EY安永
Building a better working world

Strategy for a tech-driven GBA

Preface

Entering an era of high-quality economic growth, President Xi Jinping showcased the key directions in China's economic policies in a symposium on economic and social work in August this year [1]. He highlighted that China is entering a new stage of development in the 14th Five Year Plan, which calls for effective structural reforms that prioritize both international collaboration and the strengthening of domestic demand. In the spirit of the President's speech at the 19th Communist Party National Congress, the objective to achieve high-quality economic growth through new industrialization, informatization, urbanization, rural development and coordinated regional development is paramount.

The President's speech, in our view, reflected the significance of the key regional development initiatives, including the Greater Bay Area (GBA) development plan. These regions are home to millions of people who will embrace higher living standards and more sophisticated consumer markets. With these development initiatives, the regions are going to be the center of China's industrial and technological development that will expedite China's journey to becoming a high-income economy. Such national vision sets the background of this report.

Promoting technological advancement is the primary focus of the GBA development plan. While reviewing the progress made in its technology sector, we found the GBA leading in terms of both the number of technology enterprises and the number of patents and products in the country. With Shenzhen's capabilities in developing cutting-edge innovations and technologies, coupled with Hong Kong's strengths as an international capital market and financial center, the GBA is set to break new grounds in enterprise research and development, talent pool and technology ecosystem.

EY is proud to have contributed in the process. We are advisers for many of these technology enterprises and are proactively supporting the development of the ecosystem. We assist our clients in breaking cross-industry silos through technology to deliver better health care in the region. We also help disrupt traditional industries so they can optimize their budgeting and forecasting by using artificial intelligence technology. In the GBA, we are launching new solutions that not only pull its cities closer but also creating ripples in the rest of the world.

We expect the technology industry in the GBA to remain the epicenter of China's high-quality growth. Going forward, we believe the ecosystem can continue to grow through 1) proactive policy support and new infrastructure sponsorship from the Chinese government; 2) dynamic private enterprises that are open for competition; 3) a supportive capital market that can deepen the financing model; and 4) an expanding talent pool that attracts top brains from around the world. If anything, the GBA is already on the right track.

Jack Chan
Chairman, China
Regional Managing Partner
Member of The Global Executive

1. www.xinhuanet.com/politics/2020-08/24/c_1126407772.htm

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Highlights

With innovation and technology being one of the main pillars in Greater Bay Area development, a recent deep dive by the China government on the characteristics of the industry should provide an important glimpse into the supportive policies to come.

We note that while tangible deliverables such as the number of enterprises engaging in R&D and patent applications reported solid increase in the past five years, a "soft environment" such as manpower and an innovative ecosystem is also catching up.

While Shenzhen remains a clear leader in innovation and technology, the progress of the other eight cities varied. In terms of the soft environment, nevertheless, we note that the Hong Kong's comparative advantages in capital financing and academic research could provide a boost for the whole region. Its traditional industries also present opportunities for catch up through technology upgrades.

To support long-term development of innovation and technology, we believe the China government will have to rely on a multi-pronged approach that emphasizes on eliminating hurdles against market dynamics, improves digital infrastructure, opens market to foreign investors, establishes a transparent and accessible financing model, and expands the eligible talent pool.

1 A deep dive into innovation and tech industry in the GBA

The Greater Bay Area (GBA) was picked as a national champion for innovation and technology development by the Central Government. Specifically, the Outline Development Plan ("the Outline") for the Guangdong-Hong Kong-Macao Greater Bay Area (GBA), released in February 2019, stated that the GBA is going to be shaped into an international technology and innovation hub that:

1. strengthens fundamental research

2. attracts international talent

3. enhances connectivity between cities

4. expands new pillars and existing industries with comparative advantage[2]

In the one-year anniversary of the Outline, the region has made steady progress with ambitious implementation plan laid out, such as Shenzhen's new designation as a national demonstration area[3].

In order to closely monitor the development, the Guangdong Bureau of Statistics was commissioned to study the characteristics of the technology sector in the nine GBA cities in the Mainland in depth[4]. In our view, the exercise reflects the dedication of the regional leaders to pin down the key areas in innovation and technology development in the region. Key observations made in the study, as such, may be followed up with supportive measures in the pipeline.

2. *Guangdong-Hong Kong-Macau Greater Bay Area – From connectivity to integration*, EY report, 2019
3. *The Shenzhen demonstration area - Showcasing China's formula for high-quality growth*, EY report, 2020
4. stats.gd.gov.cn/attachment/0/384/384305/2853067.pdf

