries related to Industry 4.0, it could also complicate the international business environment for efficient and innovative Chinese firms whose operations are not driven by subsidies and industrial policy. A distortion of global M&A markets through state-directed investments made for the Chinese Government's strategic reasons, instead of as a result of private firms pursuing profits and a strengthened competitive position, could be expected to produce the same result.

It needs be recognised that a continued reliance on using policy tools (see page 15 for details) to pursue CM2025 goals creates a real risk of global pushback.

²⁷⁶ *Overcapacity in China: An Impediment to the Party's Reform Agenda*, The European Union Chamber of Commerce in China, <<http://www.eurochamber.com.cn/en/publications-overcapacity-in-china>>

²⁷⁷ Ibid

²⁷⁸ Ma, Si, *Ningbo Becomes the First Pilot City to Implement Made in China 2025*, *China Daily*, 19th August, 2016, viewed 23rd December, 2016, <http://www.chinadaily.com.cn/business/2016-08/19/content_26536807.htm>

²⁷⁹ Harvey, Ben, *Policy Vacuum on Chinese Investment Needs Fixing*, *The West Australian*, 11th December, 2016, viewed 17th January, 2017, <<https://thewest.com.au/business/agriculture/policy-vacuum-on-chinese-investment-needs-fixing-ng-b88325807z>>; Lawder, David and Denny Thomas, *US Panel Urges Ban on China State Firms Buying US Companies*, *Reuters*, 17th November, 2016, viewed 17th January, 2017, <<http://www.reuters.com/article/us-usa-china-idUSKBN13B1WO>>

²⁸⁰ Jones, Claire and Hornby, Lucy, *Economists Urge Germany to Keep Door Open to Chinese Companies*, *Financial Times*, 2nd November, 2016, viewed 4th January, 2017, <<https://www.ft.com/content/dbc36ada-a105-11e6-891e-abe238dee8e2>>



Europe's openness to Chinese investment

This is not to say that the European Union is turning protectionist. While there have been some media stories that have implied that Europe has become less receptive to Chinese investment,²⁸¹ as of mid-January 2017, there have only been two acquisitions attempted by Chinese interests that have been held up by reviews conducted by European authorities. The first was the proposed sale of Osram lighting's subsidiary Ledvance to a Chinese consortium consisting of IDG Capital Partners, the lighting company MLS and Yiwu State-Owned Assets Operation Centre for over EUR 400 million.²⁸² Osram's opto-semiconductor light-emitting diode (LED) technology for lamps and luminaries has strategic applications. As of mid-January 2017, the review is still ongoing and has yet to reach any conclusion.

The second is the semiconductor equipment manufacturer Aixtron. As discussed on page 31, in this case the legally-mandated review of the proposed sale only went forward in October 2016, after the German government received "previously unknown security-related information" from US authorities.²⁸³ Prior to the receipt of this information the German authorities had stated in September that the proposed acquisition would proceed. Ultimately the review was not concluded, as the CFIUS declined to approve the sale of Aixtron's American assets, including a R&D centre. The CFIUS reportedly cited "unresolved national security concerns" and the conclusion "that there would be no reasonable way to mitigate the US national security risks perceived by CFIUS on the basis of the mitigation proposals submitted by the parties to date."²⁸⁴ President Obama chose not to overturn this decision when it was referred to him after Fujian Grand and its partners declined to rescind their offer in response to the CFIUS' decision.²⁸⁵

In light of the number of investments that have been attempted in 2015 and 2016, two reviews amounts to an extremely small number. Significantly, a large number of successfully completed Chinese investments have been made in industries where European business is either partially or completely blocked from making similar investments in China by the foreign investment negative list and other legislation.²⁸⁶

It is important to keep the scale of investment flows in mind. As German Ambassador to China Michael Clauss stated on 2nd December, 2016, "EU companies have bought up to 14 companies in China so far this year, and that amounts to 5 percent of what has been bought up by Chinese companies only in Germany this year".²⁸⁷

Lastly, it should be noted that European reviews of foreign investment on national security grounds are conducted on far more transparent and narrow terms than the mandate for China's current regime for equivalent reviews.

9. Recommendations

9.1 For the Chinese Government

9.1.1. Move forward with domestic market-based reforms

Before China's technological and manufacturing industries can reach their full potential, the Chinese authorities need to move forward with market-based reforms. Facilitating a competitive environment for private enterprises, allowing market forces to reign and creating strong political institutions will ultimately prove more effective at driving economic development and innovation than efforts by government officials to steer capital and support into industries that they themselves have identified as priorities through a top-down process.

