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China's Digital Silk Road in the Belt and Road Initiative

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DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university, and that to the best of my knowledge and belief it does not contain any material previously published or written by another person, except where due reference is made in the text.

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ABSTRACT

The Digital Silk Road (DSR) in the Belt and Road Initiative (BRI) is China's global digital infrastructure project connecting Asia, Africa, Europe and beyond to China. Its elements are hardware such as 5G fibre-optic cables and networks, satellites and mobile handsets; and software including ICT (Information and Communication Technology) applications such as fintech, smart cities, and e-commerce. The DSR is crucial for China's development and its ambition for technological leadership in the digital revolution of the 21st century and ultimately President Xi Jinping's 'China Dream'. Since he came to power China's domestic industrial and foreign policies have been directed towards producing high-tech, cutting edge ICT goods and services to successfully expand globally via the DSR and to compete with competitors such as the US, Japan and Germany. Domestically, strong state-led policies such as subsidies, tax breaks, large investments in R&D and pursuing technology catch-up in core and strategic technologies such as robotics, AI, 5G support Chinese tech giants to compete globally. For economies along the BRI Chinese 5G technologies are promoted as affordable and effective, and many have signed up. The DSR is the backbone of the digital economy. China's lead in 5G challenges US dominance in the technology space. Consequently, the US discredits China's technology as posing a threat to national security. This thesis argues, on balance, that the DSR delivers more benefits in the development of BRI economies than challenges, with the potential to deliver China's much touted 'win-win' outcomes for the global digital economy.

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List of Acronyms

13th FYP – 13th Full Year Plan

5G – Fifth Generation

ADB – Asian Development Bank

AI – Artificial Intelligence

AIIB - Asian Infrastructure Investment Bank

ASEAN – The Association of Southeast Asian Nations

BDS – BeiDou Positioning and Navigation System

BRI – Belt and Road Initiative

BRF – Belt and Road Forum

CCP – The Chinese Communist Party

CNNIC – China Internet Network Information Centre

DSR – Digital Silk Road

EV – Electronic Vehicle

eWTP – Electronic World Trade Platform

GPS – Global Positioning System

ICT – Information and Communication Technology

IP – Intellectual Property

IT – Information Technology

MIC2025 – Made in China 2025

MIIT – China's Ministry of Industry and Information Technology

NDRC – National Development and Reform Commission

NDZ – National Demonstration Zones'

PRC – The People's Republic of China

SDG - Sustainable Development Goals

SEA – Southeast Asia

SME – Small and medium enterprise

WIC – World Internet Conference

China's Digital Silk Road in the Belt and Road Initiative

INTRODUCTION

This thesis critically assesses the significance of the Digital Silk Road (DSR) in China's Belt and Road Initiative (BRI) and its relationship with China's domestic development strategy in pursuit of what President Xi Jinping calls the Chinese Dream.[1] This thesis questions the extent to which the DSR can deliver one of China's signature foreign policy goals, which is 'building a community of common destiny'[2] and in facilitating digital development in BRI economies. Some Western observers consider the DSR to be an alarming threat to the global digital order.[3] This thesis argues that, on balance, the DSR is delivering more development opportunities to emerging economies by providing cost-effective next generation technologies. This thesis also argues that the West's criticisms of the DSR as posing a threat to national security and the international order are exaggerated. Such criticisms are often politically-motivated and aimed at disrupting and ultimately preventing China's ambitious goal of becoming a global leader in advanced technology by 2025.

Unveiled in 2013, the BRI is China's signature foreign policy initiative to jointly build and improve cross-border infrastructure, including rail and road, to connect Eurasia and the Indian Ocean region with China. The infrastructure is designed to facilitate and improve trade and development, investment and people-to-people relationships. Rapid growth of technology in an increasingly inter-connected world underscores the significance of digital infrastructure and, therefore, the DSR, which is infrastructure to potentially enable a digital backbone and central nervous system for the BRI.

The construction of the DSR includes ICT infrastructure such as fibre-optic cables, satellites and other foundations which enable and facilitate users in the digital and technological ecosystem. The DSR's infrastructure is predominantly built with Chinese funds using Chinese-centred technologies such as Huawei's 5G. In addition, Chinese technology (tech) giants

[1] Xi (2016c)
[2] Xi (2017b)
[3] Atkinson (2019b)

including Huawei, ZTE, Baidu, Alibaba, Tencent, JD.com, Xiaomi and Insupar are playing key roles in commercialising Chinese technologies in financial technology (fintech), smart cities, Internet of Things (IoT) and e-commerce along the DSR.[4]

The DSR is critical to China's development strategy and to President Xi's 'Chinese Dream'. In general, the CCP's aspiration is that China is an advanced, industrialised country by 2049. In particular, the China Dream narrative comprises two 'centenary goals': the first is to 'build a moderately well-off society in all respects' by 2021, the centenary of the founding of the Chinese Communist Party (CCP); the second goal is to 'build a modern socialist country that is prosperous, strong, democratic, culturally advanced and harmonious' by 2049, the centenary of the founding of the People's Republic of China (PRC).[5] The DSR is central to what the CCP calls the 'great rejuvenation of the Chinese nation'.

Intricately linked to the CCP's domestic and foreign policy goals is what Schwab calls the Fourth Industrial Revolution,[6] unveiling an ambitious development strategy centred on technological innovation and digital interconnectivity at home and abroad. The Fourth Revolution is the currently unfolding stage of the Information Technology (IT) revolution powered by 5G infrastructure and artificial intelligence (AI) technology.

Domestically, after President Xi came to power a range of domestic state-led strategies such as the 13th Five-year plan (13th FYP) 2016-20[7], Made In China 2025 (MIC25),[8] and Internet Plus (Internet+)[9] are being implemented to turbocharge China's economic transition to a high-tech focused economy, reforming manufacturing and deepening the digital economy. The 13th FYP and MIC25 initiatives include prioritising the construction of fifth-generation (5G) information technology (IT) infrastructure, upgrading industrial manufacturing to higher end supply chains, investment in big data technology such as Artificial Intelligence (AI), cloud computing, data centres and the Internet of Things (IoT), and strengthening science and technology to advance innovation.[10] 5G infrastructure and AI technology are enablers of a whole range of other IT applications which significantly improve and add value to the economy, including fintech, e-

[4] Moore (2018)
[5] Xi (2016c)
[6] Schwab (2015)
[7] Central Committee Communist Party of China (2016)
[8] Wübbeke (2016)
[9] Pasquier (2015); Xi (2017b)
[10] Central Committee Communist Party of China (2016)

commerce, smart cities and self-driving cars. These emerging technologies represent enormous economic potential as the drivers of the digital economy slated to emerge as a result of Fourth Industrial Revolution.

President Xi openly declares that the CCP's ambition for China is to be a leader of the Fourth Industrial Revolution and a global cyber superpower.[11] Domestic policies since 2012 focus on charting a path towards becoming 'master of its own technologies', with indigenous innovation industries and leadership in artificial intelligence (AI) R&D.

The CCP stresses that over the past four decades China has established and is refining a successful domestic development strategy.[12] The BRI and the DSR are an ambitious grand strategy to embed China's domestic development model in foreign policy goals and outcomes. The BRI and DSR serve to support the Chinese economy as it transitions up the value chain of the global economy by first extending lower-level industrial technologies and iron, steel and cement industries to interior economic regions and participating BRI countries.[13] Secondly, the DSR serves as fertile commercial ground for Chinese homegrown technology exports.

The CCP's 'soft power diplomacy' defines the BRI and the DSR as promoting common development and prosperity and creating and 'a road towards peace and friendship by enhancing mutual understanding and trust, and strengthening all-round exchanges'.[14] The BRI's grand vision is to connect commerce, trade and investment, and cultural exchanges linking the globe to China. It is the biggest infrastructure investment plan in history. China has pledged USD$1 trillion across the BRI. By 2019, 138 countries had signed up for BRI and DSR projects.[15]

This thesis questions the extent to which the DSR can deliver one of China's signature foreign policy goals, which is 'promoting common development and prosperity'.[16]

[11] Xi (2017a)
[12] Xi (2017b)
[13] Yu (2017) p. 356-358
[14] National Development and Reform Commission (2015); Liu (2020) p. 13-23
[15] Belt & Road News (2019); Gerstel (2018)
[16] Xi (2017b)

Since 2015, Chinese tech giants have progressively gained technological and commercial leads in 5G, smart cities, fintech and e-commerce along the DSR. Chinse tech giant, Huawei, is currently the dominant global seller of 5G technology, next-generation ultra-fast networks which propel the digital economy of the 21st century. 5G vastly enhances the digital connectivity which the DSR aims to deliver to participating economies. Huawei and ZTE account for about 40% of the global 5G infrastructure market.[17]

China's lead in 5G technology in global markets is alarming to the US. Currently, US companies are still developing 5G.[18] The CCP's ambition, China's rise to great power status and increasing tech prowess cause geopolitical tensions, challenging the US position as the globe's dominant tech leader in the innovation and technology space. Not surprising, the US is the biggest critic of the DSR.

The Trump Administration pushed back against China's tech lead and ambitions, resulting in heightened tension between Washington and Beijing and the ensuing trade war since July 2018.[19] The US asserts that China's lead is due to aggressive mercantilist policies, intellectual property theft, forced transfer of technology and unfair trade practices[20]. As a result, major Chinese companies such as Huawei, ZTE and Fujian Jinhua are subjected to punitive trade ban measures[21] in the US, increasing geopolitical tensions. The Trump administration's strategy is to impede China's tech prowess by blocking its tech companies and disconnecting them from global supply chains.

The US discredited Huawei's 5G network and technology by accusing it of cyber espionage and pressured allies to ban its technology.[22] Close allies Australia and Japan banned Huawei's technology[23]. In January 2020, the UK approved a limited rollout of Huawei's 5G network, but amid the Hong Kong protests and subsequent China's new national security law for Hong Kong in June 2020, the UK reversed its decision and banned Huawei in July 2020.[24] Other European

[17] Benner (2020)
[18] Ibid
[19] SCMP (2020b)
[20] White House (2018); Atkinson (2019a)
[21] U.S. Department of Commerce (2019)
[22] Sanger (2019)
[23] Economist (2019c)
[24] Yan (2020)

countries are making similar assessments, perhaps giving time for Erickson and Nokia, the only competitors, to develop their own 5G technology.[25]

US opposition to the DSR focuses on a single line of attack, that is, mistrust of the CCP. Any Chinese-centred technology, 'people to people' or commercial relationship is deemed to pose a national security threat.[26] Some Western observers consider the DSR an alarming threat to the global digital order.[27] They allege that the DSR is an extension of China's state apparatus which exports digital authoritarianism,[28] mass surveillance tools[29] and attempts to restructure global order.[30] Some warn that China's participation in standard setting processes in the technology ecosystem is causing the global internet to 'balkanise' or fragment.[31] The DSR elevates the technological tussle between the US and China to new heights.[32]

Western criticisms[33] of the DSR downplay reasons for the high take-up of China's investment in infrastructure development and China's hardware and software technologies.[34] Chinese technology is affordable and effective and the DSR contributes to a digital upgrade, bridging the digital divide and facilitating development of emerging economies. Part of the China's tech giants' commercial successes is their willingness to look for commercial opportunities in developing economies across Eurasia and the Indo-Pacific [35] where others have been reluctant.

This thesis argues, on balance, that the DSR contributes to development along the BRI and has the potential to deliver the 'win-win' outcomes the CCP's narrative for the 21st century global digital economy promotes.

The CCP's narratives around the DSR are consistent and strong. As such, the thesis argues China will not jeopardise its development strategy and is not deterred by US threats. It argues that selling technology via the DSR does not equate necessarily to China having a grand

[25] Statt (2020)
[26] Benner (2020)
[27] Atkinson (2019b)
[28] Mozur (2019)
[29] Barma (2020)
[30] Hemmings (2020)
[31] Hillman (2019a); McGeachy (2019)
[32] Economist (2020b)
[33] Lee (2020)
[34] Arcesati (2020); Greene (2020)
[35] Hillman (2019a)

strategy to spread authoritarianism. It is reasonable to conclude that infrastructure investment along the DSR and the BRI indicates the CCP's determination to deliver development for itself and participating economies.

The thesis sets out the origins and evolution of the BRI and the growing importance of the DSR in Chapter 1. China invested heavily in funding BRI and DSR projects by establishing the Asian Infrastructure Investment Bank (AIIB) and the Silk Road Fund. Chapter 2 illustrates some key DSR activities and China's dynamic state-led domestic industrial policies linked intricately to the DSR. Chapter 3 focuses on the web of DSR activities and the opportunities and risks arising within the economies of the Association of Southeast Asian Nations (ASEAN) as a case study. Chapter 3 also critically assesses the US's punitive measures in attempting to blunt China's technological ambitions. Finally, Chapter 4 unpacks the DSR's challenges, the CCP's concept of cyber sovereignty and consequential US-China tensions, and the US's response to China's growing influence in standard settings processes, US aid to ASEAN and alternative versions of 'smart cities'.

CHAPTER 1

Background

This Chapter briefly outlines the origins and evolution of the BRI and the DSR, which are loosely inspired by the ancient Silk Road. The BRI and DSR's cross-border infrastructure connectivity is China's attempt to ignite the next stage of global trade and investment under its leadership. In 2019, the BRI and DSR spanned 138 countries connecting Asia, Europe and Africa to China,[36] especially in developing and emerging economies with a digital infrastructure gap.