2 Robust growth of the area as a national champion

Remarkable growth in innovation and technology development in the region

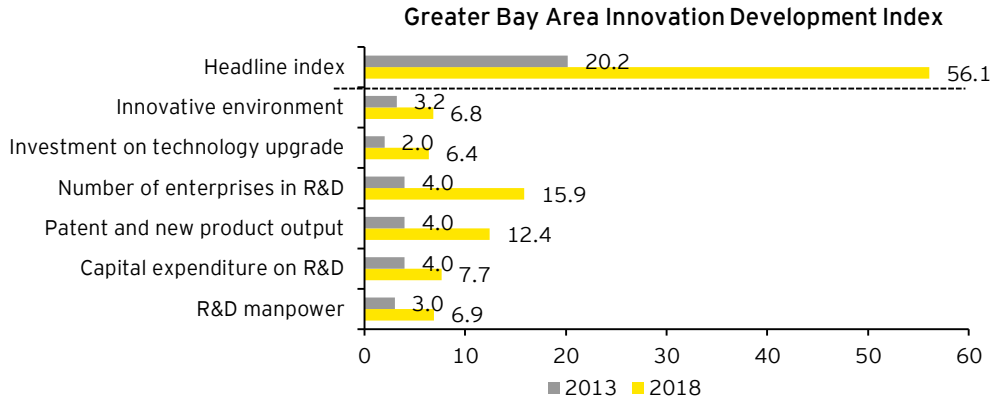
The Guangdong Bureau used a quantitative approach to evaluate the innovation and technology development in the region. Based on the National Bureau of Statistics' methodology, it created the GBA innovation development index based on six areas on research and development (R&D): the number of enterprises engaging in R&D, patent and new product output, R&D manpower, enterprise capital expenditure on R&D, investment on technology upgrade, and an innovative environment. Not surprisingly, the index showed that the market environment for innovation development in the nine GBA cities in the Mainland nearly tripled between 2013 and 2018, suggesting remarkable breakthroughs.

The GBA innovation development index has six categories and 11 components

Category	Component
R&D manpower	R&D personnel per 10,000 employed workers
Enterprise capital expenditure on R&D	R&D expenditure as % of total VAI from industrial enterprises above designated size
Patent and new product output	New product as % of total production by industrial enterprises above designated size
	Patent applied per 10,000 inhabitant
	Patent granted per 10,000 inhabitants
Number of enterprises engaging in R&D	Number of enterprises with designated R&D personnel
	Enterprise engaging in R&D as a % of total industrial enterprises above designated size
	Number of designated high-tech enterprise
Investment on technology upgrade	Investment on industrial technology upgrade
Innovative environment	Local government spending on technology as % of total expenditure
	University graduate per 10,000 inhabitants

Source: Guangdong Bureau of Statistics

Significant improvement in innovation development especially in tangible categories

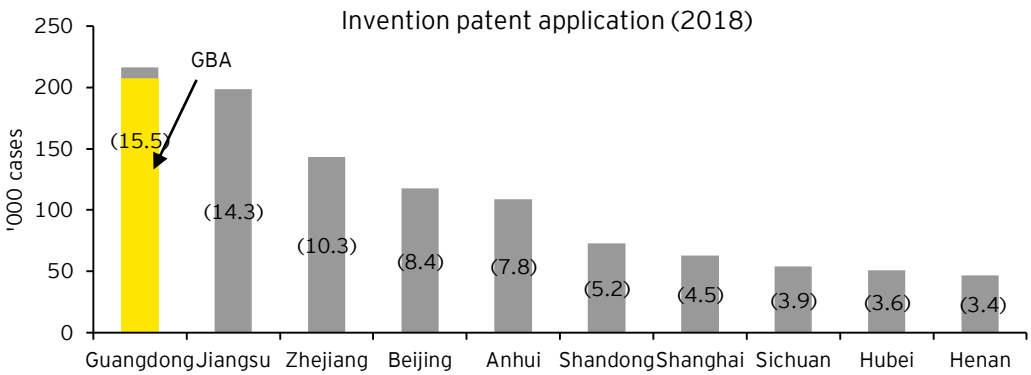


Source: Guangdong Bureau of Statistics

Enterprises demonstrated strong commitments, with government support

The index showed that the GBA's technology development is boosted especially by the rapid increase in the number of enterprises engaging in R&D and the output of R&D in terms of patents and new products, both of which have more than tripled. Indeed, Guangdong (mainly the GBA cities) led the whole country in terms of international Patent Cooperation Treaty (PCT) patent applications, with 24,700 or over 40% of national total in 2019[5]. Meanwhile, the nine GBA cities in the Mainland are collectively home to around 20.5% of China businesses that have R&D facilities, against an overall share of 13.2% in 2018.

The GBA is a national leader in patent application



Note: Share of national total in bracket
Source: Wind, Guangdong Bureau of Statistics

5. www.sipo.gov.cn/zscqgz/1145388.htm

It suggested strong enterprise sponsorships that are in line with favorable policies since the launch of the National Intellectual Property Strategy in 2008[6], as well as the ambitious national and regional targets on patent applications and ownership[7]. For example, internet companies in the region are actively investing through their corporate venture capital, amid government incentives on patent application. Also, the government introduced venture capital (VC) funding promotion policies, such as co-financing for private VC funds from local government funds[8]. As a result, China's VC market expanded to become the world's second largest with strong presence in Shenzhen[9].

