



THEMATIC INSIGHTS

China and the race for global tech leadership

Opportunities and risks in the
innovation economy



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Introduction

China has been widely forecast to overtake the United States to become the world's largest economy within little more than a decade – a cross-over that could now happen earlier given the differential economic impact of the COVID-19 pandemic on both countries¹. But there is less recognition of an arguably more critical transformation: of China having the potential to be the world's technology leader.

The Middle Kingdom already leads in some technology segments by some margin. It is the largest e-commerce market, three times bigger than the U.S.² Its mobile payment user penetration is the highest in the world: nearly three times that of the U.S.³ Its electric vehicle market is as big as the U.S. and Europe combined⁴.

China is also home to the world's largest mobile gaming market⁵, e-sports market⁶, industrial robot

market⁷, 5G market⁸ and bitcoin mining market⁹. Moreover, for industries where China is currently placed second, such as pharmaceutical¹⁰, insurtech¹¹ and venture capital¹², they are growing at a faster pace than in the U.S.

There are two key drivers which point to a consolidation of China's technology lead over the coming decades: scale and the state-level single-minded focus on innovation, neither of which any other country is currently close to approaching. The potential opportunities may be usefully categorized as derived from three areas:

- » The build-out of a vast, coherent digital economy infrastructure,
- » Leveraging of the world's largest group of internet users,
- » Transformation of traditional industrial sectors.



1 On a GDP-basis, China's Development Research Centre of the State Council updated its forecast to 2032 in September 2020 while the UK-based economic consultancy the Centre for Economics and Business Research revised the date to 2028 from 2033 in its World Economic League Table 2021. The World Bank adjudged the cross-over on real PPP terms occurred in 2017: "Purchasing Power Parities and the Size of World Economies: Results from the 2017 International Comparison Program," May 2020.

2 <https://tenbagroup.com/12-china-e-commerce-market-trends-2020/>

3 <https://www.statista.com/statistics/244501/share-of-mobile-phone-users-accessing-proximity-mobile-payments-country/>

4 <https://www.virta.global/global-electric-vehicle-market>

5 <https://www.telecomreviewasia.com/index.php/news/industry-news/2138-china-leads-mobile-games-market-with-forecasted-growth-in-2020>

6 <https://strivesponsorship.com/2020/03/04/global-esports-market-report-2020/>

7 <https://roboticsandautomationnews.com/2020/10/12/china-has-more-industrial-robots-than-next-four-countries-combined/37273/>

8 <https://techcrunch.com/2020/09/15/china-tops-110-million-5g-users-in-less-than-a-year/>

9 <https://news.bitcoin.com/65-of-global-bitcoin-hashrate-concentrated-in-china/>

10 https://www.iqvia.com/-/media/iqvia/pdfs/canada/2019-trends/top10worldwidesales_en_19.pdf?la=en&hash=5B6D9922E053B42D9F2A1FD7A1883A87

11 https://www.eulerhermes.com/en_global/news-insights/economic-insights/Is-China-winning-the-insurtech-race.html

12 Comparing reports for China from Fortune magazine and for the US from the National Venture Capital Association, it appears that China's VC market is twice the size of that of the US. But PitchBook estimated that China was the second largest in 2018. With definitional and calculation differences, it seems plausible to gauge that the US and China VC markets are of comparable size.

Exhibit 1:
World's Top 5 E-commerce Markets (Gross Merchandise Volume, USD billion), 2019

Note: 2019 total gross merchandise volume shown, except for Japan where 2018 data used due to current availability. Sources for China¹³, US¹⁴, UK¹⁵, Japan¹⁶ and Germany¹⁷ as per footnotes.