The DSR comprises a digital infrastructure network linking the CCP's domestic development and economic reform agenda with its goal of leading the global digital revolution, from which it hopes to gain political influence and reap economic benefit.

Origins and Evolution of the Belt and Road Initiative

On 7 September 2013, President Xi Jinping delivered a speech titled 'Promote People-to-People Friendship and Create a Better Future' in Kazakhstan at the Nazarbayev University in the presence of President Nurulsultan Nazarbayev.[37] President Xi conjured an image of the ancient Silk Road over two millennia which connected China to Central Asia, arguing that through

> unity, mutual trust, equality, inclusiveness, mutual learning and win-win cooperation - people of various countries, belief and cultural backgrounds have successfully cooperated in sharing peace and development created the history of friendship along the ancient Silk Road through the ages.[38]

By mythologising the multitude of mutual benefits of the ancient Silk Road, President Xi reignited a modern-day Silk Road, inviting China's neighbours to join. Soon after, on 2 October 2013, President Xi proposed the 21st Century Maritime Silk Road on his state visit to Indonesia.[39]

[36] National Development and Reform Commission (NDRC) (2019b)
[37] Xi (2013a)
[38] Ibid
[39] Xi (2013b)

The BRI comprises land (the 21st Century Silk Road) and sea routes (the 21st Century Maritime Silk Road).[40] In March 2015 the CCP released a BRI White Paper *Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road.*[41] The document outlines the CCP's aspirations for the BRI as a blueprint for jointly building and improving cross-border infrastructure including rail and road which connects Eurasia and the Indian Ocean to China. The BRI calls for 'policy coordination, facilities connectivity, unimpeded trade, financial integration and people-to-people bonds.'[42] The CCP policy propaganda talks of 'harmony, balance and wholeness image of China going forth to encompass the world on land and sea, at once opening the world and binding the world more closely to China, in a balanced and harmonious way'.[43] This ambitious undertaking includes digital connectivity.

Image removed due to copyright restriction.

[44]

[40] National Development and Reform Commission (2015)
[41] National Development and Reform Commission (2015)
[42] Ibid
[43] Ziegler (2020b)
[44] Ziegler (2020a)

The DSR was first envisioned in the 2015 BRI White Paper as the 'Information Silk Road', inviting BRI nations to 'jointly build digital infrastructure such as cross-border undersea and optical cables and networks to improve international communications connectivity'[45]. The development of the DSR grew in prominence because of growing interest in the Fourth Industrial Revolution,[46] which aims to deliver a global economy built upon digital connectivity and deeper information and communications technology (ICT) applications. The rapid growth of technology in an inter-connected world underscores the significance of digital infrastructure and therefore the DSR in the BRI.

According to China's National Development and Reform Commission, as modern information technology makes continuous breakthroughs and the digital economy thrives, all countries have seen their interests connected more closely.[47] Thus, in a global digitised economy, President Xi advocated interconnectedness with BRI countries, stressing network infrastructure construction and cybersecurity.[48] China's ambition includes all dimensions of power. According to Xi in a 2018 'Speech at the Work Conference for Cybersecurity and Informatization', the CCP aims to build a modern socialist country that is prosperous, strong, democratic, culturally advanced and harmonious' in 'realising the Chinese Dream of Socialism with Chinese Characteristics.'[49]

The DSR is enmeshed with China's domestic policy settings. The CCP unveiled an ambitious development model centred on technological innovation and digital interconnectivity at home and abroad[50] with the aim of ramping up and expediting a technological innovation. After 2013, the 13th FYP, MIC 2025 and Internet+ set out to aggressively modernise and upgrade China's industrial sector, focusing on innovation and advanced indigenous technologies. These policies will be discussed in Chapter 2. China's active role in the DSR and in 5G innovation since 2013 demonstrate the CCP's determination to gain technological leadership in all aspects of the 5G ecosystem including hardware and software applications.[51]

[45] National Development and Reform Commission (2015)
[46] Schwab (2015)
[47] National Development and Reform Commission (NDRC) (2019a)
[48] Xi (2018)
[49] Ibid
[50] Central Committee Communist Party of China (2016); World Bank (2019)
[51] Eder (2019)

The Digital Silk Road and the China Dream

China's meteoritic ascent through sustained annual gross domestic product (GDP) growth averaging about 10% for 40 years since the 1980s propelled it to double its GDP every eight years and raise living standards significantly. It is estimated that 850 million people were lifted out of poverty.[52] Using purchasing power parity (PPP), the size of China's economy surpassed the US in 2014.[53]

Because of rapid growth, China's economy matured, with GDP growth slowing from an annual average of 10.54% between 2000 and 2007 to an average of 7.84% from 2011 to 2015 and 6.5% in 2017.[54] The CCP calls this economic trajectory China's 'new economic normal'. Given that China's GDP per capita is a quarter of the average of the Organisation of the Economic Co-operation Development (OECD) economies,[55] and to avoid a feared 'middle-income trap', it remains an emerging economy with more to aspire to, such as achieving the OECD's high-income per capita status.[56] The middle-income trap refers to economies unable to sustain economic growth sufficiently over time to transition to the high-income economy status due to rising costs and declining competitiveness.[57]

For China to forge ahead and attain the World Bank's High Income per Capita status, the CCP's architecture of both domestic and foreign policy after 2012 was dedicated to pursuing an innovation-led growth model in moving up the value chain. [58] According to the World Bank, the ambitious goal includes not only economic growth based on innovation and technology but also human capital development and labour market reforms, deepening entrepreneurship, industrial upgrading, regional integration and development and increasing global competitiveness.[59]

The next phase of China's modernisation trajectory focusses on shifting its economy away from low-cost manufacturing production to producing high-end goods and services, increasing

[52] World Bank (2020a)
[53] World Bank (2020b)
[54] World Bank (2019)
[55] Ibid
[56] Organisation for Economic Co-operation and Development (2020)
[57] Liu (2017) p. 657
[58] Xi (2013b)
[59] World Bank (2019)

domestic consumption, pushing for developing indigenous technologies and ultimately to be a 'technological superpower'.[60] It is here that the DSR is envisioned to deliver the CCP's goals.

For the CCP, development remains at the forefront of its strategy to retain the political legitimacy of one-party rule over the world's most populous nation. It talks of the Chinese Dream to garner popular support and instil a sense of patriotism.[61] The CCP uses the China Dream narrative to reawaken a powerful sense of destiny for the Chinese people.[62] Essentially, domestic strategies focus on raising living standards by increasing the level of technological competence, raising the standards of industrial development and raising the productivity of its workforce through education and training.[63]

President Xi argues in numerous speeches that the Fourth Industrial Revolution presents a rare opportunity where China is at the 'same starting line' with OECD countries when it comes to emerging and advanced technologies.[64] In 2016, during his speech at the Work Conference for Cybersecurity and Informatization, Xi stated that to realize the China Dream, the CCP must 'focus on implementing strategies for innovation that promote breakthroughs in core technologies and indigenous innovation.'[65] One of the goals of the subsequent 13th FYP 2016-20 is to fundamentally shift manufacturing toward medium and high-tech industries and to move the economy up the value chain, intensify innovation, deepen integration of the internet, big data, and artificial intelligence with the economy, rely on domestic consumption and rebalance the different regions of the domestic economy.[66] The China Dream, for all its propaganda, is not devoid of powerful political substance for understanding the DSR. To dismiss the China Dream as propaganda diminishes our understanding of the centrality of the DSR in the CCP's national development strategy and how to respond to China's rise.

China's increasing self-confidence was manifested at the 2016 G20 Summit held in Hangzhou. Xi stated: 'China's development has benefited from the international community, and we are

[60] Xi (2016c)
[61] Central Committee Communist Party of China (2016)
[62] Xi (2016c)
[63] World Bank (2019) p. xi - xxix
[64] Xi (2016c); Xi (2017b); Xi (2018)
[65] Xi (2016c)
[66] Central Committee Communist Party of China (2016)

ready to provide more public goods to the international community'[67]. The CCP uses the BRI and the DSR as platforms for long-term cooperation and collaboration.[68]

The CCP hopes to gain political influence and reap economic benefit for the decades ahead with cooperation and collaboration among participating DSR countries. The DSR's narrative of building a community of common destiny is arguably credible as a goal, despite its obvious interest self-serving the CCP. As studies show, infrastructure is the foundation of economic prosperity,[69] which is why the DSR is developing technological infrastructure as the foundation for a new digital economy.

The Fourth Industrial Revolution

During his keynote address at the World Economic Forum (WEF) Annual Meeting in Davos in January 2017, President Xi argued that the dominant western, neo-liberal global growth model needed a reboot as economic growth was slowing, inequitable and lacked robust driving forces. He urged states to pursue a dynamic innovation-led growth model and foster development in an unfolding 'Fourth Industrial Revolution'.[70] In this context, the question is whether the DSR, in its early stages in 2020, is on track to deliver on any of its goals.[71]

The Fourth Industrial Revolution was coined by Klaus Martin Schwab, Founder and Executive Chairman of World Economic Forum, in December 2015.[72] It refers to the next phase of technological evolution enabled ultrafast 5G network and enabled 5G technology which allows for increased speed in data transmission, superior reliability (no outages) and exponentially enhanced capacity with no network congestion.[73] The DSR promises to accelerate the evolution of the digital economy, proliferating both consumer and business ICT applications.

For consumers, 5G facilitates self-driving cars and access to healthcare such as remote surgery, and live video streaming, improved gaming experiences, drones and virtual reality. 5G enables artificial intelligence (AI), robotics, mobile payments, the Internet of Things (IoT), 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum

[67] Xi (2016b)
[68] Zhexin (2018) p. 330-333; Sidaway (2017) p. 593-594
[69] Yu (2017) p. 357
[70] Xi (2017a)
[71] Ibid
[72] Schwab (2015)
[73] Economist (2019a)

computing.[74] For businesses, 5G enables ever-greater efficiency in producing goods and services by driving down connectivity cost such as transportation, logistics, communications and the global supply chain, resulting in higher levels of income growth.

Consequently, 5G is predicted to alter the whole physical world we live in. Our global interconnected society – transportation, buildings, metres, machines, factories, medical devices, cities – will be connected and augmented by electronics, software, sensors and clouds.[75] The aim of the DSR's 5G is to enable technological infrastructure, which is the 'backbone and central nervous system to build an intelligent and fully connected society' for businesses and consumers.[76]

Deloitte predicted in 2018 that 5G applications increase productivity which will contribute AUS$50b additionally to the Australian economy by 2030.[77] It is predicted that there will be more than 40 billion connected devices by 2025.[78] The 5G ecosystem is expected to be worth a staggering US$2.5tr and generating revenue of US$10tr by 2035.[79] This is the transformation of the Fourth Industrial Revolution promoted by its advocates.

The race to build the infrastructure for tomorrow's economy is fiercely contested in the geopolitical spaces between the US and China. The stakes are high as the leader of this race will be a superpower of the digital world. China's Huawei and ZTE are successfully selling into and constructing the DSR. The US is currently still looking to come up its own 5G technologies. Europe's Nokia and Erikson and Korea's Samsung are the only other three 5G sellers.[80] Both Huawei and ZTE had about 40% of the global 5G infrastructure markets in 2019.[81] This development is one source of US-China tensions, which are discussed in Chapter 4.

[74] Economist (2019a)
[75] Ibid
[76] Ibid 5G, the enabling IT infrastructure is the 'backbone and central nervous system to build an intelligent and fully connected society'
[77] Deloittes (2018)
[78] Ibid
[79] Economist (2019a)
[80] Cogley (2020)
[81] Benner (2020)

The CCP's DSR conception and intent

President Xi argues that China must play a bigger global role because its future development is interdependent with the global economy. His more assertive foreign policy direction serves the pursuit of long-term geoeconomics [82] goals and ultimately the China Dream in moving up the value chain by upgrading industry. China's geopolitical insurance is to build closer political ties and secure connectivity to global supply chains by promoting regional integration.

Yu argues that infrastructure development is the foundation of industrial and economic development.[83] There is a large infrastructure gap in BRI developing economies which limits trade and economic prosperity. It is estimated that Asia needs US$26tr of infrastructure investment within the decade to 2030[84] in sectors such as agriculture, transportation, energy, water and telecommunications. It is estimated that China will invest over US$1tr in the next 10 years in BRI projects.[85] To facilitate this, six main BRI economic corridors were identified for infrastructure development needs which are also energy and resourced rich regions.[86] The six main BRI economic corridors connect Mongolia and Russia, Eurasia, Central and West Asia, South Asia and Indochina to China.[87] The BRI's physical projects such ports, high speed rail and fibre-optic cable and networks are enabled by the DSR's infrastructure connectivity.