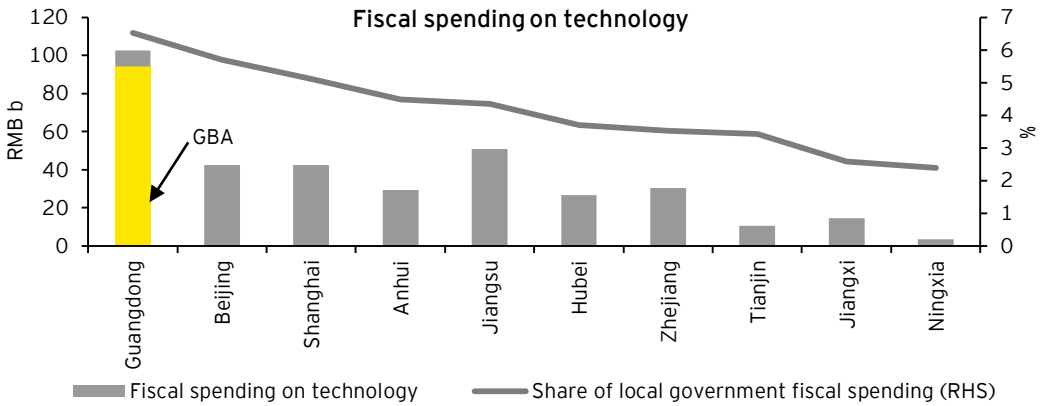
Soft environment such as talent supply lags behind

Meanwhile, the study also showed that the soft environment for GBA's innovation and technology development continued to lag. Compared to more tangible achievements above, R&D manpower, enterprise capital expenditure on R&D, and the innovative environment have increased albeit at less pronounced pace. It may suggest room for further improvement in terms of the availability of R&D talent, the share of R&D funding as a share of value-added of industry (VAI), and the share of R&D funding in local government finances.

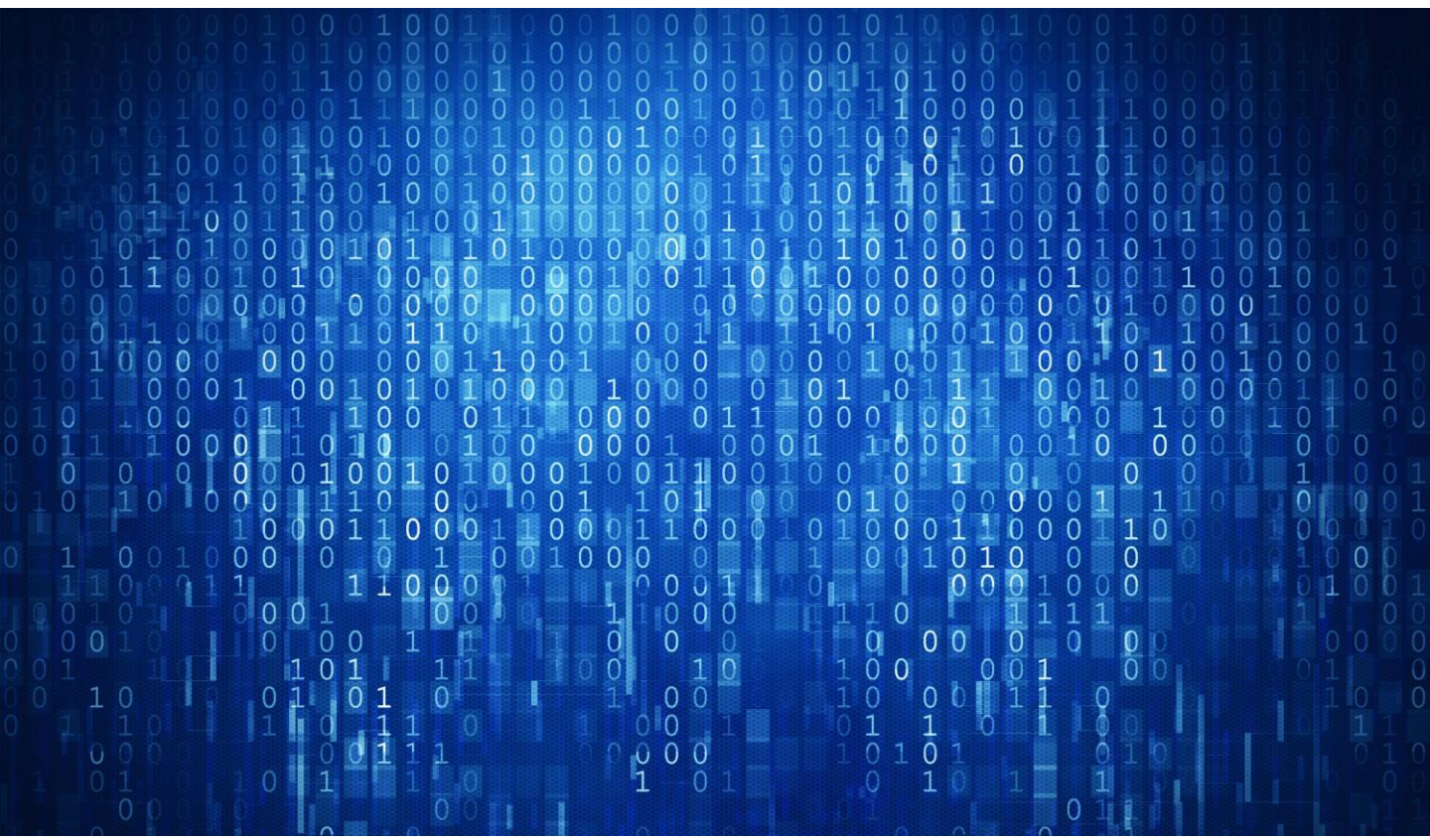
6. www.gov.cn/zwgk/2008-06/10/content_1012269.htm
7. www.sz.gov.cn/zfgb/2017/gb991/content/post_4999118.html
8. www.rieti.go.jp/jp/publications/pdp/18p012.pdf
9. pitchbook.com/media/press-releases/china-became-second-largest-venture-capital-market-by-total-capital-invested-in-2018-according-to-pitchbook-report

