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Guangdong Province's tech development as part of China's dual-circulation vision

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SUMMARY

Since the beginning of China's ongoing tension with and technological blockade by Western countries, Beijing has sought to offset the challenge by enacting the "dual-circulation" economic policy. If successful, the Chinese economy will move away from its outward-oriented model and focus on domestic demand and technological innovation. Instead of being an autarky, Beijing has higher aspirations of leading the global digital economy and technological advancements with its own standards and act as an alternative in a West-dominated sector. However, challenges remain as vital infrastructure, expertise and human capital remain inadequate. This paper focuses on Guangdong's role in China's technological dual-circulation drive, its vision and initiatives within the nationwide developmental framework, and the limitations present in both a provincial and national level.

KEY FINDINGS

1. Beijing's plans to accelerate its expertise in the digital economy under the "dual circulation" still face a number of obstacles. China's tech industry faces a "chokehold problem ("卡脖子"问题)" of vital hardware being vulnerable to Western political risks, and success in domestically nurturing talent and finding alternative sources for raw materials is vital to the upward value chain migration, and ultimately redefining the global tech standard.

2. Guangdong follows the same transformation from an outward-bound to an outward-inward digital economy model and leverages its decades-long edge in economic development.

3. This change not only serves the economic purpose of facilitating the nation's digital transformation, but also a political purpose of showcasing the CCP's exceptionalism and integrating the two former colonies through the Greater Bay Area (GBA) scheme.

4. Guangdong's dual circulation vision still faces setbacks in multiple areas, such as human resources, lack of spillover effects and difficulty in moving up the value chain.

INTRODUCTION

Since the US-China trade war and souring relations, together with the global regression and diminished access of foreign export demands since COVID19, China's priority was to ensure its economic growth and that the changed global landscape wouldn't spiral into greater economic and political purposes. Its dual circulation policies are its means to establish the country towards greater emphasis on economic self-reliance, especially in the realms of technology and industrial development. Guangdong's traditional role as an economic and manufacturing powerhouse has given it a role in China's dual circulation initiatives. Despite governmental support and initial success, Guangdong's development in technology-savvy industries still have a long way to go to being the driving success of Chinese technological self-reliance and realising China's vision on dual circulation.

HISTORICAL CONTEXT

Since Deng Xiaoping initiated China's economic reforms in 1978, China has focused on outward trade, starting from resourced-based and textile exports to electronics and eventually towards high-tech devices. In 30 years, China's exports have rapidly moved up the value chain, with electronics taking up 50% of overall exports and high-tech devices taking up 30% by 2008 (Li 2008: 36-40). Processing trade import-exports rose from USD2.5 billion in 1981 to USD986 billion in 2007, and the overall trade volume with the US rose from USD20.6 billion in 1978 to USD2.2 trillion in 2007. By the 2000s, China's economic output had shifted to processing trade for high-tech electronics. During the 10th Five Year Plan, China had already become the world's largest manufacturer and exporter of laptops, mobile phones and electronics. Related exports reached USD5 billion and took up 41.1% of overall export during that period.

Shortly after, Beijing sought to further the transition towards a high-quality, high-tech economic model while maintaining strong ties with the global export economy. In 2015, Beijing released the Plan for the Implementation of Deepening the Science and Technology System Reform (深化科技体制改革实施方案) to continue China's direction to a high-value economy (State Council 2015). It sought to accelerate technological innovation domestically and facilitate growth in human capital, technological expertise and infrastructure to enhance China's international competitiveness. The Outline of the Innovation-Driven Development Strategy of China (**国家**创新驱动发展战略纲要) further iterated China's strategic ambitions in cementing a leading role in global innovation by nurturing local technological talent, boosting domestic innovation capabilities and establishing technological hubs and research institutions across the nation (State Council 2016).

Real change in policy occurred in 2020 when Beijing proposed a new economic circulation that would shift the focus back to the domestic market (Lin Yifu 2021). Named the "dual circulation" model, the goal is to let domestic and international circulation promote each other. As the worlds' largest trading nation, the shrinkage in global demand, either as a result of worsening US-China relations and the global trade regression since the COVID19 outbreak, will be dearly felt by the Chinese economy. Finding a way to absorb the

economic output domestically has hence become a priority. China's "dual circulation" policy is meant as "an economic development pattern that takes domestic development as the mainstay, with domestic and international development reinforcing each other". China's trade negotiator, Liu He, said the key of this new strategy is to bolster Chinese domestic industry's connectedness and innovation to achieve sophisticated technologies while remaining open to global production (Su Liujin, Liang Junshang 2021).

