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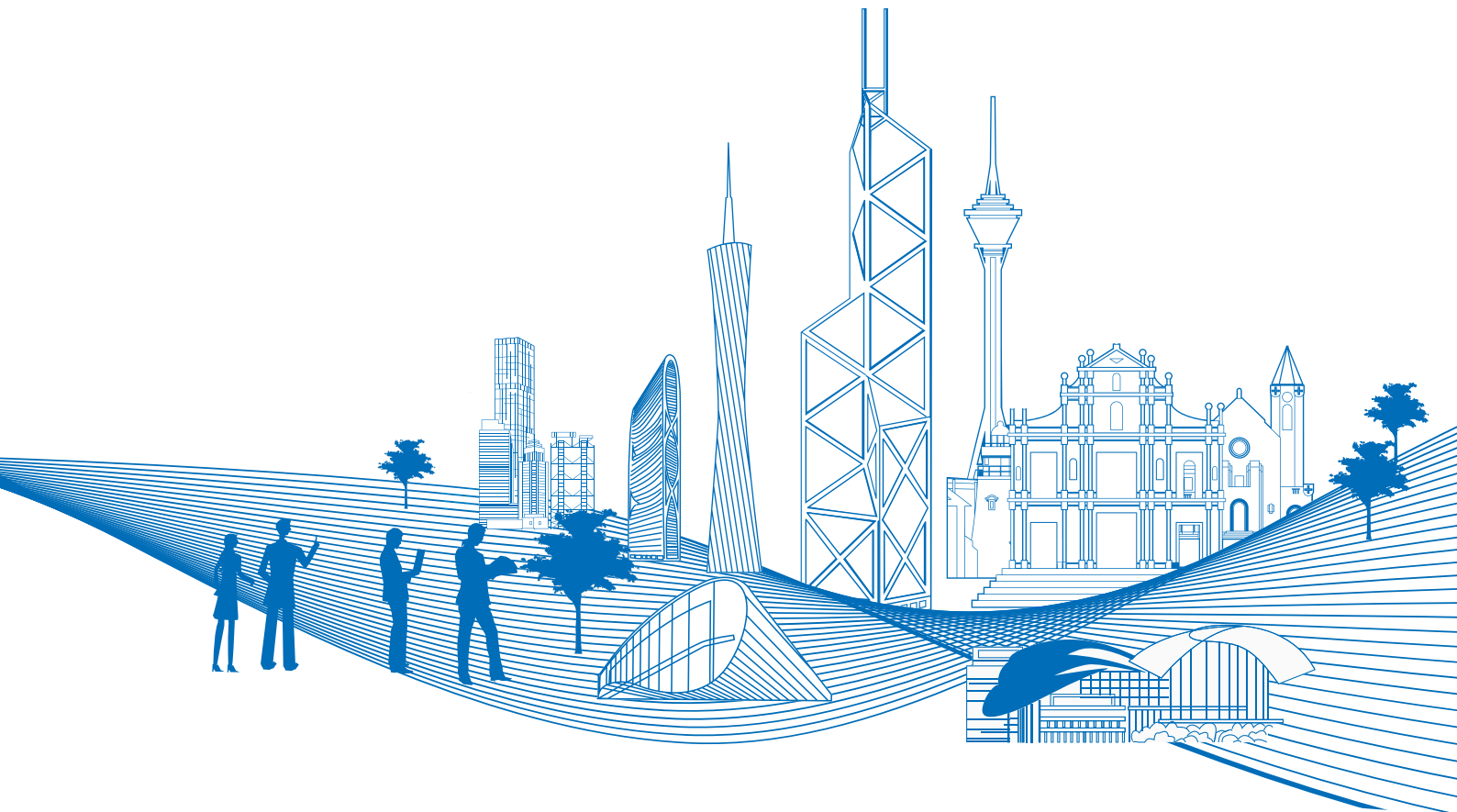


Center for Internet
Development and Governance
互联网发展与治理研究中心

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DIGITAL ECONOMY AND TALENT DEVELOPMENT IN THE GUANGDONG-HONG KONG -MACAO GREATER BAY AREA

February 2019



RESEARCH GROUP



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10/2018

Key Findings

01

The labor force distribution in Guangdong-Hong Kong-Macao Greater Bay Area (“Bay Area”) is more strongly concentrated to the east of the Pearl River, with Shenzhen, Hong Kong and Guangzhou as the three core cities. Between 2016 and 2017, among the cities to the west of the Pearl River, only Zhuhai showed an upward trend of labor force growth.

