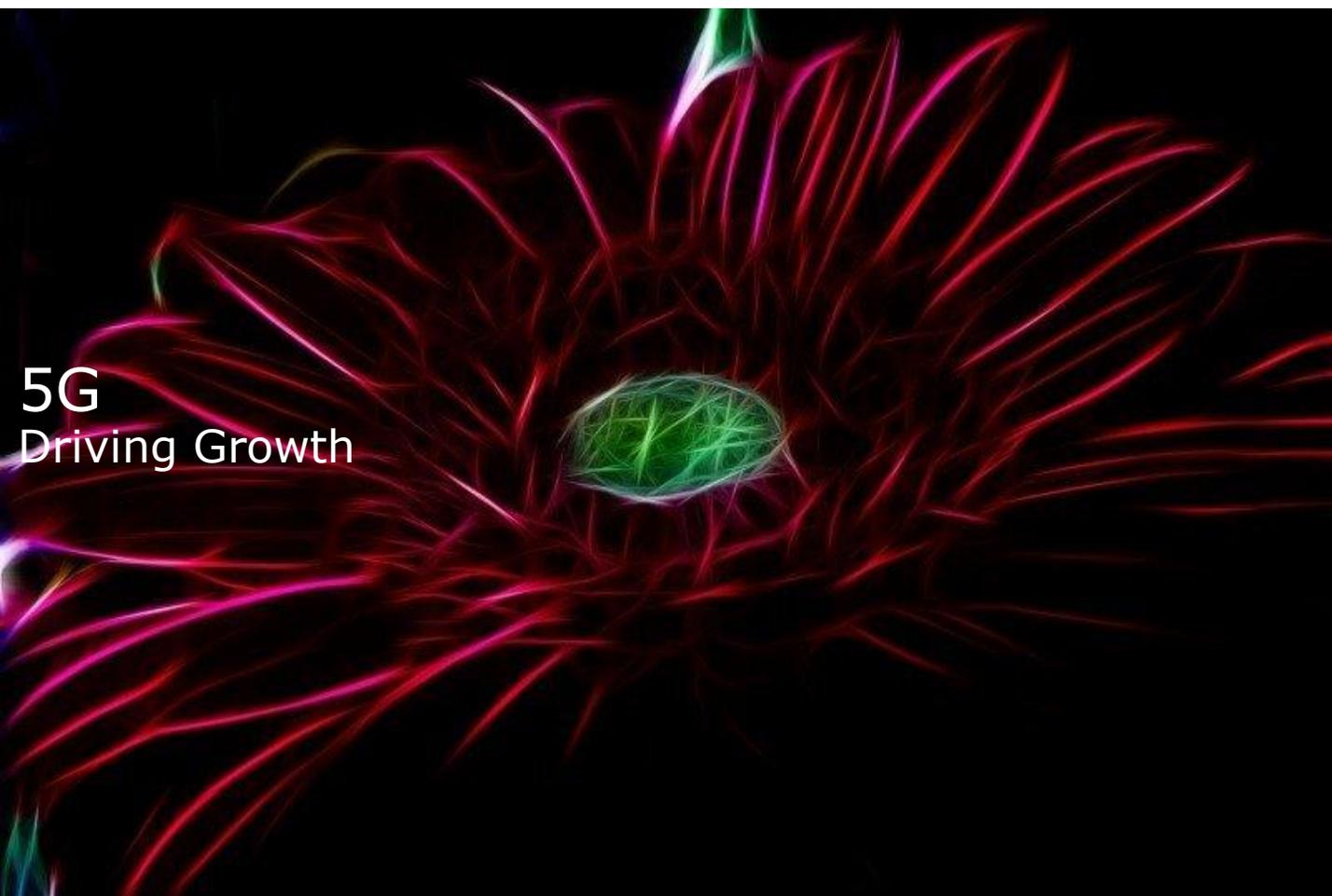


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5G
Driving Growth

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Executive Summary

- 5G has significant potential to drive economic growth over the decades to come. Research suggests that by 2035, 5G's economic contribution could total US\$15.8 trillion globally.
- The sectors that stand to gain the most are manufacturing, information & communications, and wholesale & retail. Geographically, China should receive the greatest economic benefits from 5G due to its conducive government policies and sheer market size.
- In our view, 5G will profoundly impact China's real estate market, lifting demand for industrial real estate, offices, and data centres. Retail is also likely to gain, although 5G's impacts will take time to be felt.