281 Ibid

282 *Osram Finds Best Owner for Lamps Business*, Osram, 26th July, 2016, viewed 4th January, 2017, <<http://www.osram-group.com/en/media/news/press-releases/pr-2016/26-07-2016>>

283 Chazzan, Guy, *Germany Withdraws Approval for Chinese Takeover of Tech Group*, *Financial Times*, 24th October, 2016, viewed 24th October, 2016, <<https://www.ft.com/content/f1b3e52e-99b0-11e6-8f9b-70e3cabccfae>>

284 *AIXTRON SE: Tender Offer by Grand Chip Investment GmbH / Referral of CFIUS Decision to the President of the United States*, Aixtron, 18th November, 2016, viewed 10th February, 2017, <<http://www.aixtron.com/en/press/press-releases/detail/aixtron-se-uebernahmeangebot-der-grand-chip-investment-gmbh-abgabe-der-cfius-entscheidung-an-den-praesidenten-der-vereinigten-staaten/>>

285 Donnan, Shawn, *Obama Blocks Chinese Takeover of Tech Group Aixtron*, *Financial Times*, 3rd December, 2016, viewed 3rd December, 2016, <<https://www.ft.com/content/0c940900-b8e2-11e6-ba85-95d1533d9a62>>

286 *European Chamber Executive Position Paper 2016/2017*, The European Union Chamber of Commerce in China, pp. 25-29, <http://www.europeanchamber.com.cn/en/publications-archive/459/Executive_Paper_2016_2017>

287 Blanchard, Ben, *Germany Says Receiving Growing Protectionism Complaints in China*, *Reuters*, 2nd December, 2016, viewed 4th January, 2017, <<http://www.reuters.com/article/us-china-germany-idUSKBN13R0SW>>

Analysis in the Chinese state-owned media *Xinhua* on how Chile avoided falling into the middle trap has already reached the same conclusions regarding the importance of such reforms. Specifically, Chile's success is attributed to "gradual market-oriented [sic] reforms under proper government supervision, a transparent and efficient administration and judicial system, effective social security system and robust development of Small and Medium Enterprises (SMEs) and foreign trade".²⁸⁸ Reforms that focus on improving China's total growth potential instead of continuing to focus on investment are what its economy needs.²⁸⁹

These include, but are not limited to, the following:²⁹⁰

1. Reform systemic and institutional structures (e.g. ease administrative approval processes, establish full rule of law and enact further market-based reforms of SOEs).
2. Establish fair market conditions for competition (e.g. reform market access conditions and negative lists, stronger after-market monitoring, enhance IPR protection, product quality and product safety).
3. Establish a supportive financial system (e.g. reduce financing costs and develop the venture capital/private equity sector).
4. Create a suitable tax incentive system (e.g. introduce viable PPP models and tax incentives for R&D).
5. Develop education and training programmes for professionals at all levels (e.g. cooperation programmes with higher education institutions, dual education programmes and international cooperation).
6. Improve the regulatory system for small, medium-sized and micro businesses (e.g. easier access to funding for SMEs and micro businesses and support for medium-sized, small and micro-financial institutions).
7. Further open up the manufacturing sector (e.g. equality of investment conditions for foreign investors and legal protection for investments).²⁹¹

While moving forward with these reforms is far more difficult than setting up government-backed investment funds and releasing more subsidies, successfully doing so would free the authorities to focus on the role that government is best suited to: facilitating innovation through support for basic research and infrastructure, as well as the maintenance of a strong regulatory environment.

Fortunately, with the 2013 *Decision* of the Third Plenum, China already has a blueprint for market-driven reforms. The next step is to develop a roadmap that prioritises and thoughtfully sequences them in a way that can be used to drive the process forward.

9.1.2 Support free trade and allow market share to be determined by competition, not government targets

Since the period of reform and opening up began nearly 40 years ago, China has been one of the leading beneficiaries of the open liberal trading order. Unfortunately, due to a backlash against free trade and globalisation, the benefits that Europe and China both gain from this order are currently under strain.

As anti-free-trade politicians have gained ground in multiple countries around the world, some have pointed to China as a cause of the problems faced by their national economies. It is therefore important that the proponents of free trade in European Union Member States are able to point to significant benefits that their society's gain from trade relations with China, both in terms of citizens' career opportunities and their role as consumers. One of the largest contributions the Chinese authorities can make towards reinforcing the liberal trade order is to afford more market access to foreign companies and investors.

288 Wang et al, *Reform, Social Security, Development of Small Businesses Help Chile Avoid "Middle-Income Trap"*, *Xinhua*, 29th May, 2016, viewed 7th January, 2017, <http://news.xinhuanet.com/english/2016-05/29/c_135397056.htm>

289 Pei and Mao, *China can Draw Lessons from LatAm Efforts to Avoid Middle Income Trap: Experts*, *Xinhua*, 25th January, 2016, viewed 7th January, 2017, <http://news.xinhuanet.com/english/2016-01/25/c_135043662.htm>

290 Communication with GIZ, 15th January, 2017.

291 *European Chamber Executive Position Paper 2016/2017*, The European Union Chamber of Commerce in China, <http://www.europeanchamber.com.cn/en/publications-archive/459/Executive_Position_Paper_2016_2017>



It was therefore encouraging when President Xi Jinping spoke in support of globalisation and free trade at the 2017 World Economic Forum. He said: “China’s development will continue to offer opportunities to business communities in other countries. China will keep its door wide open and not close it. An open door allows both other countries to access the Chinese market and China itself to integrate with the world. And we hope that other countries will also keep their door open to Chinese investors and keep the playing field level for us.”²⁹²

Similarly, in an opinion piece published by *Bloomberg* the following week, Premier Li Keqiang wrote, “...above all, we remain convinced that economic openness serves everyone better, at home and abroad. The world is a community of shared destiny. It’s far preferable for countries to trade goods and services and bond through investment partnerships than to trade barbs and build barriers”.²⁹³ The European Chamber hopes that China will promptly follow through on the pledge to “keep its door wide open” and will stay firm to its commitment to globalisation.