02

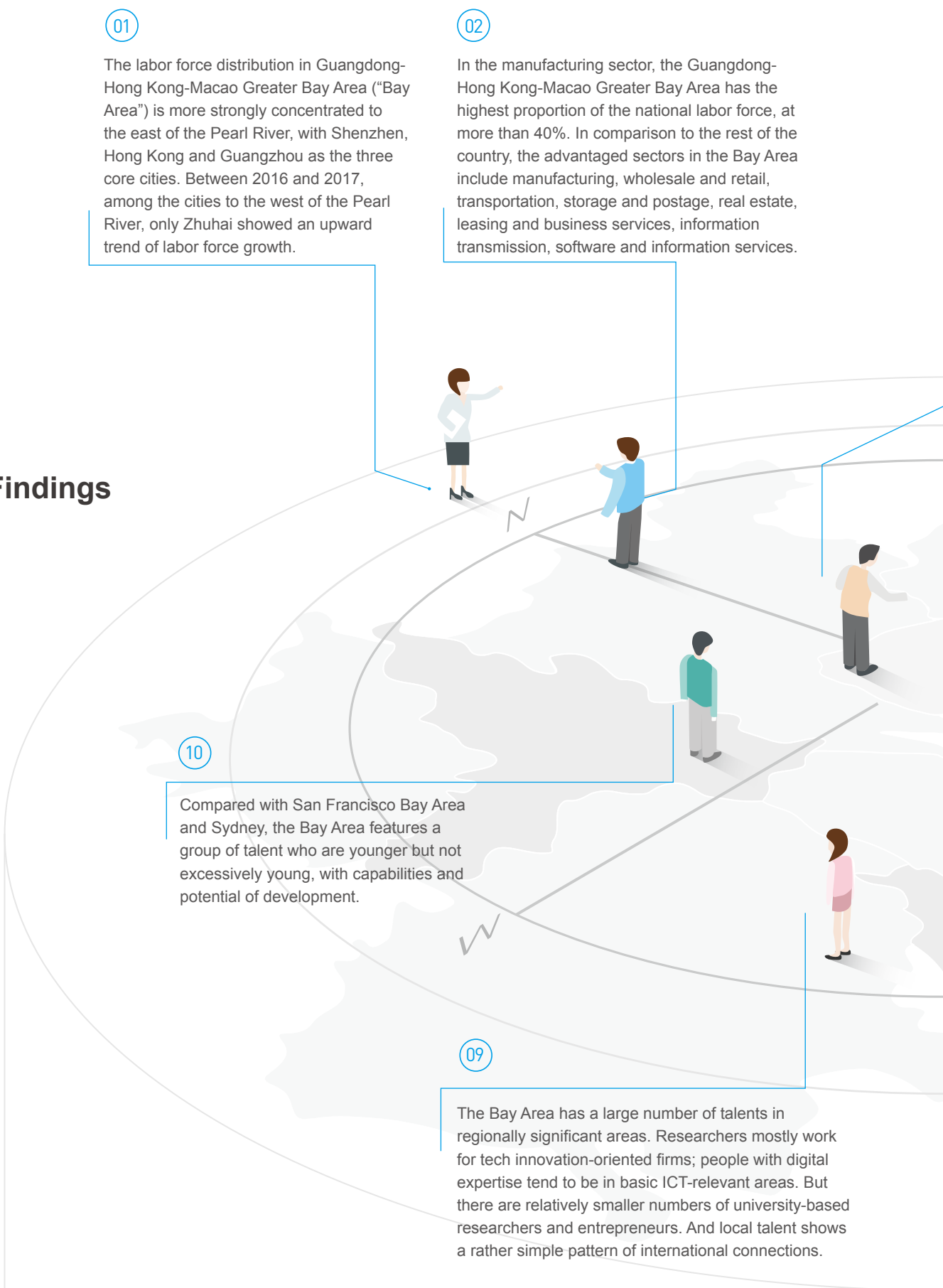
In the manufacturing sector, the Guangdong-Hong Kong-Macao Greater Bay Area has the highest proportion of the national labor force, at more than 40%. In comparison to the rest of the country, the advantaged sectors in the Bay Area include manufacturing, wholesale and retail, transportation, storage and postage, real estate, leasing and business services, information transmission, software and information services.