It is important to note that the lag comes from exceedingly strong growth in enterprise commitment rather than a lack of progress in these areas. In terms of the share of local government spending on technology development, the GBA is a strong national leader with 4 of the top 10 cities coming from this region. It comes amid a four-fold increase in spending in the past five years, to close to RMB90b in 2018 from around RMB20b in 2014. Corporate R&D spending by industrial enterprises, meanwhile, also increased to 7.2% of total VAI in 2018 from 5.7% in 2014.

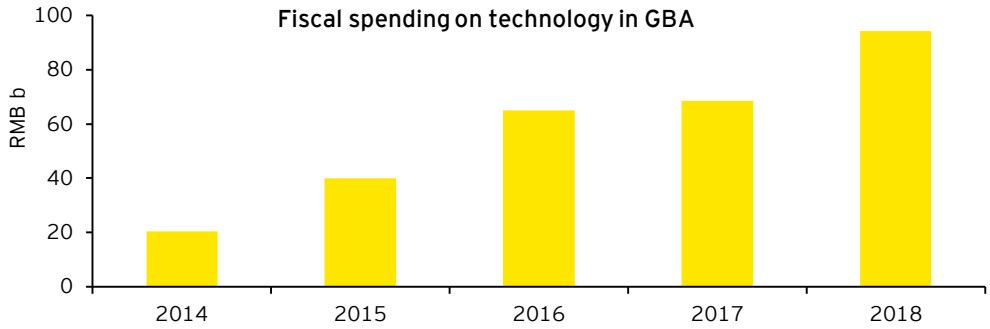
The GBA is also a national leader in fiscal technology spending



Source: Wind



GBA fiscal tech spending has more than quadrupled in the past five years



Source: Wind

Nevertheless, the divergent trends do reveal the challenge to institutionalize innovation after the low hanging fruits are picked. Building upon the progress of tech enterprises, the process functions a lot like a coral reef[10].It calls for the gradual creation of an ecosystem by accumulated networks of both new and veteran talent in the right field. Individuals in the network should be encouraged to mix together in productive ways. Over time, ideas emerging in the network of talent find endogenous support for development, which could in turn attract more technical, labor, and capital resources.

10. hbr.org/2012/12/how-to-create-an-innovation-ec

Box 1 | The innovative ecosystem in the GBA

Health care sector in the GBA ecosystem
The evolution of the innovation ecosystem in the GBA is taking place rapidly. This is the synergy that comes from the collaboration of diverse entities that pertains to the creation of new products and services.

As an example, a multinational pharmaceutical company has recently invited top market leaders and experts across industries such as communication technology giants, health care providers, insurance companies, property developers and non-governmental organizations in the GBA to create a new structure of working together, with an objective to disrupt the business model of the life sciences and health care industry.

Digital platform to generate real-time, multilateral exchange of information
Traditionally, the health care sector takes on a dispersed network with hospital being the main connection point with patients. It not only leads to an imbalance of information between the hospital and other components within the health care sector, the isolated data and incompatible documentation are also prone to human errors and long processing time.

The proposed new structure starts with seeking to enable information sharing within the health care sector through the agreement with a consortium of involved parties, with patients' consent. It is then combined with big data collected from wearable technology, online medical consultations, insurance policies, patient representative organizations, and other demographic and consumer analytics.

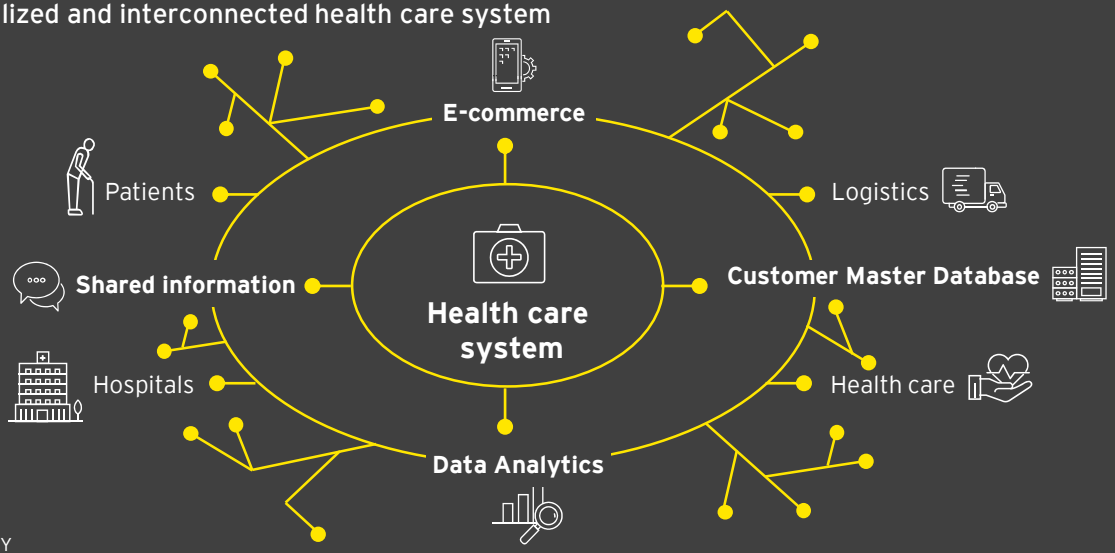
Deliver better patient experience through the ecosystem