9.1.3 Contribute to the establishment of new international investment guidelines

The Chinese Government has an opportunity to play a leadership role in developing new international investment guidelines that will ensure that the legitimate interests of all countries are given due consideration. Doing so would fit well with the non-binding *G20 Guiding Principles for Global Investment Policymaking* that was proposed in Shanghai during a G20 Trade Minister’s Meeting in July 2016.²⁹⁴ The *OECD Guidelines for Multinational Corporations*²⁹⁵ can also be employed as an additional constructive starting point from which to draft new rules.

Playing such a leadership role would help to ensure that regular commercial transactions are not unnecessarily politicised and help to bring transparency to the requirements that foreign investment needs to meet in order to be fully welcome.

One of the most important steps that the Chinese and European authorities can take in this respect is a robust market opening, in part through a successfully completed and ambitious EU-China Comprehensive Agreement on Investment (CAI). It would be preferable to conclude such an agreement by the end of 2017.

9.2 For European Union authorities and Member States’ governments

9.2.1 Upgrade thoughtful and transparent investment review mechanisms

The European Union welcomes most foreign investment for the jobs and prosperity that it contributes to. However, while liberal open economies are part of Member States’ identities, this does not mean that they should naïvely view all potential investments in the same light. As stated in the European Commission’s *Elements for a New EU Strategy on China*: “...the EU expects Chinese Overseas Direct Investment in Europe to be based on free market principles, and will use all the means at its disposal to address the potential market distortions and other risks of investment by enterprises which benefit from subsidies or regulatory advantages provided by the state. The possibility of establishing a common minimum definition of what constitutes critical national infrastructure in the context of inward investment in the EU should be examined in conjunction with Member States.”²⁹⁶ Citizens of European Member States do not want their governments to buy and run companies, so it would seem reasonable

292 President Xi’s speech to Davos in full, World Economic Forum, 17th January, 2017, viewed 19th January, 2017, <<https://www.weforum.org/agenda/2017/01/full-text-of-xi-jinping-keynote-at-the-world-economic-forum>>

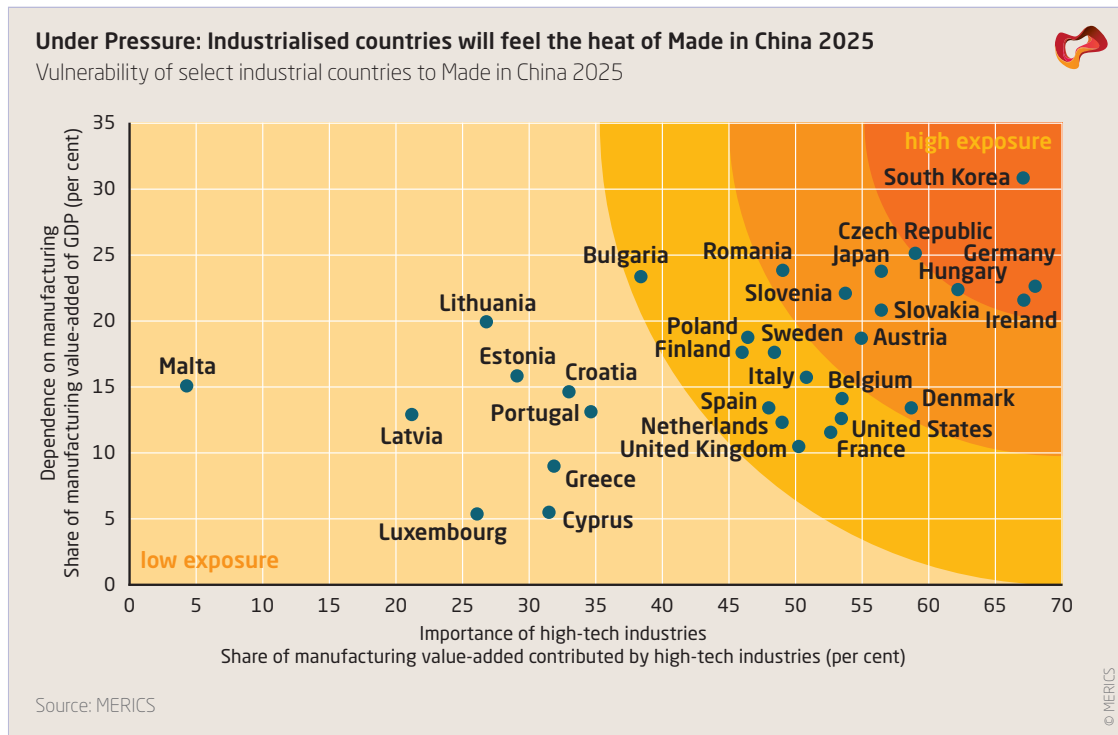
293 Li, Keqiang, Premier Li Keqiang: Economic Openness Serves Everyone Better, *Bloomberg*, 26th January, 2017, viewed 26th January, 2017, <<https://www.bloomberg.com/news/articles/2017-01-26/china-premier-li-keqiang-economic-openness-serves-everyone-better>>