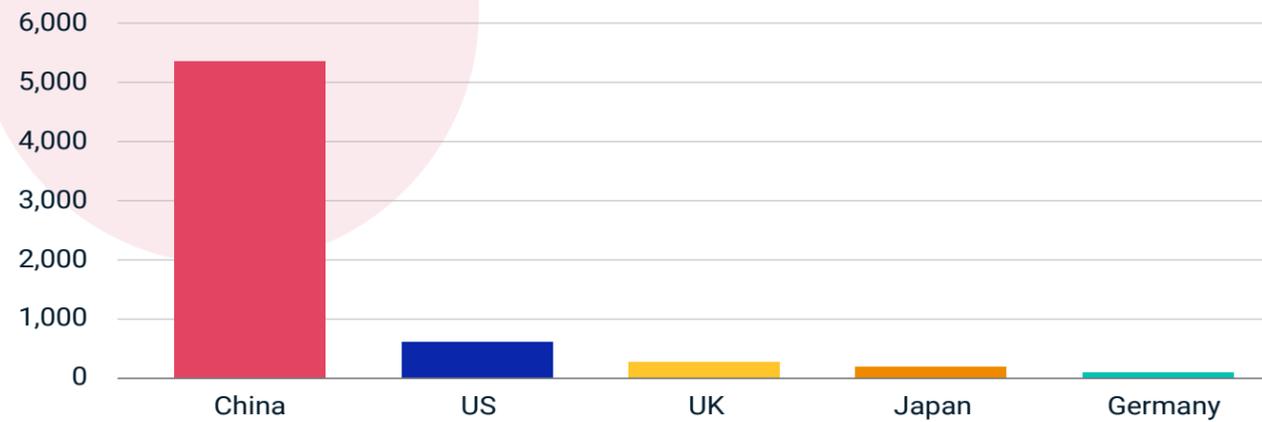
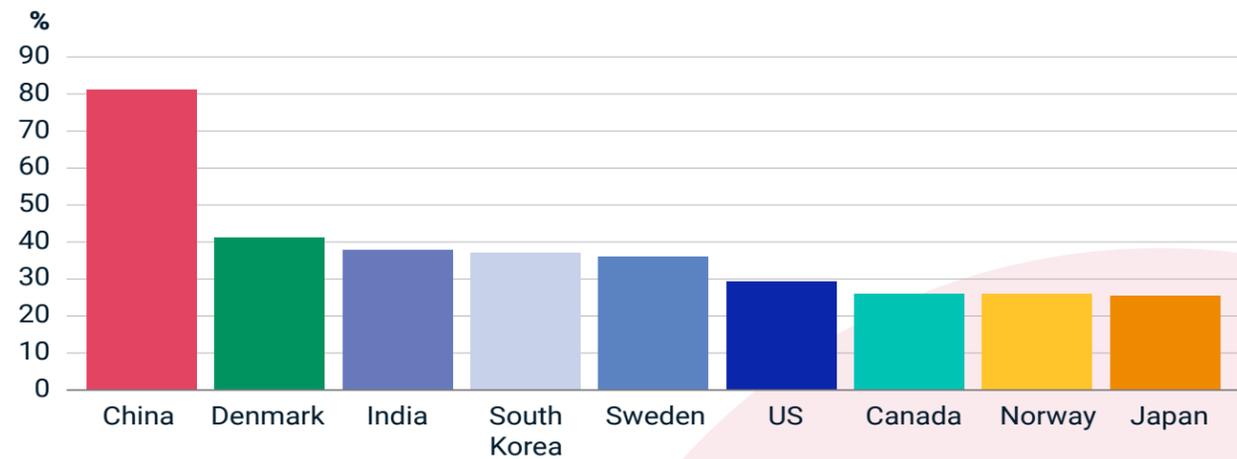


Exhibit 2:
Major Countries Ranked by Mobile Payment Usage Penetration, 2020

Source: Statista.com



13 <https://www.statista.com/statistics/1129543/china-e-commerce-market-gross-merchandise-volume/>

14 <https://www.digitalcommerce360.com/article/us-e-commerce-sales/>

15 <https://ecommercenews.eu/e-commerce-in-uk-to-reach-e200-billion-in-2019/>

16 <https://www.trade.gov/market-intelligence/japan-growth-e-commerce>

17 http://www.xinhuanet.com/english/2020-01/21/c_138724593.htm

Exhibit 3:
World's Major Electric Vehicle Markets (Sales, 1000s), 2019

Source: Data for Global¹⁸, US¹⁹, EU²⁰ and China¹⁹ markets as per footnotes.

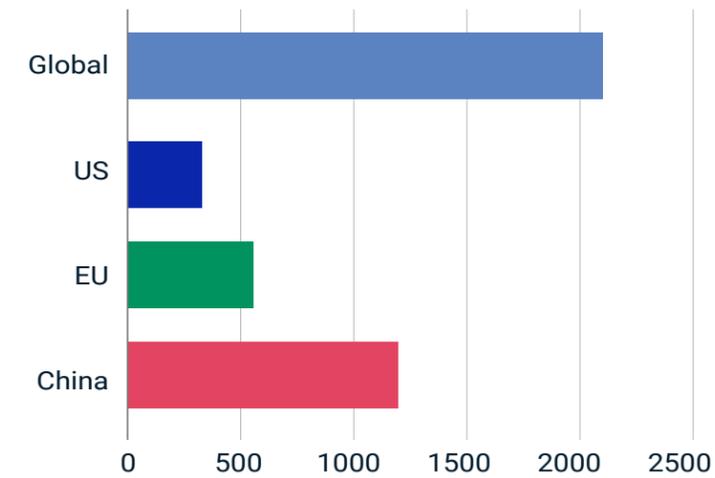
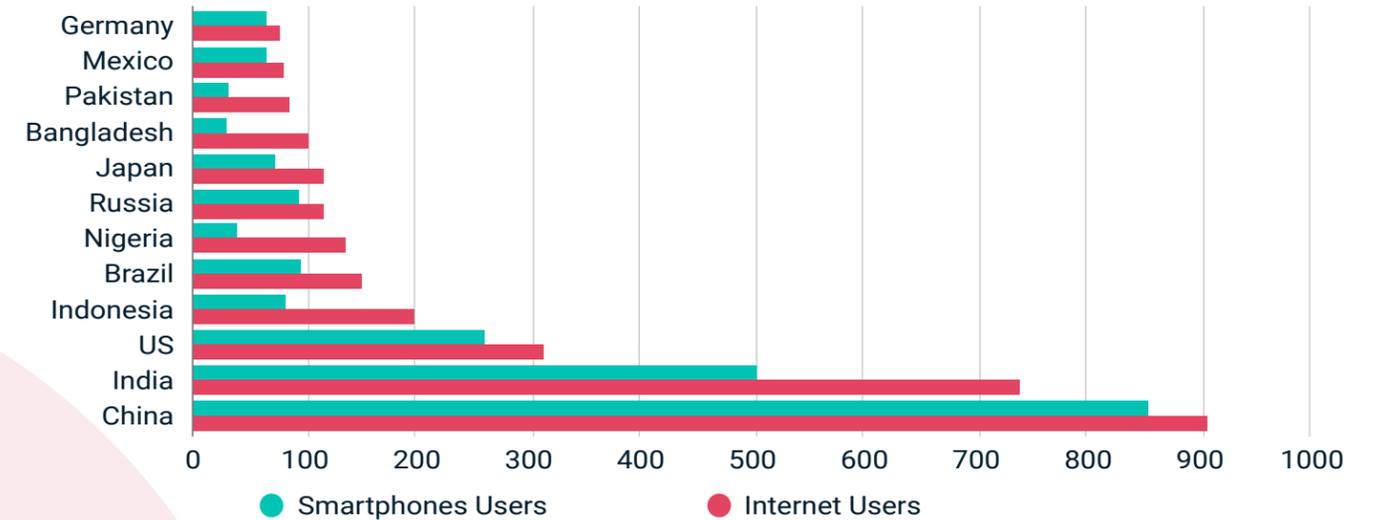