Since 2017, Beijing's promotion of the DSR is a top priority indicating its significance.[88] During the 2017 First Belt and Road Forum (BRF), the BRI Digital Economy International Cooperation Initiative was launched with the goal of integrating cutting-edge ICT technologies and solutions to advance the construction of the DSR focusing on Asian and African countries.[89] Two years later during the 2019 Second BRF, Beijing hosted a separate forum dedicated to DSR for the first time.[90] Attended by nearly 30 countries, many new projects were signed.[91] The DSR was promoted during the 4th and 5th World Internet Conference (WIC) in 2017 and 2018 respectively, which included key Chinese and foreign officials, and leading

[82] Cai (2017)
[83] Yu (2017)
[84] OECD (2018) p. 3
[85] Ibid
[86] OECD (2018) p. 3; p. 10-11
[87] OECD (2018) p. 10-11
[88] Xi (2019)
[89] Triolo (2020) p. 3-4
[90] Ibid
[91] Ibid

technology companies from around the world.[92] Hence, this thesis argues that the DSR is critical to the BRI. It concludes that DSR infrastructure and cutting-edge ICT technologies have the potential to close the digital divide and boost economic growth in many emerging and developing countries along the BRI.

The CCP's strategic thinking behind the BRI is well-documented.[93] According to the literature, the CCP seeks to secure global supply chains and trade routes, relocating some of China's foreign reserves to regional development, creating new and international markets for Chinese construction overcapacity and improving the interconnectivity of China's Western provinces.[94] The DSR supports China's innovation-led transition to global high-tech value chains while supporting the development of BRI nations and less-developed parts of China's domestic economy. BRI economies provide new market opportunities for Chinese companies at the same time absorbing excess industrial capacity.[95]

Funding

China is investing heavily in BRI and DSR projects by providing most of the funding for infrastructure construction. Funding comes from China's state-owned banks, commercial development banks, and collaboration with multilateral development institutions. China Development Bank, China Exim Bank, the Industrial and Commercial Bank of China, the Silk Road Fund are some of the major financial institutions investing in the BRI projects.[96] It is estimated that total Chinese investments in BRI projects in 2018 was over a staggering US$1tr,[97] in the form of concessional loans. In comparison, World Bank investment in BRI economies was US$86.8b.[98]

Beijing established the Asian Infrastructure Investment Bank (AIIB) in 2016 with capital of US$100b, equal to two third of the capital of the Asian Development Bank (ADB) and about half of the World Bank's. There are 103 member states.[99] Approved loans of about US$21b financed over 100 projects. The AIIB has also collaborates with other multilateral development

[92] World Internet Conference (2020)
[93] Yu (2017) p. 355-358; Huang (2016) p. 314-317; Zhexin (2018) p. 330
[94] Yu (2017)
[95] Huang (2016) p. 317
[96] OECD (2018) p. 20
[97] Gerstel (2018)
[98] OECD (2018) p. 21
[99] Asian Infrastructure Investment Bank (2020)

banks, such as the ADB, co-financing projects around the Asian region.[100] In December 2014 the Chinese government established a Silk Road Fund, pledging US$40b for the BRI[101] and in May 2017 an additional RMB100b was committed to the fund.[102] By the end of 2018, the contracted investment under the fund was about US$11b, with actual investment of US$7.7b.[103]

The sovereign wealth and investment funds of BRI economies also play a key role. For example, the Abu Dhabi Investment Authority of the United Arab Emirate (UAE) jointly with China increased investment in major solar and nuclear energy infrastructure.[104] The China-EU Joint Investment Fund, which began operation in July 2018 with an injected capital of EUR600m from the Silk Road and European Investment Funds, helped the BRI to dovetail with the Investment Plan for Europe.[105] In August 2020, Turkey's Wealth Fund looked to Chinese institutions and platforms to fund major infrastructure projects. It was reported that China was ahead of other foreign investors in Turkey.[106] Though many are wary of Chinese intentions,[107] the lure of Chinese investment is often the only alternative available for developing nations.[108]

Chinese lending for and funding of BRI projects has been challenged for resulting in unsustainable debt levels, where BRI recipient countries are unable to service debt once BRI lending is complete.[109] According to Gerstel, eight BRI countries – Djibouti, Kyrgyzstan, Laos, the Maldives, Mongolia, Montenegro, Pakistan, and Tajikistan – face unsustainable debt risks where the debt-to-GDP ratio is at least 40% of external debt owed to China.[110] The following examples demonstrate the debt trap some countries find themselves in, Sri Lanka relinquishing the Hambantota deep-sea port in December 2017 to a Chinese state-own company due to its inability to service Chinese debt of US$1b. The port is on a-99-year lease to China.[111] In 2018, Malaysia's Prime Minister Mahathir Mohammad cancelled two large Chinese-backed rail link

[100] Xinhua (2019a)
[101] Page (2014)
[102] Silk Road Fund (2017)
[103] Xinhua (2019b)
[104] McNeice (2020)
[105] Xinhua (2018)
[106] Tavsan (2020)
[107] Ore (2019)
[108] Hillman (2019a)
[109] Gerstel (2018) p. 12-14
[110] Gerstel (2018) p. 12
[111] Zheng (2018)

and pipeline projects totalling US$22b to avoid unserviceable debt[112] and renegotiated the financing.[113]

The unsustainable debt issue raises another point on the viability of many infrastructure projects in developing economies. According to ratings agencies Moody's, Standard & Poor and Fitch, over half of BRI investments are in countries with low sovereign credit ratings,[114] which indicate increased risk due to political or local economic situations. Increased risk of extending credit in turn builds up risk in the Chinese financial system, posing financial constraints.

In response to publicised BRI's debt concerns and unprofitable projects, Beijing tightened lending and is working with the IMF to improve lending standards and practices.[115] As the BRI and the DSR evolved after 2013, many BRI details still needed to be worked. Recognising pitfalls, at the Second BRF for International Cooperation on 27 April 2019 President Xi stressed high-quality, high-standard projects, promoting sustainable development.[116] The CCP called for sound project management through refining project design to improve the implementation process, transparency, good governance and adherence to rules and standards to create a good investment environment with efficient capital allocation.[117] The first five years of the BRI to 2018 can be viewed as an period of testing the ground. Successful and unsuccessful projects surfaced and problems were identified and ironed out. In 2019 the focus shifted to improving project management and picking commercially viable projects that deliver more benefits to developing BRI economies.[118]

Despite criticisms of the BRI, 138 countries spanning all continents had signed up to the BRI by the end of March 2020. There are 55 African and Middle East countries; 34 from Europe and Central Asia; 25 in the Pacific; 18 from Latin America and 6 from Southeast Asia.[119] In March 2017, the UN Security Council unanimously adopted Resolution 2344, enshrining the concept of 'a community of shared future for mankind' to strengthen regional economic

[112] Ibid
[113] Ibid
[114] OECD (2018) p. 21
[115] Gerstel (2018)
[116] Xi (2019)
[117] Ibid
[118] The Economist (2020b) p. 2-3
[119] (CUFE) (2020)

cooperation through the BRI.[120] UN Secretary-General António Guterres said the BRI and the United Nation's Sustainable Development Goals (SDGs) share the same grand goals. He argued that both are public goods offered to the world.[121] All this indicates the BRI's appeal and outcomes which the BRI and DSR may potentially deliver.

It is very early days to assess definitively the impact of the DSR on development in participating countries. By 2019, however, the DSR was thought to be contributing to the digital upgrade of many emerging and developing economies, narrowing the digital divide by providing much needed infrastructure and cost-effective technologies. This is the focus of the following Chapters. Yet, lurking beneath Beijing's positive rhetoric are challenges arising from financial risks caused by poor lending standards and management, and the commercial viability of projects.

In conclusion, Beijing is adapting its strategies to the changing geopolitical environment and lessons learnt from the positive and negative experiences of the BRI after 2013. The early BRI years provided valuable insights into assessing the positives and negatives of BRI projects. The CCP's move to tighten lending and improve lending practices so they are in line with international standard is evidence of its adjustment to the pitfalls. Its focus from 2019 is on higher-quality and commercially sound projects. During the First BRF in 2017, President Xi stressed funding projects which lead to innovation-led development. Two years later during the Second BRF in 2019, President Xi's focus shifted to prioritise infrastructure connectivity in the digital economy and innovation-led development[122] which aligns greatly with China's Made in China 2025 strategy. This is discussed in Chapter 2.

[120] National Development and Reform Commission (NDRC) (2019a)
[121] Guterres (2017)
[122] Xi (2019)

CHAPTER 2

Digital Silk Road and China's Domestic Industrial Policy

The DSR moved to the forefront of priority after its inception in 2015. On 14 May 2017, at the opening ceremony of the 'First Belt and Road Forum for International Cooperation, attended by international leaders and dignitaries representing over 100 countries, President Xi delivered the opening address, 'Work Together to Build the Silk Road Economic Belt and the 21st Century Maritime Silk Road'. He articulated the importance of infrastructure and cyberspace connectivity focusing on innovation-led development to power economic growth in the 21st century.[123] President Xi stated that the BRI will 'benefit people across the world' and the DSR is a 'road to prosperity'.[124] As discussed in Chapter 1, the CCP's push for the DSR is seen as central to China's domestic innovation-led industrial growth model and upgrade strategy.

This chapter highlights early DSR projects and unpacks major industrial policies since 2013, including MIC2025, the 13th FYP and Internet+. These state-led policies aim to move manufacturing up the global supply chain and support enterprise expansion into global markets. From the CCP's vantage point, digital infrastructure connectivity paves the way for growing exports of Chinese ICT technologies and global market share.

Digital Silk Road and its Expanded Scope

As mentioned, the DSR comprises digital infrastructure hardware and 5G software applications, smart city projects and large e-commerce and mobile payment fintech initiatives.[125] ICT applications power large BRI infrastructure to improve efficacy and efficiencies, and is an essential component of BRI infrastructure, which underscore the DSR's significance to the BRI.

Cyberspace and satellite projects include the Chinese-led Digital Belt and Road (DBAR) science program and big earth data established in 2016 by the Chinese Academy of Sciences. The objectives of the satellite imagery program are to assist with 'infrastructure improvement, environmental protection, disaster risk reduction, water resource management, urban

[123] Xi (2017c)
[124] Ibid
[125] Eder (2019)

planning'[126] by utilising big data technology.[127] The initiative includes two regional research centres in Hainan and Xinjiang to gather space-based remote sensing data on BRI projects, particularly in South and Southeast Asia.[128] In 2018, China hosted 500 young scientists from various countries for research, training over 1,200 science and management professionals[129] as part of 'people to people' exchange.

The BeiDou Positioning and Navigation System (BDS), China's global satellite navigation system, is an alternative to the US-led Global Positioning System (GPS). The BDS system was completed and launched on 23 June 2020 consisting of 55 satellites.[130] It is a key component of the DSR. The BDS is offered freely as a worldwide open system platform [131] providing high navigation accuracy to land, sea and space realm activities, and ICT services which rely of the BDS system.[132] Together with 5G infrastructure China is able to offer a self-sufficient innovative ecosystem for DSR countries. The BDS and 5G increase in importance with the maturation of self-driving cars, drones, smart cites, cloud computing, AI, ports and IoT networks.[133] Huawei and ZTE have projects in over 300 cities spanning over 100 countries. More than 30 countries along the BRI have adopted the BDS, including Pakistan, Laos, Thailand and Indonesia.[134] 5G technology and smart cities in the ASEAN region are discussed in Chapter 3. Apart from space related projects, the majority DSR projects relate to hardware infrastructure and e-commerce. Digital connectivity of hardware infrastructure and e-commerce expansion go together. State investment and investment from China's private sector are often in collaboration with DSR recipient state governments and large technology corporations.[135]

Digital Silk Road Takes Centre Stage

DSR requires significant investment in construction of fibre-optic cables and 5G networks. DSR projects, funded by both public and private Chinese entities, and completed between 2013

[126] Digital Belt and Road Program (2020)
[127] Ibid
[128] Chan (2019b)
[129] OECD (2018)
[130] Goswani (2020)
[131] Chan (2019b); Goswani (2020)
[132] Goswani (2020)
[133] Hemmings (2020) p. 11
[134] Hemmings (2020) p.10-11
[135] Eder (2019)

and 2019 are estimated to be valued at more than USD$17b.[136] Connectivity and digital infrastructure projects, such as fibre-optic and telecommunication networks, grew rapidly, at approximately USD$7b in loans and foreign direct investment (FDI). E-commerce and mobile payment investments amounted to more than USD$10b and smart city related projects amounted to several hundreds of millions of dollars.[137] Investments in areas of big data and research centres were also significant.[138]

The DSR is driven by China's tech giants, most notably Huawei and ZTE, providing fibre-optic cables.[139] Their technology is effective and at much lower costs than European and US competitors. Huawei and ZTE's investments in DSR projects are supported heavily with concessionary loans by China's state-owned banks.[140] Partnerships and/or acquisitions with local tech companies and with recipient governments are some of the ways China's tech giants expand among DSR countries. The map below illustrates the DSR's extensive global network of projects in 2019 linking Asia, Europe, Africa and Latin America to China.