10

Compared with San Francisco Bay Area and Sydney, the Bay Area features a group of talent who are younger but not excessively young, with capabilities and potential of development.

09

The Bay Area has a large number of talents in regionally significant areas. Researchers mostly work for tech innovation-oriented firms; people with digital expertise tend to be in basic ICT-relevant areas. But there are relatively smaller numbers of university-based researchers and entrepreneurs. And local talent shows a rather simple pattern of international connections.



03

In the Bay Area, high-level talents and digital talents are mostly concentrated in Shenzhen, Guangzhou and Hong Kong, among which Shenzhen ranks first. The average level of digitization of the talents in the Bay Area is 26.98%, and in Shenzhen is more than 30%, which is leading other cities.

04

The Bay Area has the highest proportion of high-level talents in manufacturing, consumer goods and ICT industries, all exceeding 10%. In terms of digital talents within industry, the degree of digitization of the ICT industry is more than 80%, and the development level of the basic digital economy is relatively higher. Meanwhile, the degree of digitization of traditional dominant industries such as manufacturing, retail, financial services is relatively low, and the development level of integrated digital economy needs to be improved.

05

Talents in the Bay Area are diverse when it comes to educational background -- more than 25% of which have studied abroad; over 30% of which have master's or doctoral degrees. They are majored in economics and management related fields including business management, economics, financial services, etc., among which ICT-relevant specialties such as computer science ranks high. And they possess general-purpose skills such as project management and leadership, with a relatively low level of integration with digital skills.

06

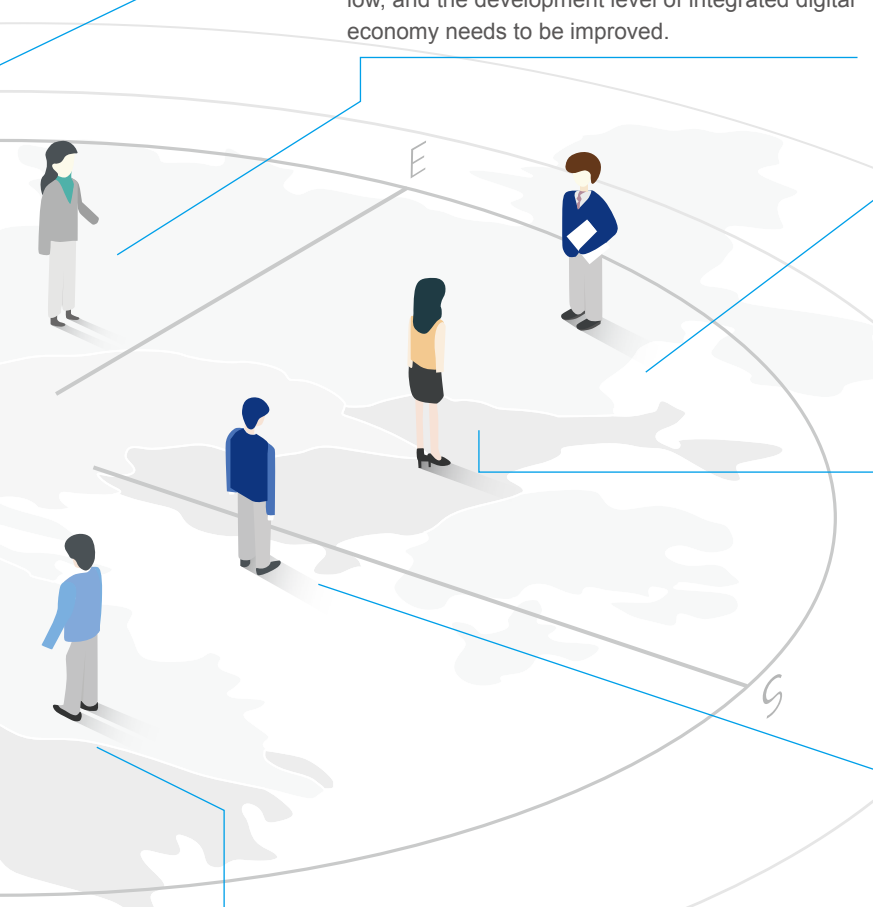
Cities in the Bay Area show distinctive characters in terms of industrial development. Guangzhou features the most balanced talent distribution among industries; Shenzhen has outstanding advantages in ICT-relevant talent; Hong Kong boasts remarkable advantages in financial and educational talent; Macao focuses on the tourism and vacation industry; the other four cities in Guangdong province possess talents mostly in manufacturing and consumer goods.