294 Annex III: *G20 Guiding Principles for Global Investment Policymaking*, G20 Information Centre, University of Toronto, 10th July, 2016, viewed 8th January, 2017, <<http://www.g20.utoronto.ca/2016/160710-trade-annex3.html>>

295 *Guidelines for Multinational Enterprises*, OECD, 19th Oct, 2011, viewed 17th January, 2017, <<http://mneguidelines.oecd.org/guidelines/>>

296 *Joint Communication to the European Parliament and the Council: Elements for a New EU Strategy on China*, European Commission, Brussels, p. 7, 22nd June, 2016, viewed 4th September, 2017, <https://eeas.europa.eu/delegations/china/15397/elements-new-eu-strategy-china_en>

to conclude that investments by funds and companies controlled by foreign governments would not be in their interests either.



It is important for all countries to preserve the good order and functioning of their markets, particularly from any possible non-market distortions. It would therefore be beneficial for the European Commission to facilitate discussions with Member States on screening the nature of investments that are being made into the EU at the individual member-state level.

While all terms must be clearly defined, for investments that would involve gaining a stake in a company above 25 per cent that may have implications for public security, the national interest or control of key technologies, such reviews would seem wholly justified. Specifically, they would be justified when there is a possibility that potential investments are characterised by one of the following:

1. Investment interest is driven by a foreign state's industrial policy, not market forces.
2. Support or subsidies from a foreign state that may distort the market for M&As.
3. A requirement for the potential investor to secure approval from its government before the investment can be completed.
4. Reciprocity is not offered and European companies are not permitted to make an equivalent investment in the home country of the potential investor.

On the third point, in some instances the Chinese authorities require that a Chinese investment abroad receives advance approval in order to ensure that it is in the national interest. As the decision regarding what the national interest is may not always be aligned with that of Member States, it is worth consideration.

On the fourth point, regarding reciprocity, as was also outlined in the European Commission's *Elements for a New EU Strategy on China* in 2016, the EU is China's largest trading partner, representing about 15 per cent of the



country's trade. Since it is also a leading destination for its outbound investment, China needs the EU as much as the EU needs China.²⁹⁷ Mutually beneficial solutions to these issues should be possible and working toward the successful completion of an ambitious CAI will serve as part of the solution.

The European Commission should consider putting CM2025 on the agenda of all existing and future EU-China dialogues, to safeguard the interests of European business and jobs. This should be accompanied by a process of continuously monitoring the progress of CM2025 with European business and EU Member States, in order to have solid facts that the European Commission can then take to dialogues with its Chinese counterparts. These consultations with Member States should also track potential WTO violations, such as national treatment, subsidies and local content requirements, among others.

While Member States may ultimately decide that it is still in their interest to approve an investment in spite of it being characterised by one of the abovementioned four factors, they should at least do so with full awareness.

Again, it is worth reiterating that such reviews should only go forward with key terms like 'public security', the 'national interest' and 'key technologies' clearly and publicly defined in advance. This is necessary in order to ensure that the existence such a review process is transparent and does not inadvertently dissuade foreign investors from going ahead with legitimate, market-driven bids.

9.2.2 Contribute to the establishment of new international investment guidelines

Like their Chinese counterparts, the authorities in EU Member States have an opportunity to play a leadership role in developing new international guidelines on investment that will ensure that the legitimate interests of all countries are given due consideration. Doing so would fit well with the non-binding G20 *Guiding Principles for Global Investment Policymaking* and the OECD *Guidelines for Multinational Corporations* mentioned in section 9.1.3 on page 54.

9.3 For European business

9.3.1 Align long-term plans with China's industrial upgrade

Though there are many challenges associated with CM2025, the move to upgrade China's industrial base remains highly significant. Its emphasis on changing the mindset of Chinese companies toward a stronger focus on quality is commendable, if somewhat overdue.

European business needs to understand the initiative from this perspective and to look for ways to align their own value propositions in the market with the opportunities that this creates. The focus should chiefly be on where the long-term opportunities are most likely to be found, as in many areas market access can be expected to contract if Chinese firms are able to close the technological gap. They should also look for ways to capitalise on the more holistic approach to industrial development characterised by the CM2025 initiative.

9.3.2 Keep innovating to stay ahead

The problems associated with China's government-driven approach to industrial development should not be taken to imply that Chinese companies are unable to innovate. Leading Chinese companies continue to develop their technological capabilities and value propositions, both in China and in international markets. European business therefore needs to maintain and expand investments in long-term R&D; rapidly respond to the evolving needs

²⁹⁷ Joint Communication to the European Parliament and the Council: *Elements for a New EU Strategy on China*, European Commission, Brussels, p. 5, 22nd June, 2016, viewed 11th January, 2017, <https://eeas.europa.eu/delegations/china/15397/elements-new-eu-strategy-china_en>

of clients, one of the primary drivers of innovation; and lead in the development of the new business models. Complacency is not an option.

9.3.3 Monitor international M&As to identify emerging competition

For the reasons outlined in section 9.2.1 on page 54, it is important that European business monitor the impact of international M&As on their competitive positions. A state-steered process that enables competitors to acquire high-quality assets may suddenly leave European companies at a disadvantage. This is in part due to the fact that European companies are unlikely to prevail in bids if competing bidders have access to state funding and loans on noncommercial terms.