In 2015, China Development Bank and the Industrial and Commercial Bank of China provided loans of USD$2.5b to India's largest telecom operator Bharti Airtel for the construction of ICT infrastructure using Huawei and ZTE's technology.[141] In 2017, Huawei Marine, backed by the China Construction Bank, partnered with Pakistan's government to construct the 15,000 kilometres Pakistan East Africa Cable Express (PEACE), which connects Pakistan to Kenya, Djibouti, France and Egypt.[142] Phase 2 was under construction in 2020 to connect Pakistan with South Africa.[143] The 820-kilometre fibre optic project for the China-Pakistan Economic Corridor (CPEC) was completed in July 2018. It was funded by China's Export-Import (Exim) Bank through a concessionary loan, with the remainder funded by Pakistan's government.[144]

[136] Eder (2019); Hemmings (2020) p. 10
[137] Eder (2019)
[138] Eder (2019)
[139] Eder (2019)
[140] Hemmings (2020)
[141] Shen (2018)
[142] Peace Cable International Network (2020)
[143] Ibid
[144] Ibid

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https://www.merics.org/sites/default/files/2019-08/Merics_Digital-Silkroad-Tracker_RGB_final_web.jpg [145]

In 2017, China poured US$1.1b ICT investments into African economies, up from an average of USD$339m over the previous four years.[146] China Communications, a subsidiary of China Telecoms, collaborated to construct the African Information Superhighway, a trans-Africa, 200,000-kilometre information network. China pledged US$60b of investment for ICT development projects in 2015.[147] In February 2019, Huawei established its first cloud data platform in the Middle East and North Africa partnering with Egypt Telecom.[148] It is also a major seller of mobile handsets in Egypt and signed an agreement to build data centres in Algeria[149]. Elsewhere in Africa, Huawei partnered with the Tunisian government in April 2019 to drive the country's ICT development.[150] These examples indicate the DSR's rapid expansion across the African continent after 2015.

[145] Eder (2019)
[146] ICA (2017)
[147] Teng (2017)
[148] Phys.org (2019)
[149] El Kadi (2019)
[150] Ibid

Until 2019, the DSR has a total of 98 projects, including almost 60,000 kilometres of undersea cable connecting the Indo-Pacific, South Pacific and Atlantic regions.[151] In Myanmar, Huawei collaborated with the Ministry of Transport and Communications to rollout 5G broadband services by 2025.[152] In 2012, less than 1% of Myanmar's population had broadband access. The 5G network rollout in principle enables it to leapfrog a few generations of networks,[153] narrowing the digital gap.

Another fast-growing area along the DSR is digital commerce (e-commerce) and the financial messaging system. China's Cross-Border Inter-Bank Payment System (CIPS), which is an alternative to the US-led international financial messaging system SWIFT (Society for Worldwide Interbank Financial Telecommunication), was created in 2015[154], backed by the Bank of China. The online payment method consists of a cryptocurrency and online digital currency, known as the Digital Currency Electronic Payment (DCEP) system. It uses the Chinese 'digital yuan' and is planned to be adopted rapidly.[155] The DSR's e-commerce and mobile payments ecosystems enable greater collaboration between e-commerce and traditional players.

Alibaba invested US$400m in Singapore Post, a postal service company, during 2014 and 2015.[156] Tencent, China Investment Corporation and Didi invested in Grab, Southeast Asia's Uber,[157] while Alibaba Group invested at least US$620m in India's e-commerce players, such as Snapdeal, Big Basket, Ticket New, and One 97 between 2015 and 2017.[158]

According to Chan, these e-commerce partnerships and acquisitions suggest that transfers of know-how, awareness of consumer behaviour trends and operationalization in the digital economy are features of enhancement and growth for both traditional and digital-based companies.[159] The examples illustrate the point that the DSR brings new technological opportunities to emerging and developing economies and enhance economic benefits.[160] On

[151] Hemmings (2020) p. 10-11
[152] Chan (2019b)
[153] Ibid
[154] Hemmings (2020) p. 11
[155] Ibid
[156] Chan (2019b); SCMP (2015)
[157] Chan (2019b)
[158] Ibid
[159] Chan (2019b)
[160] Ibid

balance, significant Chinese investment in infrastructure ICT development and e-commerce narrows the digital gap by increasing the competitive advantage of DSR developing countries and provides ICT foundation for promoting development for the digital economy.[161]

The DSR push is connected to the CCP's ambition to achieve technological leadership and help Chinese tech giants become globally competitive with Japan, the US and Germany. The DSR's ambition is linked intricately to China's domestic industrial strategy. Some tech giants such as Baidu (known as China's Google), Alibaba and Tencent (collectively known as the BAT), and Huawei and ZTE are beneficiaries of China's industrial policies.[162]

Chinese Industrial Upgrading Policy

The 13th FYP (2016-2020) outlined a strategic vision for China's economic and social development, focussing on innovation-based, balanced and green economic growth.[163] As discussed below, two ambitious initiatives were announced in 2015. First, the Made in China 2025 (MIC 2025) action plan was launched in May 2015 by Premier Le Keqiang. It is a 10-year strategy to innovate and modernise China's industrial capability into a manufacturing powerhouse.[164] The goal is to increase the economy's competitive advantages both domestically and internationally and ensure the transition to a fully industrialised economy by 2049. Secondly, the Internet Plus (Internet +) initiative leverages online platforms for the delivery of goods and services in all areas, such as finance, production, public services and urban planning. It aims to transform China through greater innovation and deepening the digital economy.[165]

Made in China 2025

MIC 2025 is a roadmap for building an innovation-led economy through to 2025 and beyond, and for China to be a technological powerhouse. The goal is to move China from a manufacturer of quantity to one of quality by reducing reliance on foreign technology. Premier Li acknowledged that 'the manufacturing industry is still the main pillar for national economy

[161] Ibid
[162] Greene (2020)
[163] Hong (2017)
[164] Central Committee Communist Party of China (2016) p. 60
[165] Central Committee Communist Party of China (2016) p. 73

and the transition towards smart manufacturing is essential'.[166] The CCP's agenda is to upgrade manufacturing, support tech companies into producing high-quality products through innovation and to be internationally competitive.[167] The goal also targets the domestic market of a fast growing, affluent middle class which are savvier consumers, demanding higher quality goods and services.[168] In 2018, China's middle class was estimated at 707 million, representing over half of total population.[169]

Following the economic growth models of the East Asian 'tiger economies' – Singapore, Taiwan, South Korea and Hong Kong – the goal is to move up the value chain from low-tech, labour-intensive manufacturing to more hi-tech and high-calibre R&D aimed at modernising the industrial manufacturing sector and pushing through the middle income trap.[170] State policies of heavy subsidies, tax breaks, investment in innovation and R&D and restricting foreign ownership in core industries were identified as necessary to modernise the manufacturing sector. This protective industrial policy is not too dissimilar to the 'Asian Tigers' government-led industrial policies which guided economic 'take off' after the 1970s.[171]

MIC 2025 is motivated by Germany's Industry 4.0 (I40) which was launched in 2013.[172] It is a national strategy of economic development and innovation. I40 consolidates German technological leadership in mechanical engineering and aims to 'drive digital manufacturing forward by increasing digitization and the interconnection of products'[173] over a 10 to 15-year period. Adoption of information technology and IoT is to connect small and medium-sized companies to global production networks, increasing efficiency and competitiveness.[174] Broadly, this is also what MIC 2025 seeks to achieve.

From 1978 to 2018, China's agricultural sector share of GDP declined from 27.7% to 7.2%, and industry from 47.7% to 40.7%. Services increased over two fold from 24.6% to 52.2%.[175] Within the manufacturing sector, the share of low-technology production declined from 29.4%

[166] Wübbeke (2016) p. 16
[167] Institute for Security & Development Policy (2018)
[168] CSIS (2020)
[169] Ibid
[170] Economist (2019b); World Bank (2019) p. 30; Wübbeke (2016) p. 16
[171] Economist (2019b)
[172] Institute for Security & Development Policy (2018)
[173] Ibid
[174] Ibid
[175] World Bank (2019) p. 29-30

in 1999 to 24.6% in 2017, which was compensated by a corresponding growth in the share of medium-technology manufacturing.[176]

China's next stage of industrial development focuses developing indigenous core technology through R&D, by gaining foreign technology know-how and nurturing home-grown innovation with both direct and indirect strategic state support. The emphasis is on 'self-sufficiency', which translates as increasing local technological capabilities in identified strategic industries and reducing foreign technology reliance in manufacturing. MIC 2025 sets out clear targets. First, the aim is to increase the domestic market share of Chinese suppliers for 'basic core components' by 70% by 2025.[177] Secondly, it aims for 40% of mobile phone chips in the Chinese market to be produced locally by 2025. A third aim is to increase local production of industrial robots to 70% of the market and 80% of renewable energy equipment, such as electronic vehicle (EV) technology and components such as batteries and drive motors.[178]

According to Wubbeke, China's manufacturing industry was hesitant about industrial upgrading due to high costs.[179] MIC 2025 was a driving force to push through innovation and smart manufacturing.[180] Ten critical core industries are considered crucial. These are: advanced information technology; automated machine tools and robotics; aerospace and aeronautical equipment; ocean engineering equipment and high-tech shipping; modern rail transport equipment; energy saving and new energy vehicles; power equipment; new materials; medicine and medical devices; and agricultural equipment.[181]

Mobilise national enterprises

The ambitious goal of converting, upgrading and smarting China's manufacturing sector demands deployment of multi-pronged strategic political and financial instruments.[182] First, the goal is for the state to identify and incubate national champions and create fertile ground and opportunities for nascent technology companies to flourish.[183] In particular, financial support, beneficial regulations or tax incentives are offered especially to companies in the ten

[176] World Bank (2019) p.30
[177] Institute for Security & Development Policy (2018)
[178] Wübbeke (2016) p. 6-7
[179] Wübbeke (2016) p. 15-17
[180] Wübbeke (2016)
[181] Institute for Security & Development Policy (2018)
[182] Wübbeke (2016) p. 37-41
[183] Wübbeke (2016) p. 29; Shi-Kupfer (2019) p. 9

critical core industries in smart manufacturing, emerging technologies, robotics and 5G technologies.[184] Secondly, generous tax rebates nurture high-tech enterprises and software developers, supplemented by direct capital injections and subsidies.[185] Reports indicate that tech suppliers received subsidies of 1% to 6% of their operational revenue, including software developers Inspur and Digiwin, smart manufacturers Kunming and Shenyang, and robotics companies Siasun, Estun and Boshi.[186] Thirdly, the state deploys protectionist policies to restrict foreign competition to public procurement and limit inbound direct foreign investments into ICT areas classified as 'secure and controllable'.[187]

The state has poured substantial R&D funds into the innovation environment. For instance, between 2014 and 2016, the Ministry of Science and Technology (MoST) launched 51 basic and applied science projects for 3D printing, 41 for cloud computing and big data, 5 for sensors and 16 for robotics. The state subsidizes robotic makers and buyers to promote technological development.[188] Consequently, innovation activities, indicated by intellectual property (IP) patent applications,[189] (AI patents, industrial design and utility models) rose rapidly in China.[190] It has the highest number of patent applications globally.[191] In 2018, China applied for 1.54 million patent applications followed by the US (597,141) and Japan (313,567).[192] Although this is indicative of surges in innovative activities, patent quantity does not equate necessarily to quality.[193] Accordingly, China's high number of low-quality patent was due partly to biased government policies which rewarded registration of patents over quality.[194] The government sought to rectify this biased policy in February 2020.[195]

Strategically, MIC 2025 is dynamic and adaptive, constantly readjusting to challenges and weaknesses.[196] Assessments of progress indicate China was making headways in emerging and smart manufacturing technologies including 5G, advanced high-speed rail, electronic vehicle

[184] Wübbeke (2016) p. 29-32; Shi-Kupfer (2019) p. 9
[185] Wübbeke (2016) p. 30-32; Shi-Kupfer (2019) p. 15-17
[186] Wübbeke (2016) p. 39-40
[187] Ibid
[188] Ibid
[189] China Power Team (2016)
[190] Wübbeke (2016) p. 40
[191] Zhang (2019a)
[192] Ibid
[193] Dudley (2020)
[194] China Power Team (2016); Mallapaty (2020)
[195] Mallapaty (2020)
[196] Ibid. p. 9-10

(EV) batteries, AI and IoT, and in traditional technology sectors such as aerospace, advanced semiconductors, software engineering and advanced machine tools, where China was comparatively weak.[197] As such, MIC 2025 aims to close the technological gap by pursuing technological catch-up and building domestic capabilities.[198] In sum, China prioritises development of cutting-edge, emerging technologies with heavy R&D spending.[199]

Pursue technological catch-up

To accelerate China's technological progress, Chinese enterprises receive political and financial support to acquire foreign tech and hasten technology catch-up. Overseas acquisitions, wholly or partly, resulted in technology spill-over and knowledge transfer.[200]

In the areas of robotics and core technology, direct foreign investment by Chinese flagship companies rose fast. Chinese Midea Group acquired Kuka, the German robot company and one of the worlds Big Four robotics makers in 2016, for US$5.1b. The robotic company Wanfeng Technology Group bought the US robotics Paslin for US$302m in April 2016.[201] In early 2015, Efort Intelligent Equipment Co Ltd, one of China's largest industrial robotic makers, acquired the Italian company CMA Robotics and opened an R&D centre in Italy.[202] China's robotic market leader Siasun acquired a vocational training centre in Germany in 2016 to increase its footprint in the robotics industry.[203] Estun Automation acquired Germany's Carl Cloos Schweisstechnik for US$216m in 2019; Estun's revenue growth tripled in three years from 2015 to 2018 to CNY$1.4b, which was attributed to four earlier foreign acquisitions.[204] Government subsidies enabled Chinese tech firms to acquire overseas technology. Estun and Efort received state subsides of CNY30m and CNY170m respectively.[205]

[197] Zenglein (2019) p. 9-10; p. 21
[198] Ibid
[199] Ibid
[200] Wübbeke (2016) p. 40-41
[201] Tobe (2017)
[202] Wübbeke (2016) p. 45
[203] Ibid
[204] Watanabe (2019)
[205] Ibid