07

The Bay Area is characterized by net inflow among the spectrum of overall labor force, high level talent and digital talent. Shenzhen is much more attractive to talent than the other cities in the Bay Area, where it becomes the center of talent aggregation, especially it highlights the core role that Shenzhen is playing in terms of attraction to digital talent.

08

Compared with other Chinese cities as hubs of digital economy, such as Beijing and Wuhan, cities in the Bay Area are much more attractive to digital talent. The level of attraction is similar to Shanghai and Chengdu but it's far behind Hangzhou in this aspect.





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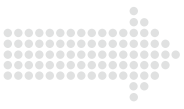
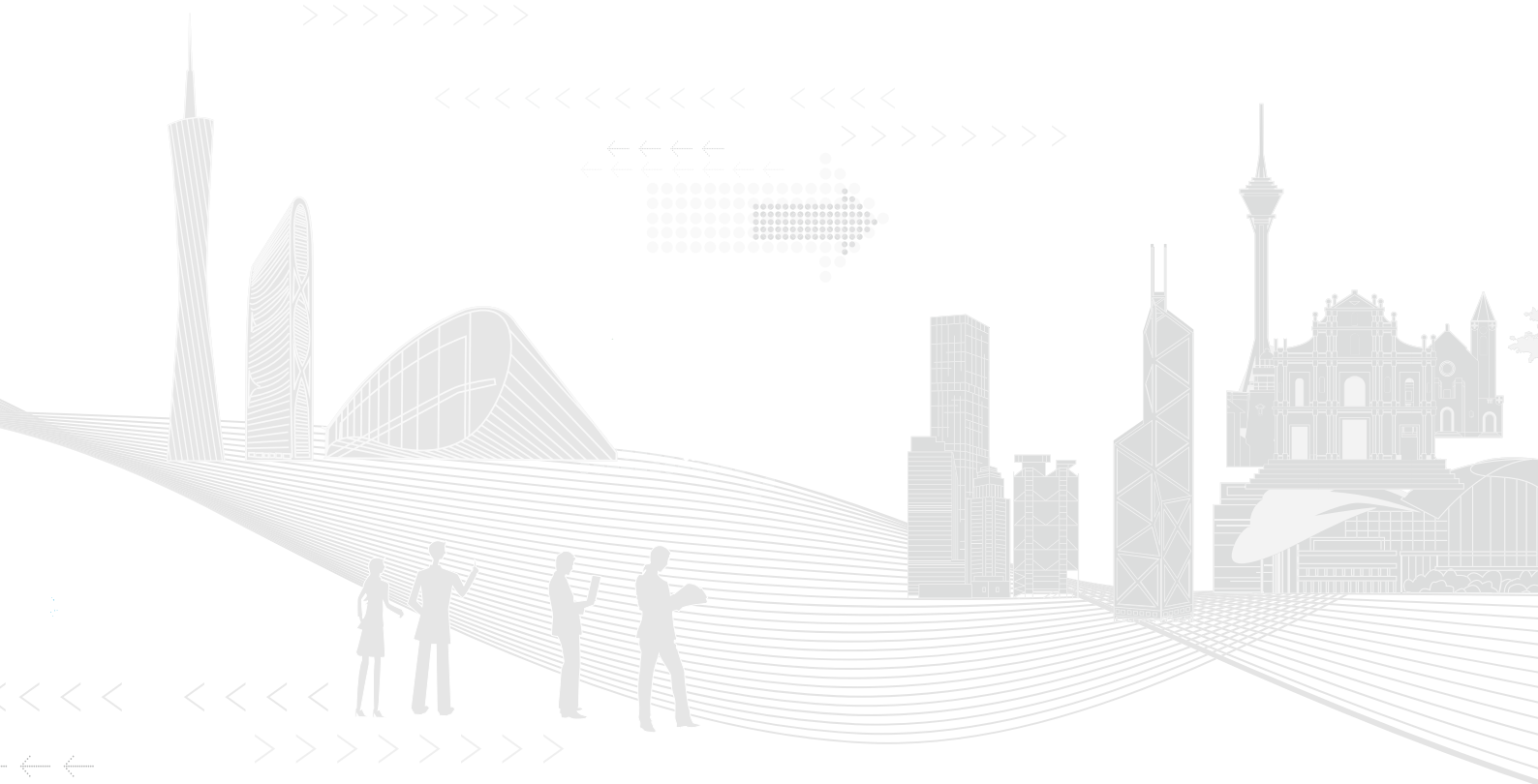
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01