Introduction

- After a broad and cyclical upswing that persisted for almost two years, global economic growth has begun to wane. Factors including trade conflicts, higher business and political uncertainty, and tighter credit conditions have all served to constrict further economic expansion. Recent commentary has been dominated by talks of an impending economic recession, with a survey by Duke University showing two-thirds of CFOs predicting one by end-2020¹.
- Rather than just providing a faster connection, 5G will holistically improve mobile networks. So far, mobile networks have been mostly about connecting people via smartphones. With 5G, the use cases of mobile networks will expand further into industries, enabling connections and interactions between billions of varying devices, each of which will collect actionable data. The rise of 5G is a turning point that will elevate mobile networks from a mostly personal technology to a business platform that sparks economic growth².

What is 5G?

- 5G (short for the 5th Generation of mobile communications), is a bright spot in the darkening economic environment. 5G



Source: *China Is Poised to Win the 5G Race*. Ernst & Young, 13 June 2018, [www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/\\$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf](http://www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf).

¹ Graham, John. *CFO Survey: Recession Expected by Late 2020*. Duke University, 17 Apr 2019, www.fuqua.duke.edu/duke-fuqua-insights/cfo-survey-q1-2019

² 5G will enable completely new services as well as improve existing ones. A prime example of a new service where 5G will be imperative is autonomous vehicles. An instance of improving an existing service would be the use of the Internet of Things (IoT) to optimize logistics. Compared to 4G, 5G can further enhance logistics by providing 100 times more connections per unit area, 10 times the device battery life, etc. New services and improved existing services enabled by 5G have immense potential to impact the global economy and real estate market.

Economic benefits of 5G

- Development of 5G could result in two key benefits that ultimately lift global economic growth.
- The first is the direct economic contribution from the 5G value chain. Firms in the 5G value chain are predominantly in the tech and manufacturing sectors, with network operators, device manufacturers, and application developers being some of the key examples.
- The economic potential of these firms is substantial. Research by IHS Markit indicates that the global 5G value chain could create US\$3.5 trillion in output and support 22 million jobs by 2035. China will be the largest beneficiary of the 5G value chain, receiving US\$984 billion in output and 9.5 million jobs.
- The second key economic benefit of 5G is the potential to help firms increase efficiency, engage both existing and new customers in more productive ways, and create new business models. IHS Markit predicts that these benefits should result in 5G enabling US\$12.3 trillion in global economic activity by 2035.
- The top three sectors that will have the most significant 5G-enabled output are manufacturing, information & communications, and wholesale & retail³.

³ Campbell, Karen et al, *The 5G Economy: How 5G Technology Will Contribute to the Global Economy*. IHS Markit, Jan. 2017, cdn.ihsmarkit.com/www/pdf/IHS-Technology-5G-Economic-Impact-Study.pdf.

China to benefit the most from 5G

- Akin to how 5G may benefit some sectors more than others, 5G will also have disproportionately higher benefits for certain countries. China is likely to benefit the most from 5G due to ambitious government planning and a large domestic 5G market. Proactive policies will give local firms an edge overseas and allow them to better capitalise on the country's large domestic 5G market.
- China had made its 5G ambitions clear since 2013 when the government highlighted 5G's importance in the Made in China 2025 plan. Along with follow-up measures in subsequent policies, these efforts have achieved the following that will help China maximise the benefits of 5G:

1. China is a leader in the 5G race.^{4,5}

It will gain an advantage in developing and monetising 5G-enabled services as a result.

2. China's 5G domestic value chain is in place.

The country already has leading 5G equipment manufacturers⁶, government-backed telecom companies⁷, and a sufficient number of start-ups and tech giants ready to ride on 5G's opportunities.

3. The government has fostered the growth of technologies that 5G will play an integral role in, thus supporting the development of other industries, e.g. autonomous vehicles.

Huawei reportedly launched the world's first 5G hardware for autonomous cars, thus reflecting its bid to become a key player in the sector⁸.