Exhibit 4:
Top 12 Countries Worldwide for Internet Users (Millions), 2020

Source: Statista.com



18 <https://www.iea.org/reports/global-ev-outlook-2020>

19 <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/mckinsey-electric-vehicle-index-europe-cushions-a-global-plunge-in-ev-sales#>

20 <https://insideevs.com/news/394870/plugin-sales-europe-record-december-2019/>

Building out China's digital economy infrastructure

Amidst the COVID-19 pandemic in 2020, Beijing accelerated²¹ its "New Infrastructure" initiative, a policy designed both to stimulate growth and to build a solid foundation for a more digital and "intelligent" economy. The policy calls for increased investments in areas critical to such a digital transformation: 5G networks, "industrial internet" (connected industry), the Internet of Things (IoT), data centers and artificial intelligence (AI).

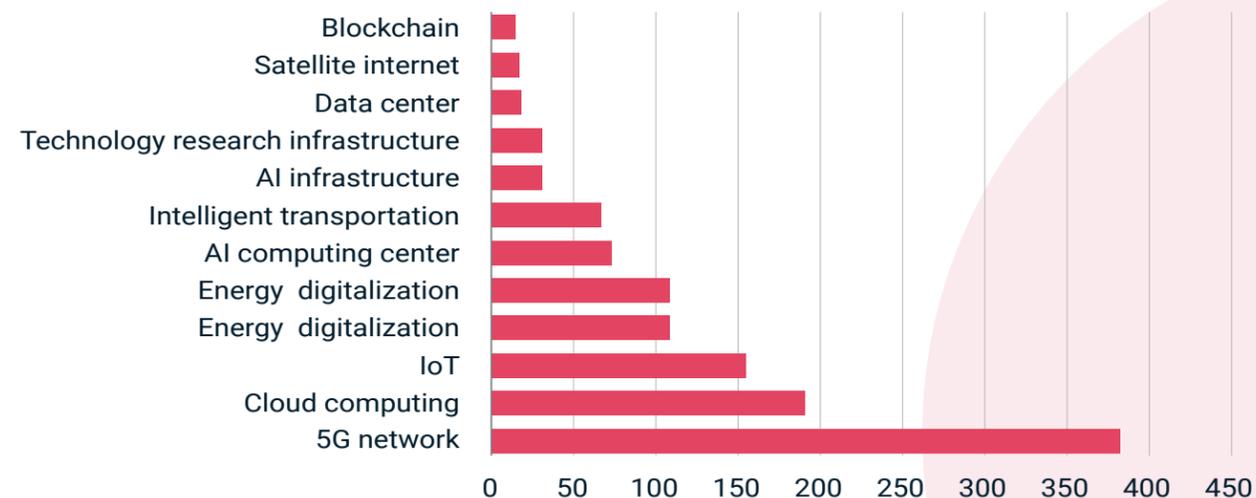
Direct investments under the program could reach RMB 10 trillion (currently USD 1.5 trillion) by 2025 while indirect investments may boost the total to RMB 17 trillion (USD 2.6 trillion).²² Across the so-called "key sectors", from 2020 to 2025, China's 5G network space could see total investment of up to RMB2.5 trillion (USD 382 billion) while the IoT sector might draw RMB 1 trillion (USD 153 billion). Cloud computing is earmarked for up to RMB 1.24 trillion (USD 190 billion), and intelligent transportation and energy digitalization may together benefit from up to RMB 1.1 trillion (USD 172 billion).