INTRODUCTION

China's economy has made great strides over the course of 40 years of reform and opening-up. The Guangdong-Hong Kong-Macao Greater Bay Area spans the Hong Kong and Macao Special Administrative Regions, the Shenzhen and Zhuhai Special Economic Zones and Guangdong Pilot Free Trade Zone. It also includes Hengqin, Zhuhai and Nansha, Guangzhou, two national-level new districts. This region is one of the most advanced in China in terms of economic reform and development.

Since the Guangdong-Hong Kong-Macao Greater Bay Area was first written into the report on the work of the government in March 2017, the local governments of Guangdong, Hong Kong and Macao have been constantly updating and improving the policy framework for the Bay Area's construction. It is regarded as a strategic move aimed to better integrate Hong Kong and Macao into the country's overall development, as well as being a key component of the Belt and Road Initiative. It's an important step towards China's construction of world-class city clusters and its involvement in global competition. The Hong Kong-Zhuhai-Macao Bridge, which opened in October 2018, shortened the distance from Hong Kong to Zhuhai and Macao to only 45 minutes. This further enhanced connectivity within the Guangdong-Hong Kong-Macao Greater Bay Area, which is of strategic significance when promoting coordinated regional development. However, faced with increasingly fierce global competition and trade protectionism, traditional economic structure is unable to keep up with the Bay Area's growing need for development space. As such, the construction of a new bay area should differ from that of traditional industrial city clusters. It should be guided by the new economy, and involve the development of new industries and business models.

The Guangdong-Hong Kong-Macao Greater Bay Area has enjoyed a wealth of new opportunities thanks to the rise of the digital economy. Its effective

use of digital information and communication technologies is a crucial driving force behind optimizing the economic structure and transforming industry as a whole. As demonstrated by the 2016 Hangzhou G20 Conference, the 2017 BRICS Summit and 2018's High-level Panel on Digital Cooperation, established by U.N. Secretary-General Guterres, the digital economy is gradually becoming the global norm. It has become the motivating force behind current worldwide economic development, in which China plays an important role. In the construction of the Bay Area, the digital economy can expand development across multiple categories, including big data, "Internet plus", artificial intelligence and intelligent manufacturing. This will permit the Bay Area to find combinations of resource allocations and production. It will also help cities to define their individual characteristics and functionality, and maximize the combined effects, specialization effects, synergy effects and scale effects.

The development of the Bay Area and the digital transformation occurring in the economy make recruiting talents a matter of increasingly great importance. These talents can spearhead technological innovation, industrial synergy, urban integration and institutional innovation and ensure the digital economy's continued growth. This report analyzes employment data from the Guangdong-Hong Kong-Macao Greater Bay Area and gathered from the LinkedIn Database. This data includes employment status, industry distribution, skill characteristics and migration characteristics of high-level talents and digital talents in the Guangdong-Hong Kong-Macao Greater Bay Area, and then analyse these results and those of talents in internationally-renowned bay areas. The report then highlights specific skill advantages possessed by the Guangdong-Hong Kong-Macao Greater Bay Area's talents, providing policy suggestions for this region's development.