⁴Multiple measures already show China as a leader in the 5G race. According to analysis by Deloitte, China has drastically higher 5G infrastructure density compared to the US, the only other 5G leader with comparable land mass. China is also set to spend a comparable amount on 5G R&D and Capex as the US, suggesting that it will be able to maintain its lead.

⁵5G: *The Chance to Lead for a Decade*. Deloitte, www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-tmt-5g-deployment-imperative.pdf.

⁶Having a cost-efficient domestic manufacturer in Huawei is important, as it means that China does not need to rely on an international manufacturer, which can clearly have issues.

⁷Meanwhile, having government-owned telecom companies is critical for 5G rollout given the immense capex that is required. Many telecom companies are likely to suffer as they bring 5G to market due to the costs. However, cost is not a concern for a Chinese state-owned telecom company supported by a comprehensive government agenda.

⁸*Huawei Says Launches 'World's First' 5G Communications Hardware for Autos*. Thomson Reuters, 22 Apr. 2019, www.reuters.com/article/us-autoshow-shanghai-huawei-tech/huawei-says-launches-worlds-first-5g-communications-hardware-for-autos-idUSKCN1RY0FQ.

China to benefit the most from 5G

- These advantages should help the local Chinese firms gain an edge in the international 5G space. More importantly, however, it allows them to capitalise on China’s immense domestic 5G opportunities. Two measures that highlight the scale of this opportunity are China’s 5G capital expenditure (Capex) and the number of 5G users. According to EY, China will have 5G Capex of US\$223 billion between 2019 and 2025, which will benefit domestic 5G equipment manufacturers. There will also be 576 million Chinese 5G users by 2025, 41% of 5G connections worldwide⁹. The large pool of domestic 5G users presents tremendous opportunities for local telecom and tech companies to create new services for consumers. As such, proactive government policy and a large domestic market will help China realise significant macroeconomic benefits from 5G’s rise.

Year	Initiatives	Description
2013	Made in China 2025	The plan pointed out that China should break through the 5G mobile communication technology comprehensively
2015	13th Five-Year Plan (2016-2020)	The plan proposed that China should promote the development of 5G actively and launch it in 2020.
2014-2015	National 863 Program	<ul style="list-style-type: none"> ▶ National major projects aimed to promote 5G key technologies development
2015-2017	National Science and Technology Major Project	<ul style="list-style-type: none"> ▶ They looked to verify and improve 5G technical schemes ▶ The program supported the global unified 5G standardization

Source: *China Is Poised to Win the 5G Race*. Ernst & Young, 13 June 2018, [www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/\\$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf](http://www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf).

⁹ *China Is Poised to Win the 5G Race*. Ernst & Young, 13 June 2018, [www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/\\$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf](http://www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf).



Real estate impact of 5G in China

- On the whole, 5G is likely to have the most significant economic impact on the manufacturing, information & communications, and wholesale & retail sectors.
- Geographically, most of the macroeconomic benefits will focus on China, which could profoundly impact its real estate market. Specifically, industrial real estate, offices, and data centres should see higher demand. Retail is also likely to gain, although 5G's impact will take time to be felt.
- Industrial real estate, in cities such as Guangzhou, should see the most immediate growth in demand. As China gears up for the commercial launch of 5G in 2020 and rapid expansion afterwards, equipment manufacturers will have to expand into additional space to boost their capacity.
- Following the targeted launch of 5G in 2020, office demand should rise first from the tech sector. Demand will be focused in cities that already have prominent tech clusters, such as Shenzhen, before spreading to those with emerging tech hubs. For instance, Chengdu is one emerging tech hub that may see a significant windfall from 5G. The city sports robust government support and is already home to both international tech giants, including Dell and IBM, and local champions like Huawei¹⁰.
- In the long-term, 5G will not only support office demand via the tech industry but will also sustain broad-based office demand by enabling businesses in all sectors to achieve higher output.

¹⁰Soo, Zen, and Celia Chen. *China's Rising Tech Hubs Are Inland, and There Are a Few*. South China Morning Post, 20 July 2018, www.scmp.com/tech/start-ups/article/2106495/after-beijing-and-shenzhen-which-are-chinas-rising-tech-hubs..