Before the change, China adopted a "Great International Circulation" strategy. During that time, it aimed to accumulate foreign currency reserves and open up to world trade to attract advanced Western technology through investment in an export and investment-heavy environment. However, it takes considerable time to convert China's production hubs, which many are aligned with the international value chains. Abrupt conversion to the domestic market may create a sudden surge of competition and costs, and without adequate technical sharing and substantial demand, the transformation may be difficult. Hence, a key factor of dual circulation's success is whether it can assimilate and implement advanced technologies in its economy, and whether its institutions and labour pool could keep up with the productivity level necessary for the jump.

Nonetheless, the concept of "dual circulation" isn't new. China already absorbed 82.6% of its domestic production before announcing this concept, of which only 17.4% of its GDP production was exported to foreign countries.

Even at its peak of export in 2006, only 35.4% of its GDP was exported abroad. So the move towards "dual circulation" is more ontological than economical. Instead of reinventing an economic model, China is accelerating a trend already formulating in its economic development and sending a signal that China is no longer solely an export-oriented economy. By the time the US-China trade war started, China had harnessed most of the necessary technology for greater self-reliance, but some highly advanced technologies still needed to be developed. With diminishing inward foreign direct investment and technological transfer amid an increasingly hostile geopolitical environment, China needs to rely on internal research and development. Beijing realises

from the trade war that it faces sharp external risks in being in a compromising position when relations sour with advanced Western countries.

The essence of dual circulation isn't to bring China into a technological autarky. Instead, dual-circulation is to accelerate China's indigenous technological and development capabilities to aid Beijing's outward expansion of influence through the Belt and Road Initiative (BRI) framework. The end goal is to "provide wider market opportunities to other countries and transform China into a magnetic field of international goods and materials (為其他國家提供的市場機會將更加廣闊，成為吸引國際商品和要素資源的巨大引力場)" for BRI countries (Liu Mengjin 2020). The background of dual-circulation stems from the technological blockade from the Western countries in areas like 5G, cloud, Internet of Things and AI. Beijing hopes to buttress China's indigenous innovation and shed its reliance on Western technological capabilities to maintain its competitiveness.

GUANGDONG AS CHINA'S DUAL-CIRCULATION TECHNOLOGICAL HUB

As the first province to open up in China's economic reforms since the 1980s, Guangdong enjoys an exclusive spillover effect from Hong Kong and Macau, together with regulatory and first-mover advantages unparalleled by the rest of the country. The result was a comprehensive manufacturer ecosystem which serves as the foundation of today's development plans together with decades-long international connectivity. President Xi Jinping personally placed extra emphasis on Guangdong as a key driver in realising his "modern socialist China" vision (Ma Xingrui 2021). He pointed out the province's Greater Bay Area, which harbours the former colonies of Hong Kong and Macau together with nine other cities, would take the lead in this matter. The southern province has a geographical advantage of being at the Pearl River Delta and has built up an extensive transportation network over the years. Including Hong Kong and Macau, the region hosts five top-100 universities and 53,000 top-tier Chinese innovative companies, and has invested RMB320 billion in research and development efforts. Besides, Guangdong is investing significantly in human capital and providing incentives for talent retention. Initiatives such as tax subsidies and joint labs with Hong Kong companies have helped attract the right talent. The provincial government has also established 10 key laboratories and attracted up to 200 technological research fellows.

The transformation to a dual-circulation is essential and greatly supported by Beijing's 14th Five Year Plan, and the key goal is simple: to ensure high-quality domestic manufacture and development in the technology sector in Guangdong to lead this sector globally amid the US' pressures. According to the White Paper on China's Digital Economy Development (中国数字经济发展白皮书) published by the China Academy of Information and Communication Technology in April 2021,

the size of Guangdong's digital economy has already reached a leading USD818 billion (or RMB5.2 trillion), taking up 46.9% of the province's GDP and 8.3 points above the national average.

By enhancing China's technological capabilities, Beijing hopes to one day lead the world's digital and AI standardisation in the post-COVID era (Ren An 2021).

Beijing has a few particular aspirations for Guangdong and the Greater Bay Area. First, Guangdong is to help propel China to become a world leader in global technology with innovation as key. Guangdong would focus on innovation as the mantle of development and push the Greater Bay Area into a global technological innovation and hub. It would also seek to address the "chokehold problem ("卡脖子"问题)" of being overly reliant on vital materials from Western countries, such as chips, generators and software, which Beijing is exposed to political risks in the case of sanctions or worsening foreign relations. Second, Beijing seeks to construct a modernised industry ecosystem to accelerate the nation's high-value industry. Guangdong is to be the foundation of a development that not only helps build the next-generation global new economy hub but also better integrate Hong Kong and Macau into the provincial framework. Third, Guangdong will be a pivot point for both outward and inward dual-circulation. On one hand, Guangdong's geographical and infrastructural advantage will see it linked with other economic and technological hubs along the Yangtze River and around Beijing to induce economic spillovers and outward expansion. On the other hand, Guangdong is to incorporate innovations and developments from across the province to enable a more assertive role in international competition and the centre of a BRI-based multinational trade ecosystem.