Data sharing allows for more astute examination that will be useful for: 1) global sourcing and distribution of medication; 2) improvement in the quality of traditional and online health care; 3) pharmaceutical research and drug safety monitoring; 4) research in patient welfare and consumer behavior; 5) further development in the Internet of Things (IoT) and next-generation wearable technology; and 6) the basis for more industry innovation and incubation programs.

Presence of hard environment factors spurs the ecosystem development

As this example illustrates, an ecosystem would not be possible without the presence of diverse entities that are collaborative and interdependent in the early stage. The creation of "hard environment" – presence of enterprises engaging in R&D – a natural first step to create such innovative ecosystem may be considered. The other factors in the ecosystem, including manpower, capital, and idea, will only flourish once the hard environment has taken root.

A digitalized and interconnected health care system

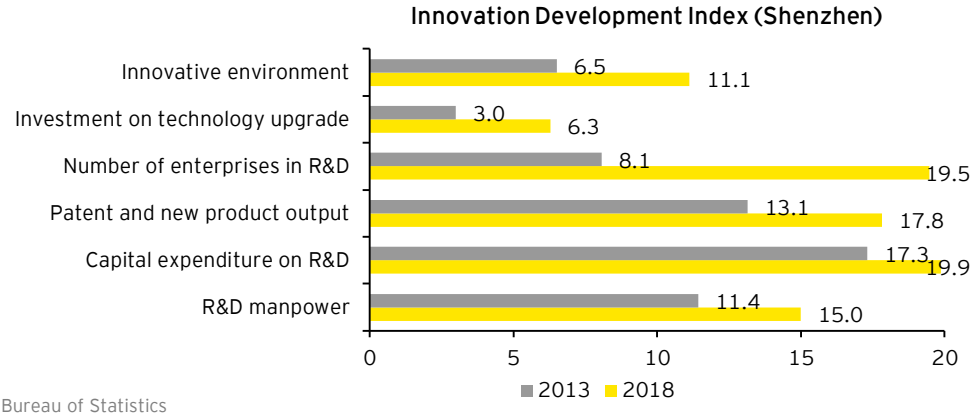


Source: EY

Three innovation leaders in the GBA

By location, Shenzhen and Zhuhai are leaders among the nine GBA cities in the Mainland with the highest readings in the innovation development index, followed by Dongguan, which showed the most improvement from being one of the last three cities in 2013 to one of the leaders. Shenzhen stands out in having one of the highest scores in enterprise capital expenditure on R&D, reflecting its massive private sector in the technology sector. The city also has strong R&D manpower and an innovative environment, consistent with its profile as China's technology hub and the obvious leader in the GBA in terms of innovation.

Shenzhen's technological progress is characterized with a strong innovative environment and labor supply



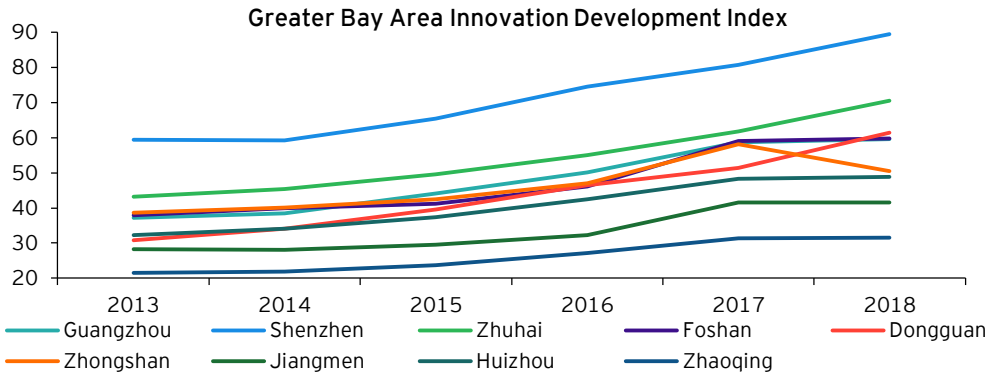
Source: Guangdong Bureau of Statistics

Zhuhai also has one of the more "tech-ready" economy with strong R&D manpower and an innovative environment, but while Shenzhen's focus is on electronics and communication equipment, it is more specialized on the biomedical industry. With an official target for the size of the industry to reach RMB80-100b in 2020, Zhuhai's VAI growth has been one of the leaders in the region in recent years.

Dongguan, meanwhile, has a relatively late start in innovation and technology development but its 2018 score in patent and new product output was almost as strong as Shenzhen. The process began in 2012 with government-led initiatives to upgrade the industrial sector from its traditional role as a hub for processing trade. The initiatives included tax concessions, R&D subsidies, seminars and exhibitions to support the city's community of mainly private and smaller enterprises in technology[11].