These overseas mergers and acquisitions enabled technology spill-over and close the technology gap in China.[206] According to Watanabe, technological catch-up strategies began to bear fruit by increasing its capability in certain technology areas.[207]

China is still vulnerable in many innovative fields such as new materials, advanced semiconductors and key components for advanced machinery and machine tools.[208] Chinese tech firms ZTE, Huawei and Fujian Jinhua have encountered major disruptions to their supply chain when access to chips and other high-tech components was cut off by the US trade war.[209]

In response, several measures were deployed to avoid China's vulnerabilities. First, heavy investments in R&D increased. In 2019, R&D spending was around US$320b, – or about 2.2% of GDP, an increase of 12.5% from 2018.[210] The sheer scale of Chinese investments in R&D, surpassed that of the EU economies combined which was 2.1% of GDP.[211] The heavy R&D spend broadly targets two areas. First, China leverages and prioritises development of cutting-edge, emerging technologies where it has competitive advantages.[212] Within the subset of IP patent applications, China ranks first as AI patent filer, a ten-fold jump between 2013 and 2017, ahead of the US and Japan in 2018.[213] China's AI patents are in e-commerce, data searches, facial recognition and language processing, showing China's R&D expenditure in emerging technologies.[214]

Secondly, the state-led MIC 2025 focuses on mobilizing different regions in China and encouraging private companies to work towards the state's goals. Each region is assigned to focus on a particular aspect of technological development.[215] China's Ministry of Industry and Information Technology (MIIT) listed 'MIC 2025 National Demonstration Zones' (NDZ) which were introduced in 2018 as pilot cities to serve as testing grounds for new technologies before moving into the real economy. Sixty-five per cent of the most promising top 20 smart

[206] Ibid
[207] Ibid
[208] Zenglein (2019) p. 10
[209] Ibid; The Economist (2020a)
[210] Xinhua (2020)
[211] Zenglein (2019) p. 11
[212] Ibid
[213] Okoshi (2019)
[214] Ibid
[215] Zenglein (2019) p. 11

manufacturing hubs emerged from these zones.[216] More than 530 smart manufacturing industrial parks were established, which centred on big data technology (21%), new materials (17%), cloud computing (13%), green manufacturing and creation of an 'industrial internet'.[217] These were given special emphasis in policy documents, underpinning the CCP's goal of sustainable development.[218]

MIC 2025 advanced many technologies after its implementation in 2015. As a result, according to Zenglein, China saw rapid development in AI, alternative energy vehicles, facial recognition, big data and digital payment and communication systems driven by private companies for profit growth and business opportunities.[219]

Huawei and ZTE dominate the roll-out of 5G along the DSR[220] while seven of the top ten EV battery companies are Chinese, accounting for 53% of global market share in 2018.[221]

Internet Plus (Internet+)

On 5 March 2015, Premier Li Keqiang launched the Internet Plus Plan (Internet+). As pervasive connectivity plays an ever-increasing role in society, this initiative pushed the Chinese economy to integrate with greater use of mobile internet, cloud computing, big data and Internet of Things (IoT).[222] The delivery of goods and services using online platforms via the internet encouraged and accelerated development of e-commerce, industrial networks, internet banking and fintech. Ma Huateng, the founder and CEO of Tencent, stated that: 'The internet has opened new frontiers including internet finance, medical services and education that didn't exist before. It should also be extended to traditional industries like manufacturing, energy and agriculture'.[223] Internet+ aims to deepen the integration of internet and further enhance the growth of China's digital economy to upgrade, transform and improve lives, and transform government functions.[224]

[216] Ibid
[217] Ibid. p. 10
[218] Ibid
[219] Zenglein (2019)
[220] Cogley (2020)
[221] Tanaka (2019)
[222] National Development and Reform Council (2015)
[223] Pasquier (2015)
[224] National Development and Reform Council (2015)

Statistics from the Ministry of Industry and Information Technology reported that China added 7.05 million kms of fibre optic in 2017, extending the total length of the country's cables by 23.2% to 37.47 million km.[225] As of March 2020, the China Internet Network Information Centre (CNNIC), a governmental agency, reported 897 million internet users at an internet penetration rate of 64.5%.[226] The capacity of the adoption rate for internet users, both consumers and businesses, is huge and the digital economy growth within China is immense. With almost 900 million internet users, China's Internet+ policies will have the capacity to rapidly scale up emerging applications and enhance IoT industries.[227]

China is aware it is already well-placed to embrace the digital transformation. For example, in the field of industrial internet and IoT technology, China is the leading global manufacturer for IoT electronics. It is estimated that 95% of IoT connected devices produced globally were manufactured in China by the end of 2020.[228] The size of China's population and rapid industrial internet uptake provide great scope and will benefit from economies of scale as it has the highest number of 5G smartphone subscribers globally at over 50 million.[229] This presents China with immense ability to upscale and deploy next-generation ICT products and services. The US, Europe and Korea still lag behind in 5G infrastructure development. Korea had 5 million 5G subscribers in February 2020.[230] If this trend continues, China is on its way to becoming a dominant 5G power.[231]

In summary, the frenetic pace of activities identified in this Chapter points to the CCP's efforts in domestic innovation-led development. These are matched by its international efforts along the DSR – illustrated in Africa and Asia. China's innovation-led industrial strategies bore fruit in upgrading domestic manufacturing and enhancing technological capabilities by acquiring world-class technologies through mergers and acquisitions and pouring significant resources into R&D.

With the support of the Chinese government, Chinese tech enterprises are able to deliver ICT infrastructure and e-commerce applications and ICT solutions along the DSR which facilitate

[225] Statista (2019)
[226] CNNIC (2020) p. 1
[227] China Telecom (2018)
[228] Ibid
[229] Kawakami (2020)
[230] Ibid
[231] Ibid

the digital development and narrows the digital gap for DSR economies. Furthermore, as Chinese ICT technologies are exported along the DSR, technology spill-over benefits DSR participating countries. On balance, thus far the benefits outweigh the costs for DSR emerging and developing economies, providing win-win opportunities to both China and DSR economies. The CCP consistently depicts China's aspiration to be a technological superpower. The DSR's international efforts are discussed in the next Chapter.

Chapter 3

Chinese Tech Giants and the Digital Silk Road

The CCP's domestic industrial strategy and economic restructuring under Xi Jinping's leadership focus on innovation-led development and digital interconnectivity. This was discussed in Chapter 2 and are intertwined with the DSR. Through partnerships with home-grown private enterprises, state/private Chinese ICT investments grew rapidly in global markets and supply chains along the DSR. Chapter 3 illustrates the extensive DSR activity by focussing on Southeast Asia (SEA) as a case study. China's digital expansion, significant investments and influence[232] in the SEA region give insight to China's digital push and provide an understanding of the DSR's dynamics for other DSR economies and regions.

As discussed in Chapter 2, assisted by state funding, favourable tax breaks and subsidies, technological catch-up with heavy investment in R&D and mergers and acquisitions enabled China's tech companies to increase their competitive advantages and expand into global markets.[233]

To reiterate, the DSR covers Asia, Europe, Latin America and the African continent.[234] The expansion of ICT investment into the Southeast Asia is not surprising, given the region's proximity to China and established economic and diplomatic relations, and shared historical and cultural ties.[235] This chapter argues that China's tech giants are the main drivers in providing digital services in e-commerce, fintech, and data centres and data storage infrastructure along the DSR.[236]

Digital Silk Road in Southeast Asia

Southeast Asia provides fertile ground for the CCP and Chinese tech giants to expand strategically and commercially. The DSR serves as a market-place for exporting digital goods and services and testing ground for China's ICT market. This is because Southeast Asia is one of the fastest-growing regional markets in the global economy and is expected to be the fourth

[232] Nguyen (2020); Naughton (2020) p. 38
[233] Zenglein (2019) p. 8-12; Watanabe (2019); Greene (2020); Shi-Kupfer (2019)
[234] Ahmed (2018)
[235] Nguyen (2020)
[236] Chan (2019b); Nguyen (2020); Moore (2018)

largest economy by 2050, overtaking the EU and Japan given its young demographics and growing middle class.[237] Collectively, the ten Southeast Asian economy making up the Association of the Southeast Asian Nations (ASEAN) offers future growth opportunities for China.[238] ASEAN's digital economy is growing rapidly, particularly in e-commerce, fintech, cloud computing and 5G networks, growing threefold after 2017. It represents 7% of ASEAN GDP.[239] In 2017, the digital economy was valued at $50 billion.

China's leading tech companies gained a good foothold along the DSR, partnering with ASEAN economy and fortifying their position in the region.[240] The China's tech giants made significant investments in AEANS digital economy. Due to government support, China's tech giants offered and delivered effective products at very competitive prices.[241] Chinese tech giants are also major investors in Southeast Asia's start-ups.[242]

5G Technology

In 2020, only five companies were building 5G infrastructure globally; Huawei Technologies, ZTE, Nokia, Ericsson and Samsung. Huawei Technologies and ZTE dominate deployment of 5G networks and ICT technologies along the DSR countries.[243] Their successful expansion, aided by state support,[244] saw these companies enter new markets and offer subsidized prices for their products,[245] edging out Nokia and Ericsson, two of European largest ICT companies.[246]

In the area of ICT infrastructure such as fibre optic cables, Huawei Marine completed over a dozen undersea cable projects in Southeast Asia, and another 20 were under construction in 2020 in Indonesia and the Philippines.[247] Chinese ICT companies gained ground in Southeast Asia, building next generation mobile internet connectivity for 5G and cloud computing.

[237] Harding (2019b)
[238] Ibid
[239] USAid (2020)
[240] Hillman (2019a); Naughton (2020) p. 26
[241] Ibid
[242] Ibid
[243] Ahmed (2018)
[244] Naughton (2020) p. 27-29;
[245] Ibid
[246] Ibid; Kitson (2019)
[247] Chan (2019b); Harding (2019a)

Huawei launched its first 5G testbed in Thailand, and Alibaba Cloud successfully unveiled a second data centre in Indonesia.[248]

In June 2019, the Philippines' Globe Telecoms Inc partnered with Huawei Technologies and launched 5G broadband services, despite a cybersecurity alert by the US.[249] In Cambodia, Smart Axiata, the major Cambodian telecommunications service provider, and Cellcard, a telco owned by Cambodian conglomerate Royal Group, jointly launched 5G network services with investment of up to US$100m for five years. The 5G rollout will use Huawei 5G technology, chosen, according to Turton, for its overall technological features, support systems and costs.[250] Although Cambodia was a late comer to the digital economy in Southeast Asia, it is the first to adopt 5G technology, leapfrogging to ultrafast network technology.[251]

In October 2019, Huawei Technologies was selected as the 5G infrastructure supplier by the Malaysian government.[252] Huawei partnered with Maxis, Malaysia's largest telecommunications company. Despite being aware of the Huawei's ban from some advanced economies, the Malaysian Prime Minister was quoted as saying there is nothing to spy on in Malaysia.[253] Additionally, in 2017 Huawei established OpenLab in Malaysia, a digital platform for collaboration between Huawei and Malaysia's small and medium enterprises (SME) to transform the delivery of digital services and accelerate development of the digital economy.[254] In 2017, Alibaba set up its first Electronic World Trade Platform (eWTP) in Malaysia, a cross-border e-commerce platform to facilitate SME participation in the global supply chain.[255] In April 2020, Huawei collaborated with Singapore and launched its cloud services and AI Innovation Lab aimed at the country's Smart Nation Strategy.[256]

ASEAN's developing economies welcome Chinese technology, both for its affordability and delivery of cutting-edge digital connectivity and solutions.[257] There are no affordable alternatives and, in 2020, no practical 5G alternative. Chinese technology expedited

[248] Young (2019); Harding (2019a)
[249] Xinhua (2019c)
[250] Turton (2019)
[251] Ibid
[252] Kumar (2019)
[253] Ibid; Tsang (2019); Thu (2019)
[254] Ahmed (2018)
[255] Naughton (2020) p. 34-35
[256] Triolo (2020) p. 5
[257] Chan (2019b); Nguyen (2020); Blanchette (2020)

connectivity and narrowed the digital divide, bringing connectivity to economies and markets overlooked previously.[258]

Huawei's and more broadly China's success in deploying vital 5G infrastructure for the global digital revolution is challenging US dominance of this technology ecosystem.[259] Emerging Chinese economic and political influence along the DSR highlights the shift in geo-economic and geopolitical power from the US to China.[260]

Huawei's ascendance from a small importer of foreign telecoms gear to a market leader in 5G networks and telecommunications is due to selling its cutting-edge products which are 30% cheaper than European competitors.[261] Accordingly, in the decade to 2020 Huawei poured $4 billion into R&D for 5G technology.[262] Its ability to reinvest profits earned from China's massive domestic market gave it advantages over competitors.[263]

The increasing irritation of the US towards China's ambition to be a technological superpower resulted in ensuing tensions and the US-China trade war in July 2018, where the US accused China of unfair trade practices.[264] The Trump administration was determined to choked off Chinese dominance by imposing punitive export control measures and lobbying allies to stop using Huawei's technology.[265]