With innovation directives come legal frameworks. The "Guangdong Digital Economy Implementation Ordinance" (广东省数字经济促进条例), effective since September 2021, was Beijing's first province-level directive on digital economy since the 14th Five-Year Plan (People's Daily 2021). Despite the challenges discussed, Beijing has recognised digital economy as the imperative direction, and Guangdong will spearhead China's development in this realm. Beijing's effort in nurturing Guangdong's digital economy has borne fruits as the market size has topped the nation with RMB5.2 trillion, taking up 46.8% of the province's GDP. However, several risks exist, ranging from ambiguous roles of government infrastructure, intellectual property protection and regulations about digital trade. The province's regulators are gradually closing the gaps with new laws, hoping to facilitate growth "in a prudent manner" while mitigating business and regulatory risks. In fact, the province's move is consistent with a wider, nationwide trend. Key regions like Jiangsu, Zhejiang, Beijing and Shanghai have already accelerated their legislative efforts on regulating the digital economy, which all followed the same path of prudent and gradual growth. Currently, each tech-focused province has their own implementation based on the Central Government's directives in a decentralised manner, as there is a lack of evidence for a Party Central-based top-down approach.

CASE STUDY: GUANGZHOU AND SHENZHEN'S LONGHUA DISTRICT

One example of Guangdong's developments is in the AI realm. The city of Guangzhou has been building an AI development ecosystem in a bid to implement forward thinking (人工智能领域实现前瞻谋划和系统布局) and address the entire value chain, making it one of the AI hubs in China together with Beijing, Shanghai and Shenzhen. Guangzhou is gifted with reliable infrastructure and connectivity with other hubs. It's China's third largest communications hub and among the top-tier Chinese cities in broadband connectivity and proliferation, as well as an early implementer of the Internet of Things. The city government has implemented a list of policy directives to help secure infrastructure essential for the city's status as an AI hub. This includes the Five-Year Plan (2018-2022) on Guangzhou's Acceleration of IAB Development (广州市加 快 IAB 产业发展五年行动计划(2018 - 2022 年), which clearly states the plan is aligned with Xi Jingping's

thoughts and directives from the 19th National People's Congress in pushing forward development in internet, AI and big data (The People's Government of Guangzhou Municipality 2018). Another key regulation is the Key Proposals of Building Guangzhou's AI and Digital Economy Test Hub (广州人工智能与数字经济试验区建设总体方案) in 2020 that hopes to guide the city into a leading position in the GBA's digital development. It iterated that Guangzhou was to have the right infrastructure by 2022, achieve significant breakthroughs in key technologies and GDP by 2025, and become a key AI hub globally and among the BRI states by 2030 (Guangdong-Hong Kong-Macao Greater Bay Area 2020). Meanwhile, Guangzhou has six enterprises trusted to build Guangdong's next-generation open AI in collaboration with key research entities affiliated with the China Academy of Science. It also began recruiting and nurturing the next generation of human capital across the value chain while leveraging the city's high-quality infrastructure. Besides, the rise of labour cost and migration of labour-intensive industries to inland provinces meant Guangdong could focus more on the domestic knowledge-intensive market. This phenomenon is aided by an advanced logistical infrastructure, the existence of city hubs in the province and a unified domestic market.

Another key example of Guangdong's dual-circulation model can be found in the southmost city of Shenzhen. The Longhua district traditionally focused on low value-adding industries and was behind other districts economically in the technological hub (Jiang Cunzhong, Lin Erwei, Zhang Xionghua (2020). In 2019, Longhua was placed fifth in the city's overall economic capacity and ranked last in economic growth. At the same time, the municipality has begun to transform its direction to cater for Guangdong's dual-circulation needs. Tertiary industry has taken up larger proportions of the municipal economy, from 40.08% in 2017 to 52.16% in 2019. Yet, among the tertiary industries, high-value-adding industries still played a relatively small ratio. Longhua's real transformation started in 2020 with the district government's Directive on Building a Pioneering Digital Economical District ("Directive", 龙华区打造数字经济先行区十大举措).