11. news.southcn.com/gd/content/2020-01/17/content_190084453.htm

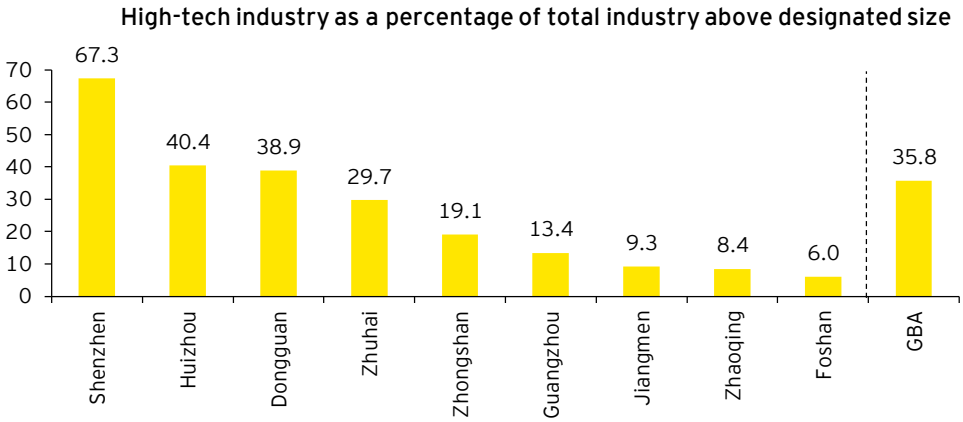
Divergence expanded with Shenzhen, Zhuhai and Dongguan as leaders



Source: Guangdong Bureau of Statistics

Among the nine mainland cities in the GBA, however, the study found that the divergence in industrial development actually widened between 2013 and 2018, with Shenzhen being the obvious leader. As a whole, the VAI of high-tech industry amounted to 35.8% of total VAI in 2018, with only Shenzhen reaching the official target at 50%. The traditional manufacturing hub of Guangzhou and Foshan, in particular, have been flagged for needing more improvement in innovation and technology development.

Most of the cities in the region still fall short of meeting the technology growth target

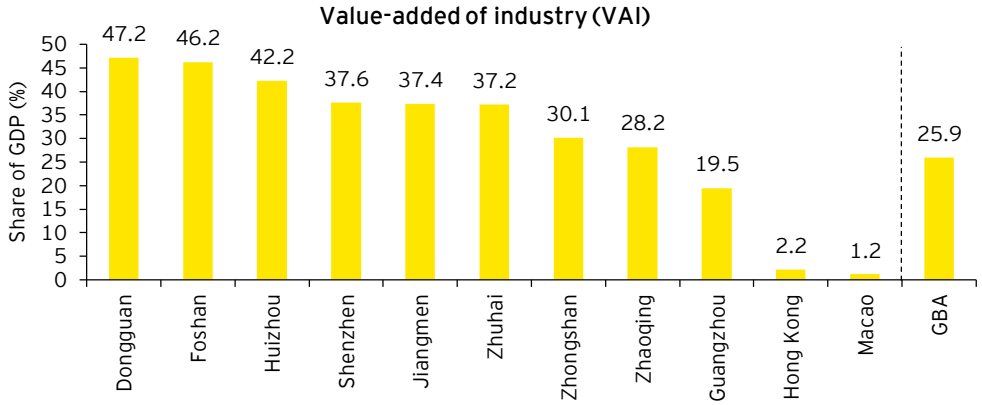


Source: Guangdong Bureau of Statistics

3 The collaborative roles of Hong Kong and Macao

As highly specialized economies with little tech-related industries, Hong Kong and Macao are not included in the study, but the study also revealed ways that the relative strong suits of Hong Kong's economy could collaborate with the tech-related industrial development in the rest of the area, especially in terms of its soft technology environment.

Industrial VAI accounts for only 2.2 % and 1.1% of Hong Kong and Macao's economies respectively



Source: Guangdong Bureau of Statistics, Wind

According to *the Global Scientific And Technological Innovation Centers Evaluation Report* by the Shanghai Information Center, Hong Kong is in the 15th place compared to Shenzhen's 27th and Guangzhou's 46th in 2020 in terms of overall innovativeness. Although Hong Kong lacks an industrial sector, its position comes predominantly from the city's comparative advantage in fundamental research, including the number of academic publication citation, the international ranking of its universities, the recognition of its scientific research, and the quality of its scientific research facilities. The talent generated from the universities in Hong Kong could feed the demand for technology talent in the GBA.

Ranking of cities in the *Global Scientific And Technological Innovation Centers Evaluation Report*

Cities	Ranking (2020)
Beijing	7
Shanghai	12
Hong Kong	15
Shenzhen	27
Guangzhou	46
Taipei	50
Hangzhou	64
Nanjing	77
Chengdu	88
Wuhan	92

Source: Shanghai Information Center

The technology enterprise may also tap into the financial market in Hong Kong to further expand its investment on R&D. Specifically, in the *Opinion on Financial Support for the Construction of the Guangdong-Hong Kong-Macao Greater Bay Area*[12], which was released in May 2020, private equity funds in Hong Kong and Macao are encouraged to participate in cross-border financing arrangements for innovative enterprises within the GBA, while qualified innovative enterprises are encouraged to list in Hong Kong. Institutional investors in Hong Kong and Macao are also allowed to participate in private equity investment funds and venture capital funds in the GBA through Qualified Foreign Limited Partners (QFLPs).