In December 2018, Huawei's chief financial officer Meng Wanzhau was detained in Canada on charges of alleged violation of US sanctions on selling technology to Iran, which Huawei denied. [266] She is the daughter of Huawei's founder Ren Zhengfei. In May 2019, the US Department of Commerce blacklisted Huawei and imposed an export ban on US suppliers selling chips and other components made in or shipped from the US to Huawei, charging it with financial fraud, trade secret theft, conspiracy, obstruction of justice and sanctions violations.[267] Previously, ZTE and Fujian Jinhua, a Chinese chipmaker, were subjected to

[258] Ibid
[259] Hemmings (2020); Naughton (2020); Eder (2019)
[260] Blanchette (2020)
[261] Bourke (2020); Yaku (2019)
[262] Yaku (2019)
[263] Ibid
[264] SCMP (2020a)
[265] U.S. Department of Commerce (2019); Economist (2019c)
[266] Ibid
[267] Ibid

similar US export bans in April and October 2018 respectively.[268] Both companies paid hefty fines and had their operations halted by the US government mandate.[269] In the complex web of global supply chains, Huawei is a large customer of US technology companies such as Flex, Broadcom, Qualcomm, Seagate, Micron, Intel, and Qorvo. According to reports, each sold more than US$90 million of their technology to Huawei in 2017.[270] The tech war clearly also hurt US companies.[271]

The US accused Huawei's 5G technology of possibly containing 'back doors', a deliberate security hole enabling cyberespionage.[272] The US lobbied its allies to ban Huawei's 5G network.[273] Australia, New Zealand, Singapore and Japan have banned Huawei's 5G equipment; European countries are still at odds with US rhetoric against Huawei.[274] However the UK, Sweden and France have joined to banned Huawei's 5G equipment as of the second half of 2020.[275]

The trade war tools are used to halt the progress of China's tech firms and buy time to shore up US tech firms which were already losing ground. A 2020 report indicated that Washington pushed for federal funding to build US-centric 5G infrastructure with conglomerates such as Dell and Microsoft, and to block Huawei from the US domestic market and overseas partnerships with Nokia and Erickson.[276] The irony that the US is trying to *catch up* with China in 5G tech rivalry is stark. US-China rivalry continues to be played out in the technology sector. China is gaining market share among emerging and developing countries along the DSR. However, US's negative campaign against Huawei and China broadly appears to have mixed results.

Although wary of China's deepening influence and US rhetoric on perceived risks associated with Chinese technology, ASEAN economies weighed the costs and risks related with the adoption of Huawei's 5G technology.[277] Many ASEAN economies were happy to adopt

[268] Politi (2018); Atkinson (2019a)
[269] Ibid; The Economist (2018)
[270] Atkinson (2019a); Atkinson (2020)
[271] Soon (2019)
[272] Benner (2020); Atkinson (2020)
[273] Ibid
[274] Economist (2020a); Iwamoto (2020)
[275] Ibid
[276] Statt (2020)
[277] Blanchette (2020); Harding (2019a); Nguyen (2020); Thu (2019)

Huawei's 5G because it is effective and affordable; and, importantly, ASEAN does not want to be left behind in development of the digital economy.[278] Chinese ICT deployment in ASEAN and other emerging economies is supply and demand driven.[279] Chinese tech companies' commercial astuteness in fulfilling digital needs meets the demands of the DSR's emerging economies.

The increasing competitiveness of China's tech companies along the DSR and the broader global digital market competes directly with the US and Europe's large tech companies.[280] The commercial successes of Chinese tech giants includes booming e-commerce investments in ASEAN.[281] Lazada Group based in Singapore is owned by Alibaba and offers evolving technology, logistics and payments infrastructure connecting the diverse ASEAN economies.[282] As of September 2019, Lazada Group had over 50 million monthly active users. The highest number of active users were in Thailand, Malaysia, Philippines, and Vietnam.[283]

Alibaba, Tencent and Didi invested heavily in app-based transportation services such as ride-hailing and ride-sharing, and the on-demand food delivery economy, with Grab and Go-Jek which started in 2012.[284] These e-commerce brands unseated and triumphed over global Uber in Southeast Asia.[285] Grab is valued at US$10 billion and includes GrabFood and GrabBike.[286] Chinese mobile operators such as Oppo, Huawei and Vivo became market leaders and dethroned the region's long-time market leader Samsung.[287] Huawei and Xiaomi, another of China's smartphone makers, are global leaders. Xiaomi was founded in 2010 and in one decade was propelled into third position ahead of Apple as the world's top smartphone seller, in number of units, in September 2020.[288]

[278] Arcesati (2020)
[279] Greene (2020)
[280] Shi-Kupfer (2019)
[281] Nguyen (2020)
[282] Moore (2018); Zhang (2019b)
[283] Zhang (2019b)
[284] Nguyen (2020); Chan (2019b)
[285] Ibid
[286] Trefis Team (2019)
[287] Cheng (2020)
[288] Ibid

Smart Cities

Smart cities refer to urban development which integrates information and digital technologies to run cities more efficiently. The aim is to optimize operations and services delivery to a city's communities and improve the quality of life.[289] The application of wide-ranging ICT embedded into infrastructure and services such as urban transport, government services and social management systems enabled real-time data flows to both service providers and end users.[290] Examples are public transport, self-driving cars, e-government, health, education, energy monitoring, waste management, traffic control, finance, emergency response and controlling crime rates.[291] China has the largest number of smart cities in the world as an urban planning and security (from fire to terrorist risks) solution.[292] In 2018, China had 200 million surveillance cameras which was expected to rise in line with China's domestic development strategy.[293] It is well advanced in smart city technologies including AI, facial recognition, big data and 5G and has a competitive edge in providing smart city solutions.[294] The concept of smart cities is exported to urban planning and development along the DSR.[295]

The US claims that China's smart cities model exaggerates benefits.[296] The adoption of ICT using AI and IoT means real-time data collection, with analysis and predictive modelling across city districts. This raises issues in regards to surveillance and data privacy.[297] This ecosystem of digital and information technology, once adopted, according to Hillman, will be hard to upgrade and expensive to migrate to another ecosystems.[298]

China's smart city model of bundling ICT services with infrastructure was criticised for the potential danger of exporting authoritarianism and alleged cyberespionage along the DSR.[299] In 2019, Huawei was accused of assisting Uganda and Serbia with surveillance of political opponents,[300] claims both Huawei and the governments denied.

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[289] Ekman (2019a); Zhang (2019c)
[290] Ibid
[291] Ibid
[292] Ekman (2019a) p. 9-10
[293] Ibid
[294] Ibid p. 17
[295] Ibid p. 15-16; Greene (2020)
[296] Hillman (2019b)
[297] Ibid
[298] Ibid
[299] Ibid
[300] Feldstein (2020); Triolo (2020) p. 4

Despite these allegations, in November 2017, Inspur Group, China's leading cloud computing and big data service provider was actively building smart city projects along the DSR, partnering with global tech giants, including IBM, CISCO Systems Inc, Diebold Nixdorf and Ericsson AB to provide IT solutions for smart cities.[301] DSR smart city projects are often in collaboration with international businesses and not totally Chinese projects. They partner DSR governments which benefit from increasing market share.[302] Alibaba and the Malaysian government pioneered the first smart development in Kuala Lumpur in 2018.[303] From a commercial perspective, Huawei's 5G deployment and Alibaba's e-commerce and fintech have strong footholds in the smart city market and will evidently benefit greatly in the long-run.[304] The United Nations estimates that by 2050 that about 70% of the global population will live in urban areas and 90% of population growth is expected to be in Asia and Africa.[305] Big tech firms such as Huawei and Alibaba are well-positioned to capture market share, establish standards and gain access to foreign data to improve their technology.[306]

Beyond the ASEAN region, smart city projects proliferated rapidly along the DSR.[307] In April 2019, the Chinese government collaborated with Kenya to build a smart city called the Konza Technology city with a surveillance system and a Cloud Data Centre.[308] China provided a US$172m concessional loan for this project to be built by Huawei,[309] which has also assisted various African enforcement authorities in the development of policing and surveillance capacity in Kenya, Nairobi and Zambia.[310] Huawei collaborated with Uzbekistan, Kazakhstan and Tajikistan in building 5G and smart city surveillance projects in 2018 and 2019.[311] Elsewhere, Huawei collaborated with the Pakistan government to build data centres and smart city projects in Islamabad[312] and entered into a partnership with the Serbian government in September 2018 to build cloud computing services.[313]

[301] Ibid
[302] Zhang (2019c)
[303] Naughton (2020) p. 35
[304] Ibid p. 26
[305] Nation (2018)
[306] Ekman (2019b)
[307] Ekman (2019a) p. 18
[308] Kitson (2019)
[309] Ibid
[310] Ekman (2019a) p. 18
[311] Ibid
[312] Ibid
[313] Ibid

Financial Technology – FinTech

Emerging fintech refers to using innovative technology to deliver enhanced and sophisticated financial services and activities such as mobile payments, micro-loans, banking, insurance and investment.[314] The widespread use of smartphones and mobile connectivity via the internet enabled fintech's rapid development in China. Fintech is another innovation exported successfully along the DSR in Southeast Asia's markets by Alipay and WeChat Pay, subsidiaries of Alibaba and Tencent respectively.[315]

The growth of fintech companies in China is supported by favourable domestic regulatory policies.[316] Large US or European technology companies are subjected to inbound investment controls and have limited access to operate freely in the mobile payment sector. This allowed local tech giants to grow rapidly, which were then exported along the DSR.[317] China and developing Southeast Asian economies share comparable finance conditions. For example, low uptake of traditional financial services due to lack of credit history resulted in a high proportion of the unbanked population, one without a bank account with a financial institution.[318] Fintech services allow anyone to transact using mobile payments without a traditional bank account. The World Bank's Global Findex Data Base reported that China, India, Pakistan and Indonesia have the largest unbanked populations. In 2017, the percentage of unbanked adults in Cambodia was 78%, Myanmar 74%, Laos 71% and the Philippines 66%.[319] Advanced Chinese fintech services assist rural consumers and small business owners.[320] It is reasonable to conclude that China's fintech firms are in a strong position to capture this market in the ASEAN region and along the DSR.

Ant Financial, founded in October 2014, is Alibaba's e-payment services system, similar to PayPal, and has great success in Singapore, Malaysia, Thailand and Vietnam since 2018.[321] It is the highest valued fintech company in the world at about US$200b in August 2020.[322] Through a mix of merger and acquisitions and partnerships, Ant Financial increased its internet

[314] Kshetri (2020) p. 65
[315] Ibid p. 62
[316] Ibid p.72
[317] Ibid p. 72-74
[318] Global Findex (2017)
[319] Kshetri (2020) p.80
[320] Ibid p. 66
[321] Ibid p. 63
[322] The Lex Column (2020)

and web presence in Thailand with Ascend Money, Indonesia with Emtek and in the Philippines with Mynt. This cutting-edge fintech is another feature leapfrogging the development of the digital economy in ASEAN. [323]

The high volume of transaction data collected from e-commence, mobile-payments and social media channels are powering the rapid development of the AI industry in China. On the downside, though, are reports that Chinese fintech companies engaged in mishandling of consumer data,[324] not too dissimilar to Facebook and Google.

Within the fintech space, new Chinese regulations introduced in 2018 required all mobile payments go through a public clearing house known as *Wanglian*. This was China's attempt at regulatory oversight of finance dominated increasingly by nonbank fintech payment platforms. It is estimated that at the end of 2016, temporary funds held by nonbank payments companies were valued at CNY460b (US$73b), according to People's Bank Of China (PBOC).[325] The establishment of *Wanglian* as a clearing and settlement house meant; first, that all mobile payments have greater interoperability; second, improved protection for customers from potential abuse by fintech giants; and third to make the fintech market more competitive by levelling the playing field for smaller fintech operators with lower costs of entry to compete with Alipay and WeChat Pay.[326]

Internationally, the effect and implication of China's regulations meant that consumer data collected by fintech operating along the DSR passed through *Wanglian.* It is managed by the PBOC.[327] According to the Nilson Report, which provides analysis of industry trends and market information on the global card and mobile payment industry, *Wanglian* is 51% owned by Mastercard, 37% by PBOC and its subsidiaries, and 9.61% each by Alipay and Tencent, which owns WeChat Pay. The remainder is owned by smaller third party JD.com.[328] From China's regulatory point of view, *Wanglian* is a tool which monitors payment channels and processes to manage financial risks and provide better transparency of the third-party payment market. Roest, a senior financial sector specialist in Washington DC, argued that the regulator's

[323] Kshetri (2020) p. 74-77
[324] Ibid
[325] Roest (2018)
[326] Ibid
[327] Ibid
[328] Nilson Report (2019)

aim is to avoid money laundering, cashing out problems and stealing funds.[329] Whether consumer data passing through *Wanglian* and the presumption that Chinese state banks use this data for cyberespionage threatening DSR economies need further inquiry.[330]

Data Centre Investments to Enable Better Digital Services

Another emerging industry central to the growth and development of the digital economy is data storage. An enormous amount of data is harvested requiring data storage centres. As digital infrastructure and services become more widespread along the DSR, investment in data centres, cloud computing and big data analysis is growing rapidly. Data centres along the DSR host content closer to end-users, which means more efficient services and lower costs associated with the internet.[331] Accordingly, coastal countries are good hosts for data centres because they are close to subsea fibre optic cables.[332]

In this sector after 2017, China Telecom Global collaborated with China's data centre companies Daily Tech and Global Switch to build data centres in Singapore and Hong Kong.[333] In July 2019, China Mobile International launched its first data centres in Singapore. Being an island, it is proving to be an important DSR data centre node.[334] Alibaba Cloud expanded its operations and launched data centres in Indonesia and Japan in 2019.[335]

In summary, China's lead across various ICT next-generation sectors and its increasing technological capability and market dominance along the DSR is challenging the US, Japan and Germany. As discussed in Chapter 2 favourable domestic policy measures contributed to China's growing lead in the technology space. The US asserts that China's lead is due to aggressive mercantilist policies, intellectual property theft, forced transfer of technology and unfair trade practices.[336]

While some US narratives are well founded, criticisms overly discount China's industrial strategy and the sheer volume of resources invested. First, the transfer of foreign technology in

[329] Roest (2018)
[330] Hemmings (2020)
[331] Kitson (2019)
[332] Ibid
[333] Ibid
[334] Ibid
[335] Ibid
[336] White House (2018); Atkinson (2019b)

strategic industries arising from mergers and acquisitions benefited foreign enterprises eager to access China's large domestic market. Secondly, government-led protective policies restricting foreign ownership and favouring Chinese firms dedicated to developing its own industries are similar to some of the strategies which advanced industrial economies once pursued.[337] Huawei's lead in 5G technology, ahead of the US, indicates China's growing technological capability and advance as a result of vast R&D investments. Nonetheless, China lags behind many advanced technologies, such as advanced microchips and advanced industrial robotics, as discussed in Chapter 2.[338]

Increased activity along the DSR in 5G, fintech, smart cities and data centres drew criticism. The US is campaigning against the DSR and Chinese technology. The US disparages the DSR as the CCP's grand strategy to promote and export its development model and spread digital authoritarianism, 'exporting illiberal mass surveillance tools' and 'attempting to restructure the global order'.[339] These will be discussed in the following chapter.