²¹ See <https://news.cgtn.com/news/2020-05-06/Getting-to-know-China-s-new-infrastructure-projects-Qf1OLy9khq/index.html> and <https://www.wsj.com/articles/chinas-trillion-dollar-campaign-fuels-a-tech-race-with-the-u-s-11591892854>. For more details: <https://www.china-briefing.com/news/how-foreign-technology-investors-benefit-from-chinas-new-infrastructure-plan/>

²² China Institute of Electronic Information Industry Development (CIDID) <http://news.sciencenet.cn/htmlnews/2020/3/437386.shtm>

Exhibit 5:
Aggregate Investment 2020-2025E in Sectors under the China "New infrastructure" Initiative (USD billions)

Source: China Merchants Securities



All these sectors have the evident potential to stimulate and support growth in downstream and upstream industries. For example, the construction of the 5G network can benefit segments including antennas, fiber optic cables, terminal devices, as well as applications such as telemedicine, augmented reality, and mobile and vehicle connectivity. According to the China Information and Communication Research Institute, investments in these related areas by 2025 could total RMB 3.5 trillion (USD 536 billion)²³. This kind of magnification effect is intrinsic to "New Infrastructure" sectors because they help establish a digital foundation supporting further growth in China's consumer and industrial sectors. Compared to the very limited role the private sector played in traditional infrastructure build-out, more Chinese private enterprises are likely to participate and benefit from the New Infrastructure program. One estimate judges there will be around 500 enterprises actively involved, of which 78% are publicly listed²⁴.

²³ <http://www.chinanews.com/cj/2020/03-04/9113848.shtml>

²⁴ See <https://finance.sina.com.cn/stock/hyyj/2020-09-02/doc-iihvpwy4547134.shtml> and <https://www.huxiu.com/article/378154.html>

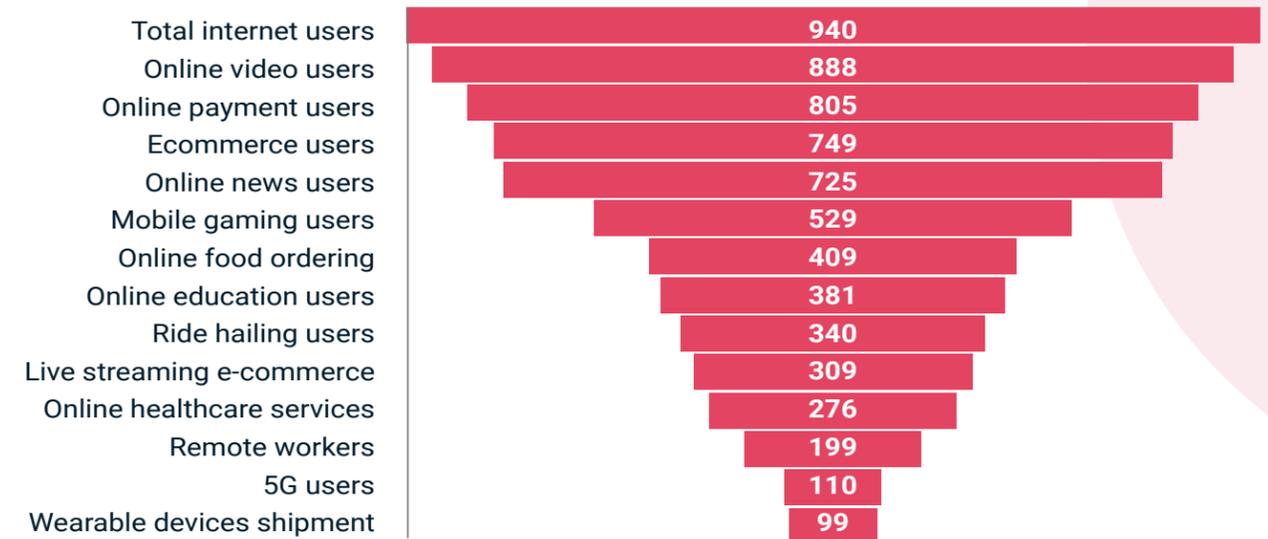


What is the “smart consumer” opportunity?

To a large extent, China's consumers are digital consumers. As of June 2020, there were 940 million internet users in China, of whom 888 million watched online videos, 805 million made online payments, 749 million shopped online, 725 million consumed online news²⁵, 381 million engaged in online education, 340 million used ride hailing apps and 276 million benefitted from online healthcare services.

Exhibit 6:
China's digital consumers (millions) 2020

Source: China Internet Network Information Center, Chinese Ministry of Industry and Information Technology, International Data Corporation



²⁵ http://www.cac.gov.cn/2020-09/29/c_1602939909285141.htm

Chinese consumers are also growing their spending power. Consumption contributed to 57.8% of China's growth in 2019²⁶, and Chinese consumers accounted for 31% of global consumption growth between 2010 to 2017²⁷. If resident income grows annually at 5% from 2021 to 2035 in line with analysis of the Vision 2035 plan²⁸, Chinese consumer demand would likely continue to be the biggest single driver of global consumption growth²⁹.