12. www.pbc.gov.cn/goutongjiaoliu/113456/113469/4023428/index.html

Box 2 | Artificial intelligence in the real estate industry

Investment on technology upgrade
Another key aspect for innovation development is on the technology upgrade of existing business sectors. Rather than considering innovation and technology as a detached concept, they can disrupt existing business practices and generate new value through revised paradigms and efficiency improvements. They can fit right into the core of the decision-making process in the traditional sectors.

AI to optimize budgeting and forecasting
An example is how a Hong Kong based international conglomerate with a diversified portfolio of market leading businesses needs to simplify complex decisions of their real estate business around how resources should be allocated and how to improve revenue projections.

We created a robust artificial intelligence (AI) and machine learning (ML) model that takes in as much data points as possible, from macro factors such as economic growth projections to micro considerations such as the positioning of new bus stops. The model algorithm then crawls through the data to identify meaningful patterns that help to generate more reliable forecasts that can ultimately be translated into increased profitability.

Understanding the post-pandemic world
The process is particularly useful in a fast-changing world such as during the COVID-19 outbreak. The transparency and objectivity of the AI model helps the strategic decision making of the senior management at a time of significantly reduced market visibility, when the demand for staying above the market noise is strong. It is also able to significantly reduce time and labor consumption as it produces well-considered scenarios in budgeting and forecasting based on different criterions in a timely manner. It helps to answer important questions such as land purchase budgets and rent adjustments ahead of the market.

Adaptability of the model infrastructure

While investment in technology upgrade can be done anywhere with the right manpower, its demand thrives where traditional industries could benefit from improvements in efficiency. Just as the process is initially applied in the real estate sector in Hong Kong, the model infrastructure is expected to apply to other sectors not only in the rest of the GBA cities but also the rest of the world, where innovation can help propel productivity gains.

How AI helps budgeting and forecasting

Strategy

AI can generate insights, assisting in strategic financial planning

- Finance-related balanced scorecards and dashboards
- Markets' financial status and operational trends
- Activity analysis
- Business development financial analysis
- Cost and utilization of resources
- Return on investment

Financial impact factors

AI can identify factors that directly impact costs and revenues

- Markets and business segmentation
- Customers
- Relet and renew
- Prices
- Marketing and promotions, etc.

Margin impact factors

AI can diagnose the impact factors on margin, increasing forecast accuracy

- Cost of goods sold
- Investment
- Interest expenses
- Engineering and building maintenance

Operational impact factors

AI can analyze impacts on operational performance

- Historical revenue data
- Channels and vendors / commissions
- Accounting and finance procedures
- Personnel capacity utilization
- Talent suitability

Risk and controls

AI can take risk and control impact factors into budget calculation

- Internal audit and controls
- Financial / regulatory reporting
- Key performance indicators
- Risk and contingency analysis

Source: EY

4 A four-pronged approach for a conducive innovation ecosystem

Coordinated model to build an innovative ecosystem

With a succinct picture of innovation and technology development in the region, this will provide valuable insights for the government in driving the impetus for change. For technological progress to take root in an economy, efforts should be assigned to creating an ecosystem for innovation in the region. It would rely on making balanced progress between the government, the private sector, the capital market, and the workforce.

1 Government: proactive policy support on new infrastructure investment

To achieve this, keen participations of the government, entrepreneurs, the financial sector and technical talent are all required. For the government's part, efforts should not only be on subsidizing patent applications and rewarding businesses with R&D facilities, but also on sponsoring more R&D through funding from the fiscal budget, lifting the unnecessary hurdles on the normal flow of ideas and supporting businesses through tax cuts and regulation change. In addition, investment on new infrastructure, which enables technology development in areas such as 5G, IoTs, industrial internet, cloud computing, blockchain, data centers, smart computing centers and smart transportation, is a high priority.

2 Private sector: opening to more dynamic competitions

The private sector should benefit from upgrades in technology infrastructure, from more comprehensive coverage of data networks to the support of incubator and accelerator programs. Shenzhen has already been tasked with driving innovation and technology development in the GBA in August 2019[13], which could lead to a positive spillover of Shenzhen's proven infrastructure and institutional settings to the region. Meanwhile, land use policies within the region may be better coordinated to allow tech businesses access to more affordable land[14].