The DSR serves China's economic and diplomatic goals and helps bridge the digital gap in emerging and developing economies in Southeast Asia, Central Asia and Africa. China's ICT infrastructure financing across Africa surpasses the combined funds of African governments, multilateral agencies and G7 nations.[340]

On the softer side of digital growth is ASEAN, China's tech companies' heavy investments in the region in collaboration with the partner country tech companies and governments indicate China's increasing influence in the region. Booming e-commerce, fintech, smart cities and data centre activities are examples of China's tech companies' commercial success in meeting the needs of the growing digital economy in the region. Partnerships facilitate knowledge-sharing and technical assistance which increases the development and growth of the DSR economies.

[337] Economist (2019b)
[338] Wübbeke (2016) p. 43
[339] Hemmings (2020)
[340] Arcesati (2020)

Chapter 4

Challenges

China's lead in 5G and the contest for technological supremacy in the 21st Century is one source of US-China tensions. The DSR's prominence brings China's internet and cyber sovereignty strategies into the light. Fears that China is exporting digital authoritarianism, the idea of internet sovereignty, advanced AI mass surveillance and is attempting to embed favourable values in internet standard settings are discussed below.[341] China's internet and cyber sovereignty policies have political and economic implications along the DSR and beyond.

China's Internet and Cybersecurity

The CCP sees the internet and cyberspace within its borders as the domain of the state, legislating and policing the information flows reflecting the CCP's authoritarian rule by controlling information and public discourse. [342]

The CCP's fundamental interest is its political legitimacy, domestic stability and development[343] which achieves the Chinese Dream. The Chinese state legislates cyber laws to guide and promote the productive functions and applications of the digital age in the interests of the state; or internet sovereignty.[344] In June 2010, the Information Office of the State Council released 'The Internet in China', a White Paper on Internet policy.[345] It outlines the basic principles of governing the Internet where 'the internet within China's territory is the jurisdiction of Chinese sovereignty.'[346] Everyone has the right to use the Internet but persons and organisations operating within Chinese territory must obey it's Internet laws and regulations.[347]

[341] Hemmings (2020)
[342] Jiang (2010)
[343] Jiang (2010); p. 80
[344] State Council (2010)
[345] Ibid
[346] Ibid
[347] Ibid

The CCP's aspiration is, on the one hand, to rely on the internet as an instrument of engaging productively with citizens and making Party members more accountable in their public responsibilities and, on the other hand, to censor criticism and political dissent.[348]

The CCP reiterates concerns about internet security and stresses that internet security in different countries should be respected fully. According to the BRI's White Paper, the CCP sought support for China's 'cyber sovereignty' and stated 'we should seek common ground and reserve differences, promote development through exchanges, and jointly protect international Internet security.'[349] It proclaims consistently for the right to regulate the internet within China's sovereign borders and for all nations to regulate the internet within their borders.[350] The CCP's model of Internet and Cybersecurity law is the basis of warnings about digital authoritarianism.

US-China tension

The US's campaign against the DSR and Chinese-made technology is worsening the US-China relationship.[351] The US has push backed against China's technology strategy and the construction of the DSR as the CCP's grand strategy to promote and export its development model and spread digital authoritarianism.[352] One of the criticisms relates to the sale of smart city solutions using AI-enabled mass surveillance technology and China's model of digital trade and finance which raises fears of data privacy breaches.[353] A second criticism is that the internet is in danger of fragmentation or, 'balkanization', because of China's participation in international standard settings in cybersecurity and the internet, such as the International Telecommunications Union (ITU), Internet Protocol (IP) or the 3rd Generation Partnership Project (3GPP).[354] This thesis argues that the complex environment of ICT international standard setting precludes China's ability to dominate and the expression of concern is no basis for preventing a sovereign member from participating.

[348] Jiang (2010)
[349] National Development and Reform Commission (2015)
[350] Mai (2017)
[351] Atkinson (2019b); Vergun (2020); Benner (2020)
[352] Ibid; Hemmings (2020)
[353] Hemmings (2020)
[354] Mueller (2020a)

According to ICT experts, China's participation in standard setting and the use of its 5G network is unlikely to lead to the future fragmentation of the internet or global technology ecosystem.[355] 5G standards are dictated by established international telecom associations which are represented by multiple stakeholders, including China. Adoption of China's 5G technology along the DSR is a question of effectiveness and cost, as discussed previously, rather than a preference among DSR countries for China's as opposed to US standards[356]. Participation in international standard setting bodies is to align and deepen the standardization of the Chinese infrastructure networks and ICT products and services with global compatibility and interoperability.[357]

Digital authoritarianism

Digital authoritarianism is defined as 'the use of digital information technology by authoritarian regimes to surveil, repress, and manipulate domestic and foreign populations' and 'is reshaping the power balance between democracies and autocracies'[358] According to Feldstein, digital repression comprises six techniques: surveillance, censorship, social manipulation and harassment, cyber-attacks, internet shutdowns and targeted persecution against online users. These six techniques are not mutually exclusive. Intrusive spyware, for example, implanted by government security services on a user's computer, is both a form of surveillance as well as a cyber-attack.[359]

In January 2020, US Defence Secretary Mark Esper claimed that China had developed a 21st century surveillance state with the ability to censor speech and infringe upon basic human rights.[360] He accused China of exporting facial recognition software and systems abroad.[361] The US State Department alleged that China's technology 'is built upon a foundation of technology-facilitated surveillance and social control' for 'ruling China' and 'have been – and continue to be – in critical ways developed, built, and maintained on behalf of the Party-State by technology firms such as Huawei, Tencent, ZTE, Alibaba, and Baidu.'[362] It claimed that the

[355] Kitson (2019)
[356] Lee (2020)
[357] Mueller (2017)
[358] Polyakova (2019)
[359] Feldstein (2020)
[360] Vergun (2020)
[361] Chen Weiss (2020)
[362] Ford (2019)

security and human rights problems associated with the 'China Model' are being exported.[363] Damning State Department reports argue that China's tech leading companies are de facto agents of the state pursuing its strategic agendas and are subordinate to the CCP.[364] Huawei claims publicly that Chinese law gives the CCP no authority to do things such as compel a firm to install cyber 'back doors' in software code or hardware architecture, or install 'listening devices' in equipment.[365] According to a number of commentators, however, US allegations are unsubstantiated.[366]

In addition to the allegations outlined in the previous chapter, Huawei was blacklisted by the US State Department on charges of violating the International Emergency Economic Powers Act (IEEPA) in illegally assisting Iran by evading sanctions.[367]

The Trump administration campaigned for its allies to block Huawei's 5G technology and networks[368] As we saw, Australia and Japan followed suit, and India is reported to have banned Huawei's technology[369] amid geopolitical tensions over the Himalayan border clash in early June 2020 where 20 Indian soldiers were killed.[370] Many countries in Europe are still undecided. The UK and EU have allowed Huawei limited access to their 5G network rollout.[371]

To assess US claims, it is important to have a robust understanding of the complexity of the environment of technology equipment.[372] First, there is no doubt, as pointed out earlier, that China's tech giants gained a global footing especially along the DSR with the backing of favourable[373] industrial policies and state subsidies. If state subsidies contributed to the global successes of tech giants this does not equate necessarily with China having a global strategy to export its authoritarian model to the world.[374] The national security threat allegations attract increased heat and scrutiny regarding Chinese technology and smart city projects, especially in Western countries. However, emerging and developing countries along the DSR mostly

[363] Cave (2019)
[364] Ford (2019)
[365] Ibid
[366] Benner (2020); Lee (2020); Friedman (2019)
[367] U.S. Department of Commerce (2019)
[368] Sanger (2019)
[369] Kharpal (2020)
[370] Ibid
[371] Ibid
[372] Feldstein (2020)
[373] Greene (2020); Hillman (2019a)
[374] Chen Weiss (2020)

welcome Chinese technology.[375] First, the need for cost-effective cutting-edge Chinese technology outweighs alleged national security threats and, secondly, as discussed in Chapter 3, Chinese vast technology investments in hardware and software facilitate the digital development of the DSR economies.[376]

When it comes to AI surveillance technologies, Feldstein found that China is the largest supplier of AI technology.[377] However, democratic countries are also suppliers of AI technologies, including NEC (Japan), IBM, Palatir and CISCO (US), and other companies from France, Israel and Germany[378] in addition to Huawei, ZTE, Hikvision and Dahua.[379] Accordingly, at least 76 of 176 countries worldwide actively use AI technology for surveillance purposes, including smart cities, facial recognition and 'smart policing'.[380] Furthermore, all types of government, from advanced democracies to illiberal regimes, deploy AI mass surveillance. Fifty-one per cent of nations deploying AI surveillance technology are liberal democracies,[381] though this does not mean that democracies are abusing these systems. Whether a government uses AI technology for repressive purposes depends on internal government structures.[382]

Countries also procure technology from various sources.[383] For example, Saudi Arabia obtained AI technology from various countries; Huawei for safe cities infrastructure, Google for cloud servers, BAE (UK) for mass surveillance systems, NEC (Japan) for facial recognition cameras and Amazon and Alibaba for cloud computing centres in Saudi Arabia.[384]

According to Barma, this reflects more the need for AI mass surveillance as an advanced monitoring capability for city surveillance, policing borders, and predictive policing for criminals and suspected terrorists than China's attempt to spread digital authoritarianism.[385]

[375] Hillman (2019a); Feldstein (2020); Greene (2020)
[376] Triolo (2020)
[377] Feldstein (2019)
[378] Ibid
[379] Feldstein (2020)
[380] Ibid
[381] Feldstein (2019)
[382] Ibid
[383] Ibid
[384] Brewster (2018); Moss (2018)
[385] Barma (2020)

Reports found China subsidises Mongolia, Kenya, Laos, Uganda and Uzbekistan to encourage governments to purchase its equipment.[386] In 2017 Huawei as a commercial incentive 'gifted' the French town, Valenciennes, a euro$2m to showcase its smart city model using AI surveillance as a marketing strategy.[387] Additionally, as illustrated in earlier Chapters, concessional loans were provided to DSR countries as an 'enticement strategy' to build ICT infrastructure. Deals often include mandating contracts with Chinese firms for maintaining after sales services such as support, setup, systems management and training personnel.[388] Huawei aggressively markets its technology as a commercial opportunity, regardless of whether they are liberal or illiberal, not with the view to spreading digital authoritarianism.[389]

China's model of surveillance and technology may be attractive to repressive governments willing to emulate China's development model.[390] The enticing factor here is likely a local government's decision to *'import'* aspects of the Chinese model because of the domestic political environment, rather than the CCP pursuing a grand global strategy to '*export*' its authoritarian model[391] and to restructure the global digital order. According to Weiss, each country assesses its own needs independently.[392] If China is criticised for not working with civil society enough in the development process, it must be highlighted that the CCP reiterates consistently its non-interference policy in the domestic affairs of other countries.[393] The CCP asks to be treated the same by others as a two-way partnership/respect for.[394]

US assertions of Chinese spying are hypocritical. The Edward Snowden case revealed that the US too engages in mass surveillance and espionage domestically and internationally.[395] The USA Patriot Act 2001 mandates US companies to surrender information when requested by the US government regardless of where the information is, or if the matters relate to national security.[396] Hence, the US has similar laws to China's which also authorises the US government to obtain information for the purposes of national security.