Real estate impact of 5G in China

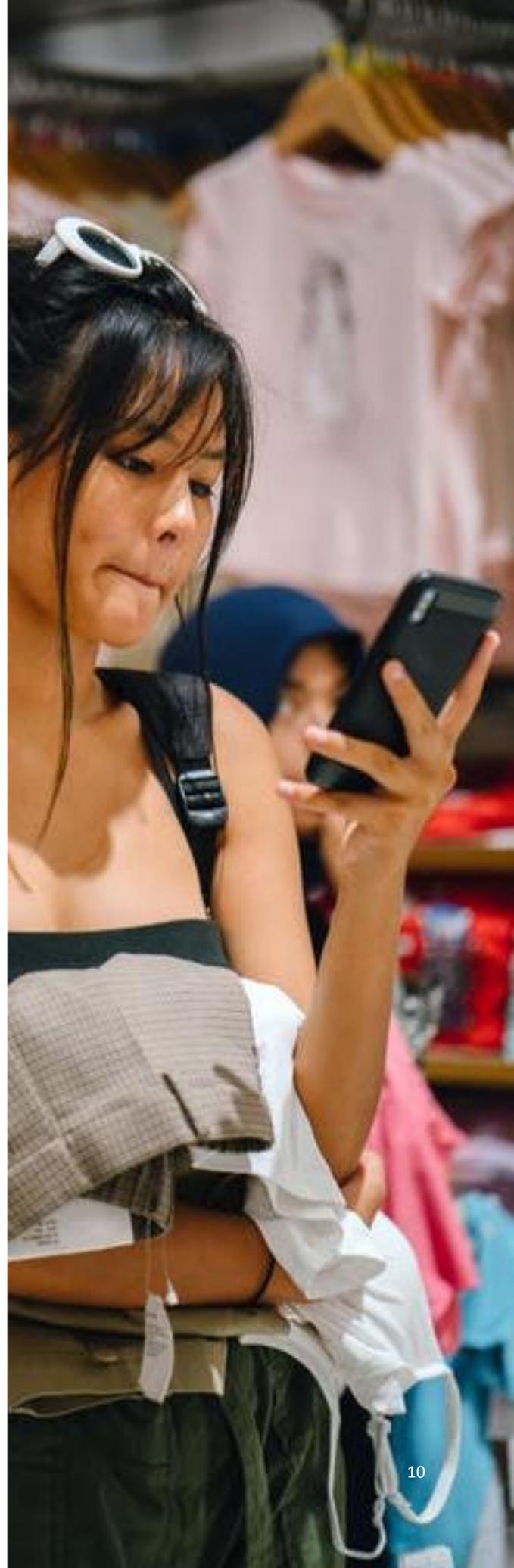
- Logistics facilities are also likely to see increased demand as e-commerce players reap two critical benefits from 5G. The first involves using 5G-enabled technology to enhance the online shopping experience. Shoppers may soon be able to use dynamic augmented and virtual reality to get a better feel for goods they plan to purchase online. The second and more important benefit is 5G's potential to increase the efficiency of logistics operations - a fundamental concern for e-commerce firms¹¹. As e-commerce players benefit from 5G's potential to boost revenue and cut costs, they should continue to expand and take up additional logistics space. Much of this demand is likely to be focused in lower-tier cities, which have higher e-commerce growth potential .
- Other than benefitting e-commerce, 5G is also likely to provide a boost to retail. 5G's impact on retail should be akin to its effects on e-commerce, in that it could provide an improved shopping experience along with more efficient logistics. Yet, there are two key differences.
- For one, brick-and-mortar retail is comparatively less logistics-demanding than e-commerce and will gain less of an advantage from improved logistics.
- Secondly, there is less clarity over how 5G can be used to enhance the retail shopping experience. Although 5G-enabled solutions are in-line with current retail trends of more experiential and personalised retail, time and experimentation will be needed before 5G's impacts can be felt.