9.3.4 Do not rely on one market or client

As the case of Aixtron (see page 31) makes clear, overreliance on one client or market may leave European companies open to risks that are difficult to control. Even if the parties behind the attempted acquisition did not deliberately depress Aixtron's stock in the hopes of purchasing the company at a discount, there is a risk that unscrupulous parties could look to it as a model for acquisitions of their own. European business should therefore carefully weigh the opportunities and challenges that come from such reliance and continually look for new opportunities to diversify their client base.



APPENDIX

Policy tools employed in support of CM2025

1. Forced technology transfers in exchange for market access

Evaluation

As outlined on page 39, in the section on NEVs, recent actions by the Chinese authorities have alerted European businesses in industries covered by CM2025 to the possibility of forced transfers of increasingly advanced technologies. Companies need to carefully plan their operations accordingly.

2. Market access and government procurement restrictions for FIEs

Evaluation

Maintaining high standards for procurement can provide government with an effective tool for driving innovation. It forces companies to improve their products in order to meet these standards and win government contracts. However, when domestic companies are not forced to compete with best-in-class products, they have less incentive to improve and the government may ultimately be left with inferior products that do not meet all of its needs.

Academics have recently found that Chinese firms have been more likely to succeed in industrial upgrading where government policy is less restrictive on the types of firms that can participate in the country's market.²⁹⁸ When foreign firms are restricted from participating in the Chinese market, their domestic counterparts have fewer opportunities to learn from the resulting managerial and technological 'spillovers' as these firms localise their business operations, often by developing local supply.

A report published by the US-China Economic and Security Review Commission (USCESRC) on industrial planning has explained how this dynamic often works. In instances where the Chinese authorities have no bargaining power but wants the technology it will allow more market access and full foreign ownership, as is currently possible for multiple areas of highly advanced semiconductor design and technology.²⁹⁹ However, if Chinese firms are able to close the technological gap, opportunities like this are likely to be slowly closed off to foreign participation.

3. Standards

Evaluation

The lack of correlation between Chinese and international standards in CM2025-related fields appears to be a deliberate move to close the country's market to foreign companies. This may have the effect of either keeping the door closed on European businesses or requiring them to pay to use Chinese standards.

Furthermore, in many instances European business are afforded minimal opportunity to provide input into the setting of Chinese standards. The European Chamber's Standards and Conformity Assessment Working Group has concluded that: "Although there has been some improvement, FIEs and their joint ventures (JVs) are sometimes only granted observer status in Technical Committees (TCs), or even excluded from membership altogether. This problem still exists particularly in relation to industrial standards. For instance, some standardisation projects are managed by individual companies or organisations instead of formal TCs or working groups. Their non-transparent development processes prevent many interested stakeholders from contributing and submitting comments, for

²⁹⁸ Brandt, Loren and Eric Thun, *Constructing a Ladder for Growth: Policy, Markets, and Industrial Upgrading in China*, *World Development*, vol. 80, 2016, viewed 22nd December, 2016, <<http://www.sciencedirect.com/science/article/pii/S0305750X15002752>>

²⁹⁹ Tai et al, *Planning for Innovation: Understanding China's Plans for Technological, Energy, Industrial and Defense Development*, US-China Economic and Security Review Commission, p. 166, viewed 5th October, 2016, <<http://www.uscc.gov/Research/planning-innovation-understanding-china%E2%80%99s-plans-technological-energy-industrial-and-defense>>

example, as happens in the rail industry.”³⁰⁰ The European Chamber hopes that the State Council’s January 2017 announcement, which stated that authorities would promote equal participation by FIEs in standardisation work,³⁰¹ will be quickly followed through on at the working level.

4. Subsidies

Evaluation

As outlined in the sections on robotics (page 34) and NEVs (page 39), direct subsidies that either augment companies’ operating costs or support the sale of finished products can incentivise companies with limited technological capacity to enter the industry in the hope of attaining subsidies. This is often done by deliberately misleading the authorities regarding the quality and originality of their products, as well as their actual sales figures.

In China, central and local governments generally do not require firms that receive funding to meet high standards and often do not cut them off from further support when they fail to produce outcomes. This is in stark contrast to the other Asian success stories of Japan, the Republic of Korea and Taiwan, where government support during their respective stages of rapid development was contingent upon success in export markets.³⁰² This also runs counter to Harvard University economist Dani Rodrick’s finding that industrial policy only succeeds in supporting the development of new industries when projects are discontinued as soon as they are found to be failures, with resources reallocated to areas that may produce results.³⁰³ Ultimately, this means that a large percentage of the support that the Chinese Government provides is not productive, as many firms will enter the market in order to profit in the short term from subsidies instead of developing long-term competitiveness.

5. Financial policy

Evaluation

As the government has identified priority sectors—or picked winners—through a top-down government-led process, the sectors selected may not be the ones that are best suited to the realities of China’s economy on the ground or its labour market. Directing the financial system to support them may therefore come at a significant opportunity cost, as investors and finance professionals are better positioned to determine which firms and industries are best positioned to make the most productive use of capital.