[386] Feldstein (2020)
[387] Honovich (2017)
[388] Chen Weiss (2020)
[389] Ibid
[390] Ibid
[391] Ibid
[392] Ibid
[393] Xi (2016b); Xi (2016a); Xi (2017a)
[394] Xi (2018); Xi (2015)
[395] Greenwald (2013)
[396] 2001)

The CCP's focus on economic development and the ambition of technological supremacy aligns with the goals of China's tech giants to prioritise commercial successes as global players.[397] Weiss argues that the CCP is not interested in the political systems of other countries, nor imposing its own model.[398] Its concern is economic development to ensure the CCP's survival. The partnership between the CCP and China's tech giants facilitated expansion of the DSR's inter-connectivity, expediting trade, commerce, and science and technology flows to emerging economies. Arguably, the benefits of economic growth arising from upgrading digital infrastructure outweigh alleged security or data privacy issues.[399] Criticism of the DSR is founded on the fear that the US is losing ground on global leadership in tech prowess to China.[400]

Increasingly, the ability to influence standard settings is another indication of China's technological advances in the technology sector.[401]

Standard-setting and economic power

Emerging technologies mean that established norms are not yet set and often exist in a largely ungoverned space.[402] China's increasing footprint in ICT ecosystems means that it has become a big stakeholder in the industry. Like many major stakeholders, China is interested in shaping the norms and principles governing the impacts of the ICT ecosystem and the development of the world's internet governance. Thus, Chinese tech companies are actively participating in every domain of setting technical standards in next-generation infrastructure for ICT products and services.

Technical standards are important for aligning global comparability and interoperability in running a whole range of ICT goods and services. Technical details are agreed through international bodies such as the International Organisation for Standardisation (ISO), the International Telecommunications Union (ITU) for international norms in cybersecurity and the Internet Protocol (IP), or the 3rd Generation Partnership Project (3GPP).[403] The 5G

[397] Zenglein (2019)
[398] Chen Weiss (2019)
[399] Triolo (2020)
[400] Friedman (2019); Economist (2019c)
[401] Mueller (2020a)
[402] Mueller (2020b)
[403] Lee (2020)

Automotive Association (5GAA) is an association building 5G connectivity into self-driving cars.[404]

Given the fluid and evolving nature of technology, these associations not only set basic technology specifications. Their functions include designing details and methods to improve the quality, security, compatibility and architecture of standards to meet future requirements for technological goods and services.[405] This process fosters economies of scale by allowing new ICT applications which conform to mutually accepted technical characteristics across markets and allows for interoperability and interfaces.[406]

For example, Internet protocol version 4 (IPv4) is the main standard on which the internet runs. It was written in 1973 by Vint Ceft and Bob Kahn in the US.[407] Arguably, according to Lee, the US had significant influence over the development of the internet.[408] The ability to define technical standards is both a mark and instrument of power competition.[409] US dominance over the Internet is challenged by China's increasing participation in international standard setting and its ability to put forward innovations in emerging technological fields reflects its ambition to be a technological superpower. The conclusion to draw is that China's capacity to participate in the international standard-setting landscape will expand.[410]

China promotes 'mutual recognition' of standards at the bilateral level with a large number of countries.[411] In December 2017, the Standardisation Administration of China (SAC) released the Standards China Unicorn Joint Construction One Belt One Road Action Plan (2018-2020) to increase the level of compatibility between Chinese and international standards.[412] The action plan calls for uniform standards ranging across technologies including 5G, artificial intelligence and satellite navigation systems.[413]

[404] Ibid
[405] Ibid
[406] Brake (2020)
[407] Lee (2020)
[408] Ibid
[409] Ibid
[410] Ibid
[411] Seaman (2020)
[412] Kitson (2019)
[413] Chan (2019a)

The Trump administration's regulation to blacklist Huawei in May 2019 made it illegal for any US company to export any US-made hardware, chips, software or services without permission.[414] This regulation had unintended consequences in the standard setting context. It meant that any interaction between US and Huawei personnel in any standard-setting processes is prohibited.[415] The reasoning behind this is that, in the course of standard-setting discussions, US-made technologies would possibly be transferred to Huawei, placing US employers in breach of the regulation.[416] Some US companies removed themselves from the standard-setting processes if Huawei was present. The dilemma left the US's best tech companies voiceless and frozen out of discussions setting the technological rules of the future.[417]

In May 2020, the Trump Administration reversed part of the regulations to let US companies participate when Huawei is present, despite being blacklisted. Naomi Wilson, senior director of policy for the Information Technology Industry Council, a policy group that includes Qualcomm Inc. and Intel Corp. as members, urged the US Department of Commerce to address 'confusing and unclear' policies which have inadvertently caused many US companies to lose their seat at the table to competitors from other countries, namely China.[418]

Another outcome of the export blacklist policy is that some of China's technologies are increasingly incompatible with the US's.[419] US's policy in banning exports to Chinese tech companies meant China's tech companies are pushed to develop their own technologies. For example, every Huawei smartphone relied on Google's Android operating system including Google Maps and Gmail.[420] US's export ban has pushed Huawei to develop its own operating system, Harmony, in an effort to remain competitive in the global smartphone market.[421] Huawei is currently the second largest smartphone manufacturer in the world behind Samsung and ahead of Apple.[422] This development has wider implications which affect Huawei's other devices and China's technology in general.[423] For example, all Huawei computer and laptops use Microsoft's Windows operating system and Huawei's 5G networks use Intel chips. The

[414] U.S. Department of Commerce (2019)
[415] Brake (2020)
[416] Ibid
[417] Economist (2020c)
[418] Shields (2020)
[419] Ekman (2019a) p. 21-22
[420] Ibid
[421] Ibid
[422] Friedman (2019)
[423] Ibid

US's trade ban may push other Chinese tech companies to develop technology without US input.[424] The risk is that, over time, this could contribute to decoupling US and Chinese technology to the disadvantage of the US. [425] This remained a fluid situation in 2020 and much depended US technology policy towards China from 2021.

The Trump administration's reactive and short-sighted policies are directly hurting US technology exports and impacting its tech companies which participate in setting technical standards.[426] By choking supply chains to Chinese tech companies, Washington's intent is to halt the advancement of China's tech giants. Yet in a complex web of globalised supply chains US firms and the whole tech industry are impacted negatively.[427]

Other measures the US deployed to halt China's technological advancement include limitations on foreign investments from China. In January 2020, the US Treasury Department issued a regulation that scrutinizes and limits foreign investment in critical technology firms, especially those from China.[428]

As we have argued, the success of the DSR and China's strategy in the technology space is one source of US-China tensions,[429] revealing the US's worse fears about China's rise.[430] The rapid growth of Chinese technology escalated concerns that foreign competitors in China will be pushed out of its massive and lucrative domestic market by domestic tech giants and, increasingly globally, via the DSR and beyond. Because China's tech companies will expand along the DSR,[431] US-China tensions will be played out increasingly in the ICT sector and development of new technologies.[432]

To counter China's growing influence in Southeast Asia, the US launched an ASEAN initiative in 2018, known as the US-ASEAN Smart Cities Partnership, to build smart and sustainable urban developments under the banner of the ASEAN Smart Cities Network (ASCN).[433]

[424] Ibid; Cheng (2019)
[425] Ekman (2019a) p. 21-22
[426] Brake (2020)
[427] Friedman (2019)
[428] Ricardel (2020)
[429] Mueller (2020b); Friedman (2019)
[430] Ibid
[431] Greene (2020); Triolo (2020)
[432] Ibid
[433] ASEAN (2018)

Strategically, this partnership offers US tech companies opportunities to develop key urban digital infrastructure in the region's rapidly growing markets. The US pledged US$113m for ASCN, which is, as Brittain, notes, miniscule for large infrastructure projects.[434]

In November 2019, the US, Japan and Australia announced the Blue Dot Network (BDN) at the Indo-Pacific Business Forum in Thailand to 'certify and evaluate'[435] high-quality, sustainable infrastructure development projects around the world, focusing specifically on the Indo-Pacific. The BDN is aimed at providing assurances to the private sector when it comes to investing in large infrastructure projects and is likened to the BRI and US-led attempts to counter China's rise.[436]

This Chapter argues that US-China tensions arose because of China's technological advances domestically and along the DSR, and its growing activism in setting standards for emerging technologies. This challenges US dominance in the technology ecosystem. The US alleges that Chinese technology sold along the DSR by Chinese tech giants is for the strategic interests of the state, thereby posing national security threats. These accusations are politically motivated and aimed at disrupting and preventing China's ambition to become a global technological leader. Unwise and short-sighted US policies to halt China's tech progress indirectly hurt the export earnings US companies and hindered their participation in standard-setting processes which are important in developing digital and emerging technologies. China, by way of contrast, sees the DSR as a 'win-win' road to its prosperity and that of DSR nations.

[434] Brittain (2018)
[435] Kuo (2019)
[436] Ibid

Conclusion

The DSR is the most significant global digital infrastructure initiative of the 21st century, as noted in Chapter 1. The CCP's goal is digital interconnectivity along the BRI by offering emerging and developing economies in particular an opportunity to fill large digital infrastructure gaps. The DSR consists of both hardware, such as fibre optic cables, satellites and data centres, and software, including fintech, e-commerce, AI, IoT and smart cities. Built by Chinese private and state-owned companies with Chinese funding, the DSR grew rapidly after 2017.

The DSR is linked intricately to the CCP's ambition to achieve the Chinese Dream of becoming a strong and rich country by the middle of the century, including global technological leadership. As we saw in Chapter 2, the CCP aggressively deploys a dynamic state-led industrial strategy to transition the national economy and deliver sustained economic growth and reducing dependence on western suppliers of strategic core advanced technologies. The CCP sees that its legitimacy hinges on delivering stability and economic growth for the country. The CCP's development model since 2015 has a laser focus on technological innovation. The expansion of the DSR relies on both the private and state sectors.

This thesis concludes that, on balance, the high level of Chinese technology uptake demonstrates that emerging and developing economies welcome the opportunities afforded by the DSR, which are comparatively affordable. The DSR offers the delivery of cutting-edge digital connectivity and ICT solutions where there are no other affordable alternatives. For emerging economies, the adoption of 5G technology leapfrogs existing technological capabilities. As such, the DSR expedites connectivity and narrows the global digital divide, facilitating commercial flows of digital goods and services, encouraging innovation and scaling up internet access. As China acquired technology spill-over and knowledge transfer from leading global technology companies, so too is China doing the same along the DSR by passing on knowledge and technical assistance in the digital economy. On balance, and despite criticisms, the DSR overall points to 'win-win' cooperation the CCP constantly stresses.

As discussed in Chapter 2 and 3, the CCP provides commercial incentives such as concessional loans and subsidies to sway decisions to adopt Chinese technology, contributing to the DSR's

rapid expansion. Though President Xi's 'win-win opportunities' and 'common development for common prosperity' mantras are often dismissed as self-serving propaganda, the emerging and developing economies' digital needs along the DSR are met by access to essential resources and technology.

The leaders of countries along the BRI are as astute as the CCP. Both parties negotiate and at times renegotiate DSR deals, balancing local economic and political needs with China's. The CCP has not engaged in deliberate debt-trap diplomacy, as we argued in Chapter 1, yet it is easy to see how large infrastructure projects can run into financial difficulties for both Chinese firms and recipient countries because of mismanagement and/or difficult business environments. However, on balance, we conclude that more benefits than costs are derived from DSR infrastructure investments. Preliminary assessments of DSR's expansion in the ASEAN region, as discussed in Chapter 3, show a booming digital economy. This is a persuasive indication of the DSR's early success and is instructive of other DSR economies and regions.

The US's amplified security fears of China's technology discount conclusions that the CCP is actively providing competitive alternatives in the infrastructure development landscape. The US views the CCP's DSR strategy as hegemonic, often looking through its own lens and projecting China's ambition as the same.[437] The CCP's interests lie first and foremost in development at home and strategically securing global supply chains. DSR markets serves as current and future export markets for the commercial gains of Chinese tech companies, as argued in Chapter 3. The CCP knows that its survival depends on the success of the BRI and DSR.

In Chapter 4 this thesis considered the view that fears of the CCP spreading digital authoritarianism are politically motivated and exaggerated. The US views the use and acceptance of technology from an authoritarian government as a national security risk. The Trump Administration's unwise and short-sighted actions at times have the opposite effects on US security and commercial interests. Trade wars and export bans designed to halt China's advance also impacted negatively on US technology companies, and perhaps weakened rather than strengthened the US's long-term position. Worsening US-China ties negatively impacted

[437] Rudd (2015) p. 13-14

both. Criticism of China's legitimate participation in international standard settings processes is the US's response to China's rising competitive advantage. As a result, Chinese tech companies influence across many ICT sectors increased, competing directly against many US global ICT companies.

Assessments of the DSR in 2020 are in their infancy. It continues to evolve. In 2020 the debates around the DSR focuses on whether it will successfully narrow the large digital infrastructure gap, or whether US opposition on national security grounds should be the starting point for assessment. Such debates often cloud the complex workings of ICT sectors and what stakeholders are seeking in governance and the global internet of the future. Deeper understanding and more research are required. A much broader question, given China's growing economic influence and as a growing technology stalwart, is how can the US engage positively with China, given that so many trading partners along the DSR in Eurasia and the Indo-Pacific accept Chinese technologies? It is in the interest of all parties that the two largest global economies develop a working framework to manage relations in the context of advanced technology and take a road that is less fractured and more prosperous for all.

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