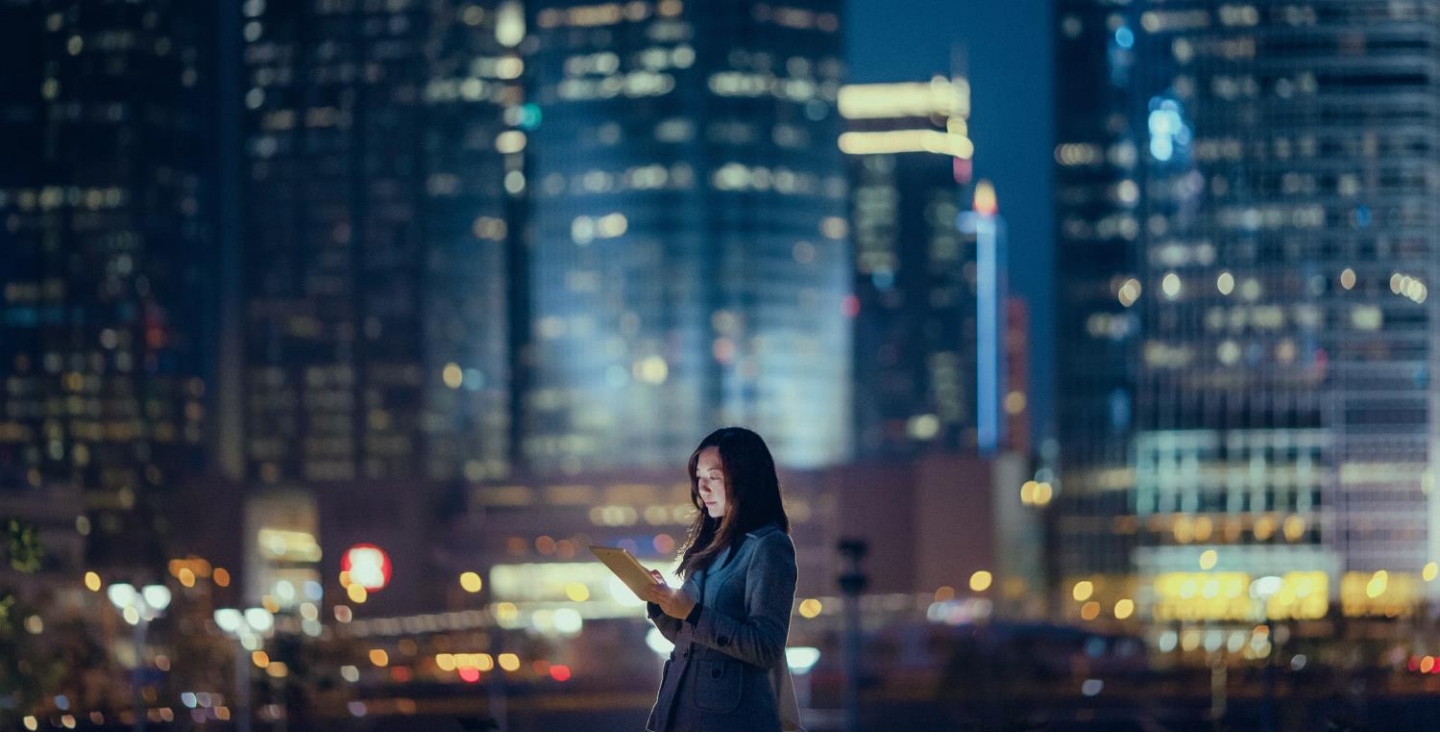
In addition, domestic industries will become more open to both foreign investors and competitors. Coming into effect on 1 January 2020, the foreign investment law has stipulations that protect foreign investors from intellectual property infringements and obligatory technology transfers[15]. In fact, foreign direct investment on the high-tech industry has already jumped by as much as 27.6%YoY between January and November 2019, and it will continue to play an important part in China's technology sector[16].

3 Capital market: technology rating

The study recommended establishing a "technology credit system" based on financial transactions and R&D outputs to evaluate the creditworthiness of new tech enterprises. The result of the technology rating system can add transparency to the government support program to use intellectual property asset as collateral for financing[17].

In fact, the rating system has been included as one of the objectives in the financialization of intellectual property by the Ministry of Finance in May[18]. As such, the government-led initiative will accelerate to create evaluation tools for technology-related intellectual property, while insurance products will also be developed. This will ultimately help to lower the cost of capital for tech enterprises, allow more targeted government policies to support technology industry development, and deepen the participation of private equity and venture capital in the technology sector.

13. www.gov.cn/zhengce/2019-08/18/content_5422183.htm
14. *The Shenzhen demonstration area - Showcasing China's formula for high-quality growth*, EY report, 2020
15. New legislation preps China as an attractive investment destination, EY report, 2019
16. www.mofcom.gov.cn/article/tongjiziliao/v/201912/20191202923875.shtml
17. www.xinhuanet.com/2020-03/11/c_1125698076.htm
18. www.gov.cn/zhengce/zhengceku/2020-05/07/content_5509474.htm



4 The workforce: attracting global professionals through Hong Kong and Macao

Arguably the biggest bottleneck in innovation and technology development in the GBA is the shortage of talent both in terms of the share of R&D personnel in the labor force and the concentration of university graduates. This is part of a legacy issue that Shenzhen lacks the endowment of top research universities that are strong in the technology field[19]. However, as discussed above, this is an area where Hong Kong may collaborate as a generator for talent.

This has been remarkable progress. The 16 measures to facilitate Hong Kong people working and living in the GBA[20], announced in November 2019, relaxed the restrictions for not only Hong Kong's permanent residents but also its expatriate population to work in China. Various city-level governments have also released plans to provide subsidies for overseas talent, in areas such as income tax, housing, and transportation. Through these measures, the GBA aims to attract professionals from around the world.

19. *Guangdong-Hong Kong-Macau Greater Bay Area – From connectivity to integration*, EY report, 2019
20. www.info.gov.hk/gia/general/201911/06/P2019110600725.htm?fontSize=1

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ED None.

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