Overseen by local Party cadres, the Directive aims to turn the district into a digital economy hub rich with infrastructure and talent worthy as an exemplar of China's digital ambition.

Under the Directive, Longhua will accommodate various aspects of China's digital economy, ranging from blockchain, 5G, integrated circuits and eCommerce, covering all verticals and in the supply chain. It'll also collaborate with top-tier Chinese digital companies like Huawei and JD.com in implementing this vision. Meanwhile, the municipality seeks to leverage existing digital infrastructure in Shenzhen and the Greater Bay Area to create a 5G-based environment that touches upon all aspects of everyday life. For example, with catering taking up most of Shenzhen's spending, the network would facilitate online ordering via mobile apps like WeChat and Meituan, and in turn buttress the online economy in metropolitan Shenzhen. As for outbound dual-circulation, Longhua seeks to export its digital economy to BRI countries and the African market while establishing an online international market presence for high-end gadgets and devices. Meanwhile, the key corporations will continue to facilitate stronger capabilities on both ends of the value chain. By decreasing reliance on foreign entities for production cycles, Shenzhen's digital economy would mitigate risks associated with the international legs of the supply chain and eventually touch upon the less-developed regions. Eventually, Longhua would take up a leading role in the region's technical infrastructure and technological advancements, and will be a hub for multinational patents and trading agreements.

PROBLEMS AHEAD

China's plan of running a dual circulation faces a few problems (Han Yonghui, Mai Jinghua, Li Qing, Zhang Fan, Luo Xiaofei (2021). To start, cities often lack forward-planning and are unable to grasp spillover effects among production hubs. Guangdong's developed cities are more clustered in the southern Greater Bay Area. For example, high-end economic information and manufacturing industries are concentrated in the coastal cities like Shenzhen, Dongguan and Huizhou, leaving the rest of the province deprived of such development. While computer communication and electrical machinery are highly homogenous, a lack of coordination between cities' policy design may undermine progress. Moreover, local governments' support for industries are often short-term and expected quick returns, ignoring the fact that meaningful transformation and development take time to materialise.

At the moment, technological innovation and research capacity remain insufficient and the upstream market of the new generation information technology industry is monopolised by the US or Japan (ibid.). Foreign investment in the Greater Bay Area is heavily dependent on Hong Kong, and investment from Europe and the US only took up 2% of total FDI in 2019. Such overreliance on Hong Kong, combined with the US' and Japan's monopoly on technology may be undesirable for China's ambitions.

As of 2019, 66.2% of Greater Bay Area's industries is in the tertiary sector, which is behind that of the San Francisco Bay Area (71.6%), the New York Bay Area (82.9%) and the Tokyo Bay Area (74.5%), and international investment from Europe and the US into the Greater Bay Area is only of 2% while the majority came from Hong Kong.

Without the right technical infrastructure and supply of the right raw materials, industries may still need foreign skills and imports for their production, especially if the dual-circulation model doesn't yield sufficient technological breakthroughs and capital to let Guangdong take off as a technological hub.

In particular, innovation progress remains laggard. For example, Guangzhou's development progress in AI lacks significant breakthroughs in theories and implementation, original innovations remain inadequate, and human capital is hindered by the lack of high-end chips, key spare parts and sensors. Between 2016 and 2022, Guangzhou filed 6,558 patents, which is behind Beijing (25,055), Shenzhen (17,364) and Shanghai (9,346). Companies' transformations to inward-facing, high-tech entities are also more difficult than expected. Traditionally outbound companies aren't innovation-savvy. On one hand, they heavily relied on instructions, raw materials, specifications and expertise from foreign clients, hence generally lacking a sense of autonomy. On the other hand, these companies found it difficult to transform due to their years-long focus on low value-adding activities and the lack of capital and expertise, so they're in danger of being locked in a "low value" spiral. China's - and Guangdong's in particular - domestic market development can't escape external factors. For example, Guangdong's export and development of mobile devices were hindered by Western blockades and slashed demand overseas, which in turn adversely affected product research and development.

Since technological advancement takes time to materialise, it'll be important to observe whether China could fill the gap and move up the value chain.

FUTURE STUDIES

In the near future, China will need to rely less on developed countries to realise its dual-circulation ambition. But to maintain the desired growth level, it must source natural sources domestically or from developing countries while fuelling its innovation efforts from its own talent pool. It'll be of interest to observers to see how China and Guangdong could build up sufficient domestic input and output, whether their effort in facilitating talent development and technological innovation could sufficiently materialise to fill in the void from Western blockades, and whether China's output and high-tech industrial standards would make an impact to global distributions change the current geopolitical balance.

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