These factors create downstream economic and business change. For example, iResearch forecast internet healthcare services to grow at 37% on average annually to reach RMB 87.6 billion (USD 13.4 billion) by 2023³⁰. Online health insurance, pharmaceutical e-commerce and remote consultations are the type of growth segments attracting interest from both established healthcare groups as well as startups.³¹

China is the largest education market in the world with 202 million of the 261 million 3-18 year olds in China actively taking part in online education.³² According to LEK Consulting, China's online education companies already account for half of the world's largest 30 publicly-listed online education firms.³³ The local market in pre-test training, after-school tutoring and enrichment course (TTE) has been forecast to grow to

RMB1.5 trillion (USD 230 billion) by 2023 while the online K-12 tutoring market may exceed USD 50 billion by 2023³⁴.

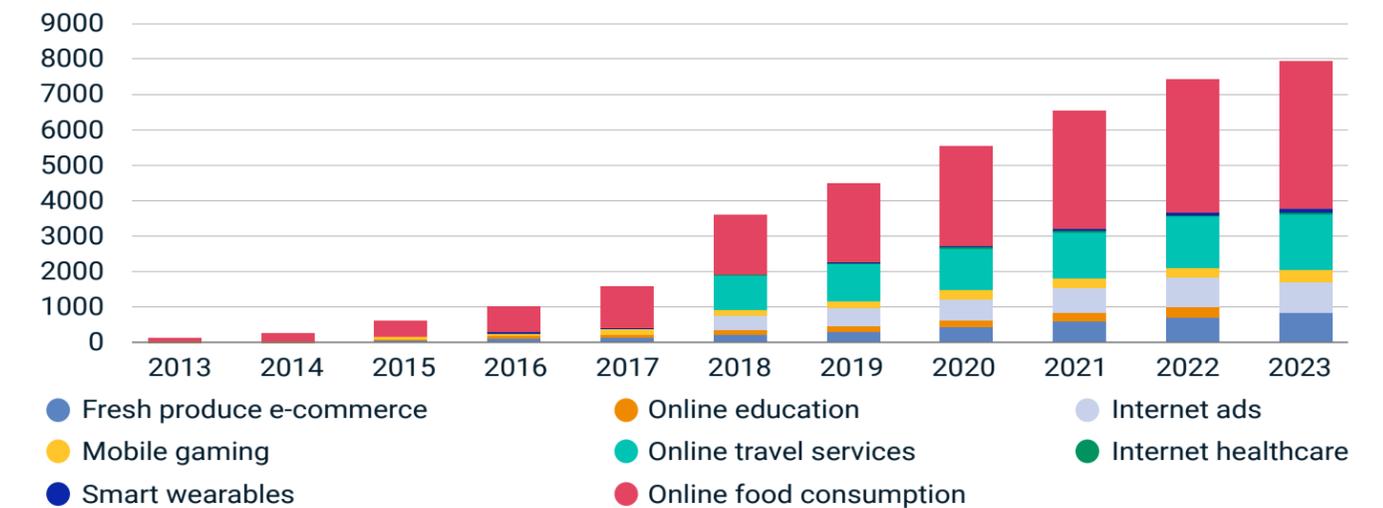
Even in more mature consumer tech industries like e-commerce and online gaming, it is possible new formats and business models may sustain momentum: fresh produce e-commerce, cross-border e-commerce, live streaming e-commerce and augmented reality gaming are all examples of how this mechanism has played out before.

26 https://www.thepaper.cn/newsDetail_forward_5547164
 27 <https://www.mckinsey.com/~media/mckinsey/featured%20insights/china/china%20consumer%20report%202020%20the%20many%20faces%20of%20the%20chinese%20consumer/china-consumer-report-2020-chinese.pdf>
 28 <http://www.sppm.tsinghua.edu.cn/jsfc/26efe489754943fa01759cb82519008c.html> and http://www.gov.cn/zhengce/2020-11/03/content_5556991.htm
 29 <https://www.mckinsey.com/~media/mckinsey/featured%20insights/china/china%20still%20the%20worlds%20growth%20engine%20after%20covid%2019/mckinsey%20china%20consumer%20report%202021.pdf>
 30 https://pdf.dfcfw.com/pdf/H3_AP202009031406987965_1.pdf?1599149829000.pdf



**Exhibit 7:
Key China Consumer Tech Markets 2013 – 2023E (RMB Billion)**

Source: iResearch Consulting, Deloitte, Forward Looking Research Institute, zaoyouxi.com, China Business Industry Research Institute. Note that online food consumption represents online food delivery and online food e-commerce – only a very small portion relates to food consumed in restaurants offline. Note data for certain market segments for certain years are not available.