6. Government-backed investment funds

In addition to the national-level funds discussed on page 17, at the provincial level each of the top ten provinces by GDP have established funds covering industries included in CM2025, which in mid-2016 controlled anywhere from EUR 67 million to 5.5 billion.³⁰⁴ Even at the municipal level, Xiamen’s State Asset Supervision and Administration Commission (SASAC) and Unigroup announced that they were setting up a EUR 2.16 billion fund to aid in the transition of SOEs by attracting emerging industries to the city.³⁰⁵ Xiamen’s Development and Reform Commission (DRC) also signed a strategic agreement with Unigroup in March 2016, to invest EUR 6.75 billion to cooperate in the areas of IC design, testing and packaging, manufacturing, Internet, big data, M&A and finance.

Evaluation

The clearest explanation for the establishment of these funds is that they have allowed China to remain technically

300 *Standards and Conformity Assessment Position Paper 2016/2017*, The European Union Chamber of Commerce in China, 2016, pp. 153-154, viewed 10th December, 2016, <http://www.europeanchamber.com.cn/en/publications-archives/424/Standards_and_Conformity_Assessment_Working_Group_Position_Paper_2016_2017>

301 Notice of the State Council on Several Measures on Promoting Further Openness and Active Utilisation of Foreign Investment, The State Council, 17th January, 2017, viewed 21st January, 2017, <http://www.gov.cn/jzhengce/content/2017-01/17/content_5160624.htm>

302 Studwell, Joe, *How Asia Works: Success and Failure in the World’s Most Dynamic Region*, Profile Books, London, 2014, pp. 61-64.

303 Rodrick, Dani, *Industrial Policy for the Twenty-First Century*, Harvard University, September 2004, viewed 9th January, 2017, <<https://www.sss.ias.edu/files/pdfs/Rodrik/Research/industrial-policy-twenty-first-century.pdf>>

304 Chan, Vincent et al, *China-HK Chronicles*, Credit Suisse, 27th July, 2016, p. 24.

305 Ibid, p. 23.



compliant with its WTO obligations to refrain from setting up direct government support for specific industries. It is also possible these funds were established after authorities concluded that having professional fund managers direct capital would lead to better outcomes than if they were to do so themselves. With the funds ultimately remaining accountable to their government backers, though, it is not clear how this will work when business and political priorities are found to diverge. Regardless, as European business raises funds on commercial terms in private capital markets, there is doubt over how it can compete in the long-term with companies that are able to access financing on non-commercial terms on a seemingly endless basis.

As some of these funds are for R&D, it is worthwhile considering the findings of the recent OECD report *Policies for Sound and Effective Investment in China*. It finds that R&D driven by the private sector tends to have better innovation outcomes. With China still lagging in this respect it is perhaps no surprise that its private domestic companies currently account for less than a quarter of the country's gross expenditure on R&D.³⁰⁶ The same report also points out that improvements to the regulatory framework are needed that will strengthen competition, in order to encourage the private sector's participation in R&D.³⁰⁷ Although implementation of these kind of reforms—which are also mentioned as priorities in CM2025 documents—is more difficult than just directing large amounts of state-backed investment into research, it would lead to more sustainable outcomes.

Access to R&D support for European business

During the same State Council Executive Meeting on 28th December, 2016, mentioned on page 45, Premier Li also pledged to allow foreign enterprises based in China to participate in state science and technology projects, with policies that provide tax reductions for R&D to also apply equally to them.³⁰⁸ While it is too soon to evaluate the ultimate outcome of this public commitment, the European Chamber would welcome such a move. As European-based subsidiaries of Chinese companies are able to participate in EU R&D programmes, Chinese-based subsidiaries of European companies should be able to do the same in China.

However, as has been seen with the High- and New-Technology Enterprise status (HNTE), implementation at the local level is often a major barrier. Currently obtaining it depends on local authorities' interpretation of the requirements, as well as their political and industrial strategies. This discretionary approach creates uncertainty for companies and accession to HNTE status is now very much dependent on the location and the company that applies. It would therefore be more efficient to set lighter, less stringent regulations, but to apply them strictly and uniformly nationwide. Doing so would help to ensure that all the internationally-qualified R&D institutions participating in the Chinese innovation system can enjoy tax, and other, benefits that this status affords.³⁰⁹

7. Support from local government

Evaluation

As discussed previously, the fact that support is often not withdrawn when it fails to produce outcomes ensures that a great deal of it is wasted. While a market as large as China's can potentially support multiple clusters, this support is further complicated by the fact that a local government will often only provide subsidies for goods produced within its own jurisdiction, and may actively prevent goods produced elsewhere from being sold there. This constraint can render it difficult for Chinese companies to scale up and compete in international markets.

It can also result in a great deal of waste through duplicative efforts that ultimately serve to spread China's resources too thinly to produce real outcomes. Miao Wei, Minister of the MIIT, has recognised the challenge that this issue poses. When asked to outline the top three reasons for not being optimistic about the implementation of CM2025, the first he listed was that provinces often blindly chase similar projects due to economic pressures, which affects the country's ability to become a strong manufacturer.³¹⁰

³⁰⁶ Innovation outcomes are measured in terms of the number of triadic patents, which are a series of corresponding patents filed in the US, Europe and Japan for the same invention, per GDP billion USD at purchasing power parity. *Policies for Sound and Effective Investment in China*, OECD, Paris, March 2016, pp. 20-21.