¹¹5G will be high on the priority list for Chinese e-commerce and logistics firms, which continue to bleed from elevated costs. Take JD Logistics, e-commerce operator JD.com's logistics unit and one of China's largest and most cutting-edge logistics companies. JD Logistics has been in the red for the last decade and lost 2.8 billion yuan in 2018 on high internal costs.

Real estate impact of 5G in China

- Ultimately, omnichannel retailers stand to gain the most within the retail sector, as they should be able to leverage 5G's advantages for both e-commerce and brick-and-mortar retail. As a result, we are likely to see the omnichannel trend grow further in China, which will support both retail and logistics demand.
- Aside from core real estate, 5G will also boost demand for data centres. Generally, 5G will enable incredibly data-intensive technologies such as autonomous vehicles. It will also allow for 1 million connections per square kilometre, a 100-fold increase from 4G, while enabling faster download speeds with less delay¹⁴. With the immense growth in data consumption highly likely, China should see exponential growth in data centre demand.

¹²China Is Poised to Win the 5G Race. Ernst & Young, 13 June 2018, [www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/\\$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf](http://www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf).



References

- Campbell, Karen et al, *The 5G Economy: How 5G Technology Will Contribute to the Global Economy*. IHS Markit, Jan. 2017, cdn.ihs.com/www/pdf/IHS-Technology-5G-Economic-Impact-Study.pdf
- *5G: The Chance to Lead for a Decade*. Deloitte, www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-tmt-5g-deployment-imperative.pdf.
- *China Is Poised to Win the 5G Race*. Ernst & Young, 13 June 2018, [www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/\\$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf](https://www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf).
- Graham, John. *CFO Survey: Recession Expected by Late 2020*. Duke University, 17 Apr. 2019, www.fuqua.duke.edu/duke-fuqua-insights/cfo-survey-q1-2019.
- Liao, Rita. *JD Founder Cautions Logistics Business Must Tighten Belt*. TechCrunch, 16 Apr. 2019, techcrunch.com/2019/04/15/jd-logistics-tightens-belt/
- Soo, Zen, and Celia Chen. *China's Rising Tech Hubs Are Inland, and There Are a Few*. South China Morning Post, 20 July 2018, www.scmp.com/tech/start-ups/article/2106495/after-beijing-and-shenzhen-which-are-chinas-rising-tech-hubs.
- *Huawei Says Launches 'World's First' 5G Communications Hardware for Autos*. Thomson Reuters, 22 Apr. 2019, www.reuters.com/article/us-autoshow-shanghai-huawei-tech/huawei-says-launches-worlds-first-5g-communications-hardware-for-autos-idUSKCN1RY0FQ.

About ARA Asset Management Limited

ARA Asset Management Limited is a premier global integrated real assets fund manager. As at 31 December 2018, the Gross Assets Managed by ARA Group and its Associates is approximately S\$80.1 billion* across over 100 cities in 23 countries.

Driven by a vision to be the best-in-class real assets fund management company, ARA Group and its Associates' businesses include:

- (a) REITs – ARA is one of the largest REIT managers in Asia Pacific. The Group directly manages Fortune REIT, dual-listed in Singapore and Hong Kong; Suntec REIT and Cache Logistics Trust, listed in Singapore; and Hui Xian REIT and Prosperity REIT, listed in Hong Kong. It also indirectly manages REITs in Japan, Australia, Singapore and Malaysia through its associate companies.
- (b) Private real estate funds – The Group manages private funds providing investment opportunities in diverse real estate sectors and geographies that cater to different investor risk appetites.
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- (d) Infrastructure – ARA Infrastructure was established in 2018 to cater to strong investor demand for global infrastructure investment.
- (e) Real estate management services – As part of the Group's investor-operator philosophy, its dedicated property management teams actively work the ground to manage its assets globally.

ARA's multi-platform, multi-product global fund management strategy, combined with its dedicated teams with in-depth local knowledge, enables the Group to offer enduring value to investors. Built on a foundation of strong corporate governance and business integrity, ARA counts some of the world's largest pension funds, sovereign wealth funds, financial institutions, endowments and family offices as its investors.

For more information, please visit <http://www.ara-group.com>.

*Includes assets under management by ARA Asset Management Limited and the Group of companies ("ARA Group") and its Associates and Joint Ventures as at 31 December 2018.

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