31 For example, e-pharmacies <https://kuaibao.qq.com/s/20181208A0VR8C00?refer=spider>, auto insurance http://www.xinhuanet.com/finance/2020-06/09/c_1126092931.htm, telemedicine www.gov.cn/xinwen/2018-01/08/content_5254212.htm and health insurance <https://www.ulabmed.com/content-1431-11990-1.html>
 32 <https://finance.sina.com.cn/stock/relnews/hk/2020-12-04/doc-iiznctke4780211.shtml>
 33 https://www.lek.com/sites/default/files/insights/pdf-attachments/China-Spotlight-EdTech_Chinese.pdf
 34 <https://www.hotbak.net/key/>





From "traditional" sectors to "intelligent" industries

Within its 2035 Long-term Vision policy, the Chinese government has emphasized a focus on innovation: technology development is thus a key state-level strategic priority. Given China's role as the world's leading factory for global supply chains and China being second only to the US in government spending, China's traditional economic activity related to manufacturing and city management has the potential to be the source of further growth as they undergo a makeover towards "intelligent industry" and "smart cities".³⁵

The so-called "Industrial Internet", which aims to create the full interconnection of people, machines and things to optimize industrial processes and improve production efficiency, would be a "core sector". As of June 2020, there are 40 million sets of connected industrial equipment, 250,000 industrial apps, and 70 influential industrial Internet platforms serving nearly 400,000 industrial enterprises in China.³⁶ Concrete examples include "dark" factories (fully automated factories), AI vision-powered product quality control systems and industrial data PaaS (platform as a service).

In 2020, China's overall industrial internet economy stood at RMB 3.1 trillion (USD 475 billion) with the core sectors amounting to RMB 652 billion (USD 100 billion), some 3.7 and 1.9 times bigger than 2017 respectively. Such growth is represented by the participation of currently around 100 domestically-listed companies (so-called "concept stocks"³⁷). As noted earlier, investments in the "New Infrastructure" (5G, data centers, AI, etc) provide key support for the likely expansion of the industrial internet.

IDC forecasts that China will spend USD 26.6 billion in smart city initiatives in 2020 and that figure will grow to around USD 41 billion in 2023. Sustainable infrastructure, data-driven governance, and digital management will contribute to over half of overall smart city spending³⁸. As above, around 100 listed companies have been identified as smart city "concept stocks"³⁹.

Smart logistics has been another growth sector. Using intelligent hardware, IoT and big data technologies to improve automation and efficiency, smart logistics in China has been forecast to nearly double from RMB596 billion in 2020 to RMB1 trillion in 2025.⁴⁰ This has the potential to boost development in warehouse robots, unmanned ports and intelligent logistics management software.

Other traditional sectors from manufacturing, transportation and agriculture to government services have the potential to see disruption and change arising from technology and infrastructure upgrades.⁴¹ Moreover, China's efforts to ensure technology self-reliance will help support investments in segments like semiconductors, operating systems and advanced manufacturing.

35 "Smart Cities: Defining the trend, describing the transition", MSCI Thematic Insight, 2020

36 http://www.gov.cn/xinwen/2020-11/05/content_5557494.htm

37 Concept stocks are discussed in https://www.yuncaijing.com/story/details/id_2572.html and <https://m.jrj.com.cn/hq/bkgndetail/id/gyhlw>

38 <https://www.idc.com/getdoc.jsp?containerId=prCHC46039220>

39 https://www.yuncaijing.com/story/details/id_75.html

40 <https://www.reportrc.com/report/20191118/2592.html>

41 For example, smart ports https://news.dayoo.com/gzrbmt/202005/13/158535_53340959.htm, car/road infrastructure http://m.stdaily.com/index/kejixinwen/2020-10/23/content_1031705.shtml, robotaxis <http://scitech.people.com.cn/n1/2020/1026/c1007-31905423.html>, driverless vehicles https://www.sohu.com/a/433168202_417915, remote sensing, drones and unmanned machines in agriculture <https://carrier.huawei.com/cn/success-stories/Industries-5G/Agriculture>, agriculture big data http://cq.cqnews.net/html/2020-03/26/content_50870954.html, smart agriculture http://www.jiangmen.gov.cn/bmpd/jmsnycj/zxd/wynq/content/post_1483142.html and plant protection systems <https://xueqiu.com/3213129193/154157976>