³⁰⁷ Including improvements in areas such as IPR protection, the development of capital markets and measures to ensure that young SMEs can compete on an equal footing.

³⁰⁸ Li Keqiang: Promote the Modernisation of Education to Provide Support of Talent for the Construction of China, news.sina.com, 29th December, 2016, viewed 23th January, 2017, <<http://news.sina.com.cn/china/xxw/2016-12-29/doc-ifxzczzf3411988.shtml>>

³⁰⁹ *Research and Development Position Paper 2016/2017*, The European Union Chamber of Commerce in China, 2016, p. 138, <http://www.eurochamber.com.cn/en/publications-archive/425/Research_and_Development_Working_Group_Position_Paper_2016_2017>

³¹⁰ *How to Make the Dream of a Strong Manufacturing Country Come True: A Special Interview with Minister Miao Wei of the MIIT*, *Caijing*, 7th September, 2015, viewed 2nd October, 2016, <<http://magazine.caijing.com.cn/20150906/3961601.shtml>>. It should be noted that in the same interview Minister Miao also listed the top three reasons for optimism regarding the implementation of CM2025.

8. Technology-seeking investments abroad

Evaluation

While many Chinese investors wisely choose to take a hands-off approach to managing acquisitions made in fields covered by CM2025, ultimately some will not be able to successfully integrate the operations or technology they have acquired into their existing corporate structures. This is not a comment on Chinese business, it is a well-known fact that a high percentage of M&As ultimately fail to create value for the investor.³¹¹ With so much credit having been made available for these investments and, in the case of SOEs, attempts to use acquisitions to scale up in size in order to avoid being merged into another company also being a possible motivation, there is a distinct possibility that some of these acquisitions are not being approached with a market-driven lens.

9. SOEs: mergers and politicisation

It is important to recognise that the recent wave of mergers of SOEs is related to multiple policy initiatives, with mergers also taking place in industries that are not covered by CM2025.³¹² Supply-side structural reform, which, among other things, seeks to eliminate industrial overcapacity and inefficient companies from the market,³¹³ is one. Another is the BRI, which, in part, amounts to a new approach to improving connectivity in Asia through upgrades to regional infrastructure—in particular the rail industry—and Chinese companies ‘going out’ into international markets.

Central State-owned Enterprise Mergers (2015-2016)

Year	Central State-owned Enterprise	Merged into	Sector
2015	CNR Corporation	China Railway Rolling Stock Corporation (CRRC)	Advanced Rail Equipment
	CSR Corporation		
2015	China Power Investment Corporation (CPI)	State Power Investment Corporation	Electrical Equipment
	State Nuclear Power Technology Corporation (SNPTC)		
2015	China Ocean Shipping Group Corporation (COSCO)	China COSCO Shipping Corporation Limited	Maritime Engineering Equipment
	China Shipping Group Company		
2015	China Metallurgical Group Corporation	China Minmetals Corporation	New materials
2015	Zhuhai Zhenrong Company	Nam Kwong (Group) Company Limited	Petroleum
2015	Sinotrans & CSC Holdings Company Limited	China Merchants Group Company Limited	Logistics
2016	Chinatex Corporation	China National Cereals, Oils and Foodstuffs Corporation (COFCO)	Agricultural machinery and equipment
2016	China International Travel Services Group	China National Travel Service (HK) Group	Travel
2016	Wuhan Iron and Steel Corporation	Shanghai Baosteel Group Corporation	New materials
2016	China National Building Materials Group Corporation (CNBM)	China Construction Materials Group	New materials
	China National Materials Group Corporation Limited (Sinoma)		
2016	China National Cotton Reserves Corporation	Sinograin	Agricultural machinery and equipment

311 Christensen, Clayton, Alton, Richard, Rising, Curtis and Waldeck, Andrew, *The New M&A Playbook*, *Harvard Business Review*, March 2011, viewed 29th November, 2016, <<https://hbr.org/2011/03/the-big-idea-the-new-ma-playbook>>

312 For a detailed discussion of recent trends in government management of SOEs, see: Leutert, Wendy, *Big is Beautiful? State-Owned Mergers Under Xi Jinping*, European Council for Foreign Relations, November 2016, <http://www.ecfr.eu/publications/summary/china_state_owned_enterprise_mergers_under_xi_jinping7196>

313 Naughton, Barry, *Supply-side Structural Reform: Policy-makers Look For a Way Out*, *China Leadership Monitor*, Winter 2016, No. 49, 1st March, 2016, viewed 23rd December, 2016, <<http://www.hoover.org/research/supply-side-structural-reform-policy-makers-look-way-out>>



Evaluation

There is no reason to assume that larger SOEs will be more innovative or efficient. Their complicated organisational structures and reticence to lay off workers means that the resulting companies may not ultimately produce significant efficiencies or capacity for innovation. As one official reportedly stated, “it even takes a lot of debate to unify the company logos, not to mention management teams and business lines.”³¹⁴

While a smaller number of SOEs may be easier for the authorities to monitor, the question stands as to how effectively senior Party leaders and the SASAC will be able to control the larger state-owned giants that remain, especially in terms of their international operations. Firms that face political interference are less likely to make successful business and investment decisions and it is highly probable that they would provoke questions regarding investments made by them in EU Member States.