Exhibit 8a:
China's "Industrial Internet" Economy (RMB billion): 2017 – 2020E

Source: Forward Looking Research Institute⁴²

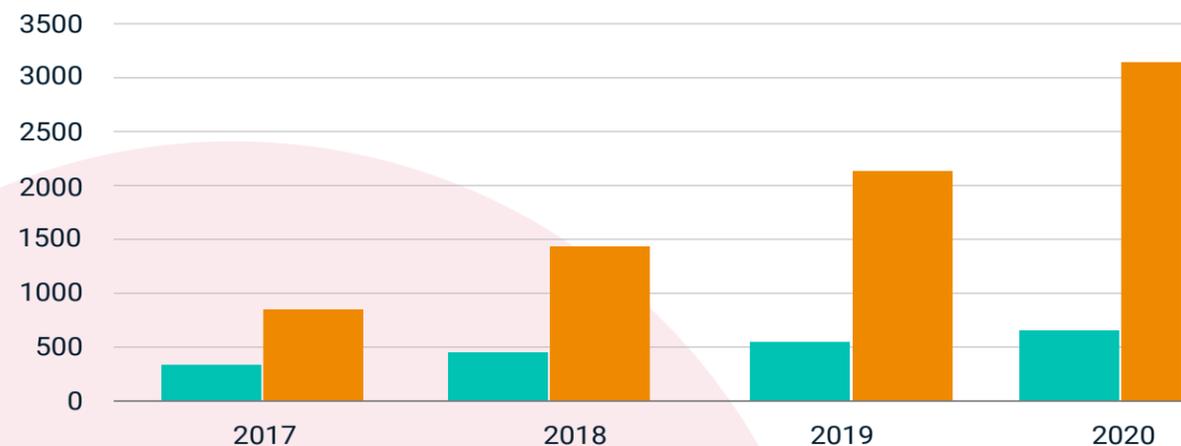
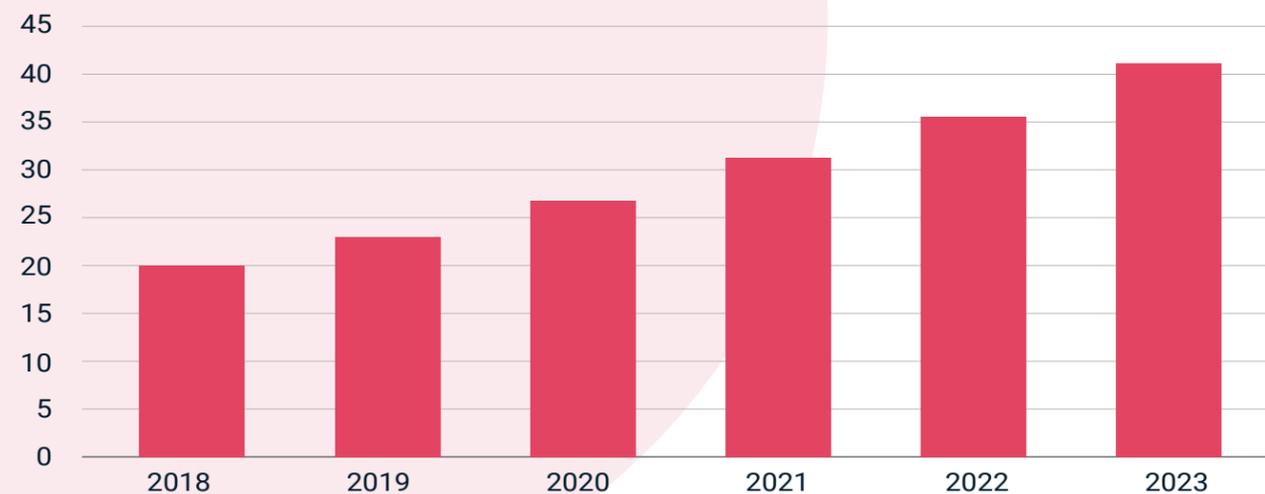