10. Public-private partnerships (PPPs)

Evaluation

By the end of September 2016, only nine per cent of 10,471 registered PPP projects had been implemented.³¹⁵ One explanation for this is that local officials are rotated every three to five years, and are therefore not incentivised to focus on longer-term opportunities. In light of the ongoing anticorruption campaign, we would also posit that incoming officials are highly reticent to move forward with projects that were negotiated by their predecessors. Furthermore, the primary participant in PPPs that have gone forward have been SOEs with private investors playing a less prominent role. This is in part due to the favourable treatment they often receive from local government.

With that said, on 26th December, 2016, the NDRC and the China Securities Regulatory Commission (CSRC) introduced a measure allowing infrastructure asset securitisation in PPPs. This provides investors with an additional exit mechanism from PPPs,³¹⁶ which is useful as these projects are typically characterised by large capital expenditures and long timelines. This new policy on PPP asset securitisation can therefore provide firms with opportunities to turn over capital faster, allowing for better profitability and increasing incentives to invest in these projects. This should help to spur interest in them among private investors.

³¹⁴ Lu, *Are SOEs Repaying Debt, Reducing Headcount and Revamping Businesses? Evidence from the Field*, UBS, 10th October, 2016, p. 8.

³¹⁵ *PPP: Promises Problems*, Cp.Signal, China Policy, 8th December, 2016, <<http://www.policy.cn.com>>

³¹⁶ *China Encourages Asset Securitisation in PPP Infrastructure Projects*, *China Daily*, 27th December, 2016, viewed 5th January, 2017, <http://www.chinadaily.com.cn/business/2016-12/27/content_27784836.htm>; *Encouraging Infrastructure PPP Asset Securitization*, China Policy, 28th December, 2016, <<http://www.policy.cn.com>>

Abbreviations

APT	Assembly, Packaging and Testing
BEV	Battery Electric Vehicle
BRI	Belt and Road Initiative
CAE	Chinese Academy of Engineering
CAFC	Corporate Average Fuel Consumption
CAI	EU-China Comprehensive Agreement on Investment
CAME	China Association of Medical Equipment
CAS	Chinese Academy of Sciences
CBRC	China Banking Regulatory Commission
CDB	China Development Bank
CDE	Centre for Drug Evaluation
CFDA	China Food and Drug Administration
CFIUS	Committee on Foreign Investment in the United States
ChemChina	China National Chemical Corporation
CIIF	Circuit Industry Investment Fund
CM2025	China Manufacturing 2025
CM2025 Roadmap	China Manufacturing 2025 Key Area Technology Roadmap
CNR	China CNR Corporation
CNY	Chinese Yuan
CRIA	Chinese Robot Industry Alliance
CRO	Contract Research Organisation
CSR	China South Locomotive and Rolling Stock Corporation
CSRC	China Securities Regulatory Commission
CT	Computer Tomography
CTA	Clinical Trial Authorisation
DRAM	Dynamic Random Access Memory
DRC	Development and Reform Commission
EUR	Euro
EEAS	European External Action Service
FCEV	Fuel Cell Electric Vehicle
FIE	Foreign-invested Enterprise
Fujian Grand	Fujian Grand Chip Investment
GDP	Gross Domestic Product
GPA	Agreement on Government Procurement
GWh	Gigawatt Hours
HNTE	High and New Technology Enterprise
HSR	High-Speed Rail
IaaS	Infrastructure as a Service
IC	Integrated Circuit
ICT	Information and Communication Technology
IDC	Internet Data Centre
IFR	International Federation of Robots
IoT	Internet of Things
IP	Intellectual Property
IPR	Intellectual Property Rights
IT	Information Technology
JV	Joint Venture
LED	Light-Emitting Diode



MEMS	Micro-Electro-Mechanical System
MIIT	Ministry of Industry and Information Technology
MLP	Medium and Long-term Plan for the Development of Science and Technology, 2006-2020
MOF	Ministry of Finance
MOR	Ministry of Railways
MOST	Ministry of Science and Technology
NDA	New Drug Application
NDRC	National Development and Reform Commission
NEV	New Energy Vehicle
NHFPC	National Health and Family Planning Commission
OECD	Organization for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OFDI	Outbound Foreign Direct Investment
PaaS	Platform as a Service
PHEV	Plug-in Hybrid Electric Vehicle
PPP	Public-Private Partnership
R&D	Research and Development
SAFE	State Administration of Foreign Exchange
SASAC	State Asset Supervision and Administration Commission
SEI	Strategic Emerging Industry
Silex	Silex Microsystems
SME	Small and Medium-sized Enterprise
SOE	State-Owned Enterprise
TC	Technical Committee
TIC	Testing, Inspection and Certification
Unigroup	Tsinghua Unigroup
US	United States
USCESRC	US-China Economic and Security Review Commission
VPN	Virtual Private Network
WIPO	World Intellectual Property Organisation
WTO	World Trade Organisation
12FYP	12 th Five-Year Plan
13FYP	13 th Five-year Plan