Exhibit 8b:
China Smart City Spending (USD billion): 2018 – 2023E

Source: IDC⁴³



⁴² <https://bg.qianzhan.com/trends/detail/506/200526-60728b68.html>

⁴³ <https://www.idc.com/getdoc.jsp?containerId=prCHC46039220>

Exhibit 8c:
China's Smart Logistics Industry (RMB billion): 2017 – 2025E

Source: Chuangyebang Research Center⁴⁴

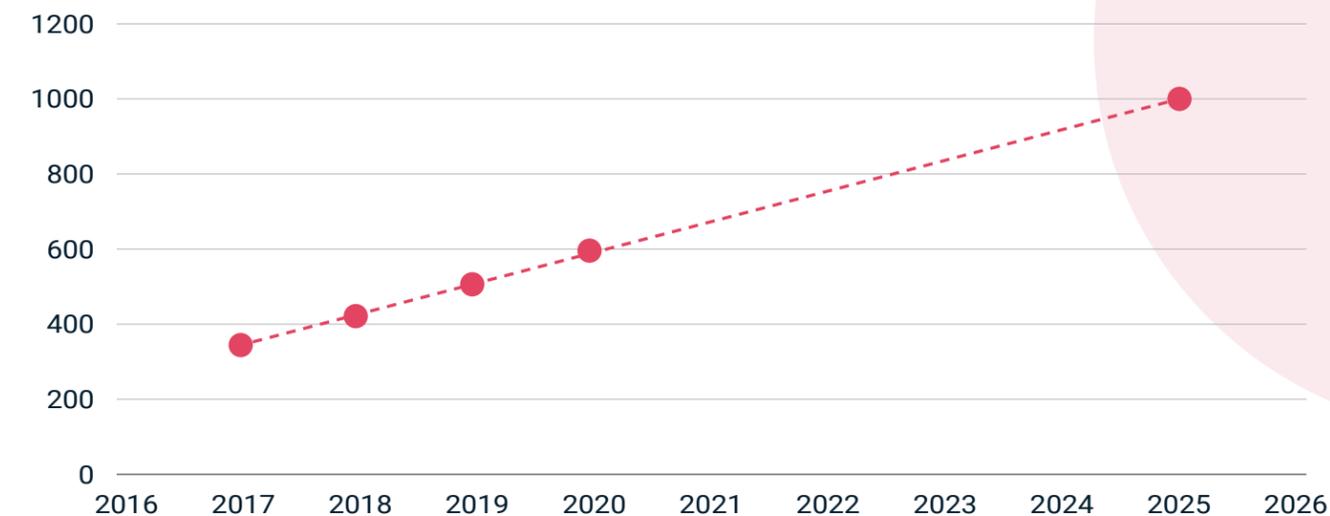
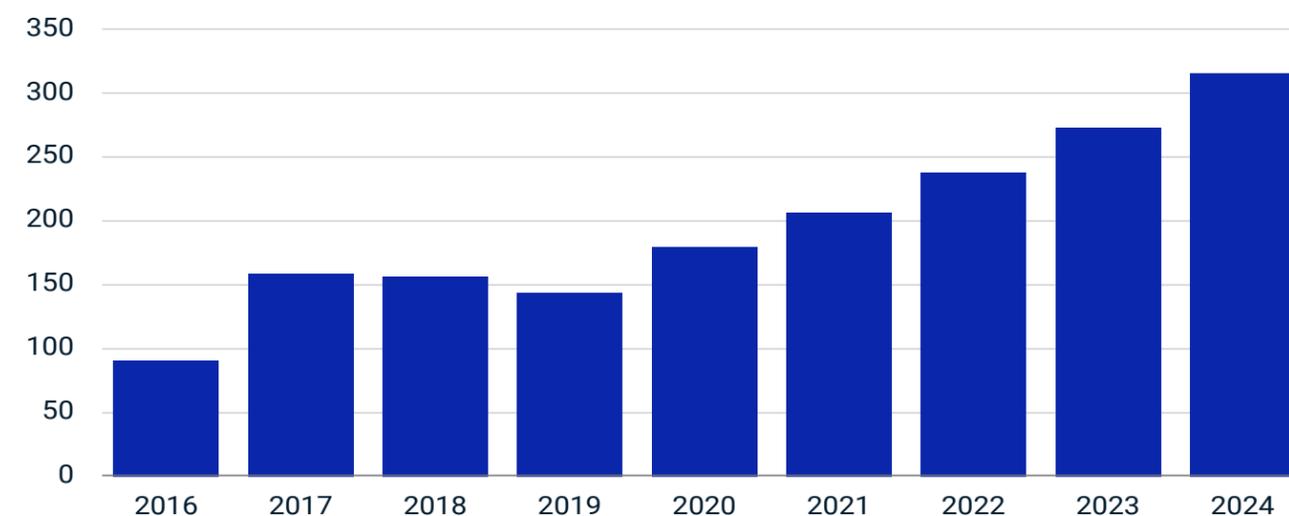


Exhibit 8d:
China Industrial Robot Unit Sales (1000s): 2016 – 2024E

Source: Qianzhan Industry Institute.⁴⁵



⁴⁴ <https://www.cyzone.cn/article/596665.html>

⁴⁵ <https://bg.qianzhan.com/trends/detail/506/200608-70fb3502.html> and <http://www.chinanews.com/cj/2020/11-23/9345216.shtml>

Conclusions



China's push to create an "intelligent economy" infrastructure supports the technological upgrade of many of its traditional industries – which in turn helps meet growing consumer demand more efficiently. This suggests a potential virtuous cycle for China as technology innovations are put to use at scale and at speed.

Two key elements as to why China may become the global tech leader are:

- » China's strength in terms of its market scale and the centralized drive towards better technology applications,
- » The "intelligent industry" makeover of the Chinese traditional economy and the associated opportunities.

Clearly there are challenges and risks as China aims for these goals. The current geopolitical tension and ongoing pandemic threaten to disrupt global industrial supply chains and redraw the world's manufacturing map. Moreover, China's top-down government policy-driven development model can sometimes lead to waste or overheating, incubate failures and result in zombie enterprises.⁴⁶



Neither of these potential drawbacks may be sufficient to undermine the China technology story, however. The ongoing US-China tech rivalry adds further distractions to China's plan to become the world's biggest innovation economy. But in the medium term, this geopolitical challenge may perversely stimulate the growth of China's tech sector as the country races to develop self-reliant tech supply chains.

46 Consider the following examples taken from the steel industry <https://www.reuters.com/article/china-steel-production-capacity-profit-0-idCNKCS1S503K>, photovoltaic cells http://www.xinhuanet.com/power/2018-04/03/c_129842961.htm, the materials sector <http://www.sic.gov.cn/News/455/3068.htm>, of zombie companies http://nads.ruc.edu.cn/upfile/file/20160727155621_848924_58213.pdf and <https://www.huxiu.com/article/318147.html>, commercial real estate http://house.qingdaonews.com/wap/2020-02/05/content_21223431.htm, and the semiconductor industry <https://www.163.com/dy/article/FN14C2CU0539JZ18.html>

▶ **MSCI would like to thank Nina Xiang, founder of China Money Network, for useful discussions and insightful analysis of this megatrend which have greatly facilitated the preparation of this document. Her platform, China Money Network, has tracked China's smart investments and technology innovation since 2011**

Nina Xiang is an expert on the Chinese venture capital and technology sector with nearly twenty years of professional financial and business media experience. She is the author of "Red AI: Victories and Warnings From China's Rise In Artificial Intelligence" (2019). She is currently an agenda contributor for the World Economic Forum and was named as the Female Entrepreneur of the Year 2019 in the ChinaBang Awards.



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