02

DIGITAL ECONOMY DEVELOPMENT IN THE GUANGDONG-HONG KONG-MACAO GREATER BAY AREA

2.1 Strategic Planning and Digital Economic Practices in the Greater Bay Area

2.1.1 The Bay Area Strategic Planning

In 2015, the State Council approved the establishment of China (Guangdong) Pilot Free Trade Zone. This zone acts as a testing base for Guangdong, Hong Kong and Macao's further economic integration. In such fully open and free environment, in order to promote economic cooperation, the liberalization of trades and innovative development, Guangdong, Hong Kong and Macao must take full advantage of their respective strengths and achieve integration with the economic community. On July 1, 2017, the National Development and Reform Commission (NDRC), the People's Government of Guangdong Province, the Government of the Hong Kong Special Administrative Region (HKSAR) and the Government of the Macao Special Administrative Region jointly formulated the Framework Agreement on Deepening Cooperation between Guangdong, Hong Kong and Macao to Promote the Construction of the Greater Bay Area, which formally included the construction of the Greater Bay Area in the nation's strategic planning. This was done in the interest of fully realizing the combined advantages of the Guangdong, Hong Kong and Macao regions, by increasing cooperation at both a national and international level and promoting the construction of the Greater Bay Area. At 2017's 5th meeting of the 12th National People's Congress, Premier of the State Council Li Keqiang stressed in the government work report that it is imperative to "promote further collaboration between mainland China and Hong Kong and Macao, and advance the Guangdong-Hong Kong-Macao Greater Bay Area Urban Cluster development plan in order to maximize the unique advantages of Hong Kong and Macao's advantages and enhance their role in our national economic development." In April 2018, the State Council issued the Plan for Further Deepening the Reform and Opening-up of China (Guangdong) Pilot Free Trade Zone. This report

clarified the strategic orientation of the Guangdong Free Trade Pilot Zone's "Two Zones and One Hub", confirming its purpose as a demonstration zone for an open economic system and an increase in cooperation across the Guangdong-Hong Kong-Macao Greater Bay Area. On January 11, 2019, the Central Committee officially established the Guangdong-Hong Kong-Macao Greater Bay Area's five aspects of strategic positioning: first, a vibrant, world-class city cluster; second, a globally influential hub of scientific and technological innovation; third, an important support for the Belt and Road Initiative (BRI); fourth, a demonstration zone for in-depth cooperation between the mainland and Hong Kong and Macao; and fifth, a habitable with a wealth of tourism and business opportunities. Hong Kong, Macao, Guangzhou and Shenzhen, as the central cities, need to become engines that will drive change in surrounding regions.

In addition, the Guangdong Provincial Science and Technology Department, in conjunction with Hong Kong and Macao, is currently preparing the Action Plan for Science and Technology Innovation in the Guangdong-Hong Kong-Macao Greater Bay Area (2018-2022). This plan is set to be released and implemented in the near future. Through joint collaboration within key areas of technology, Guangdong-Hong Kong-Macao Greater Bay Area will conduct basic and applied research and explore industrial applications for new-generation information technologies such as artificial intelligence and big data. They will also focus on intelligent and high-end equipment manufacturing. By implementing major scientific and technological projects, and joint innovation funding plans, these regions will effectively promote the in-depth integration of industry, education and research within their borders.

2.1.2 Practical Actions for a Digital Economy

Related Practical Actions in Guangdong

In 2013, Guangdong made the layout of first and accelerate the development of a data-based digital economy, establishing itself as a leader in China with the introduction of the Expert Committee for the Implementation of the Big Data Strategy in Guangdong Province. In 2016, the Guangdong Provincial Government was granted approval to build the "Pearl River Delta National Big Data Comprehensive Test Zone" and promote the "one area, two cores and three belts" big data development plan. In the same year, they issued the "Opinions of the Guangdong Provincial People's Government on the Integrated Development of the Manufacturing Industry and Internet". This report focused on the aim of developing a new platform model that would be capable of integrating the manufacturing industry and the Internet at an enhanced level. It suggests speeding up construction on manufacturers' Internet-based "innovation and enterprise" platforms, industrial cloud platforms and industrial e-commerce platforms. It also advocates for the development of a new model based on qualities of design, manufacturing, production and supply chain management. Finally, it recommends increasing innovation capabilities in areas such as manufacturing, Internet-based collaboration and green manufacturing.

Issued in 2018, the Digital Economic Development Plan of Guangdong Province (2018-2025) (draft for comments), states that it will take 5-8 years to develop Guangdong into a national digital economic development pilot area, a strategic hub for the digital Silk Road and a center for global digital economic innovation. By seizing the opportunities offered by the Belt and Road Initiative, it will be possible to address the digital economy needs of the major countries involved, which include big data, cloud computing and intelligent manufacturing. This will promote interconnectedness among these countries' digital infrastructures, encourage international industrial-capacity cooperation and equipment manufacturing of big data and cloud computing, etc., and speed up the construction of overseas cooperation parks. It will also encourage large enterprises to "go global" and "bring in", thereby advancing the digital Silk Road through the internationalization of a digital economy.



"Internet Plus"

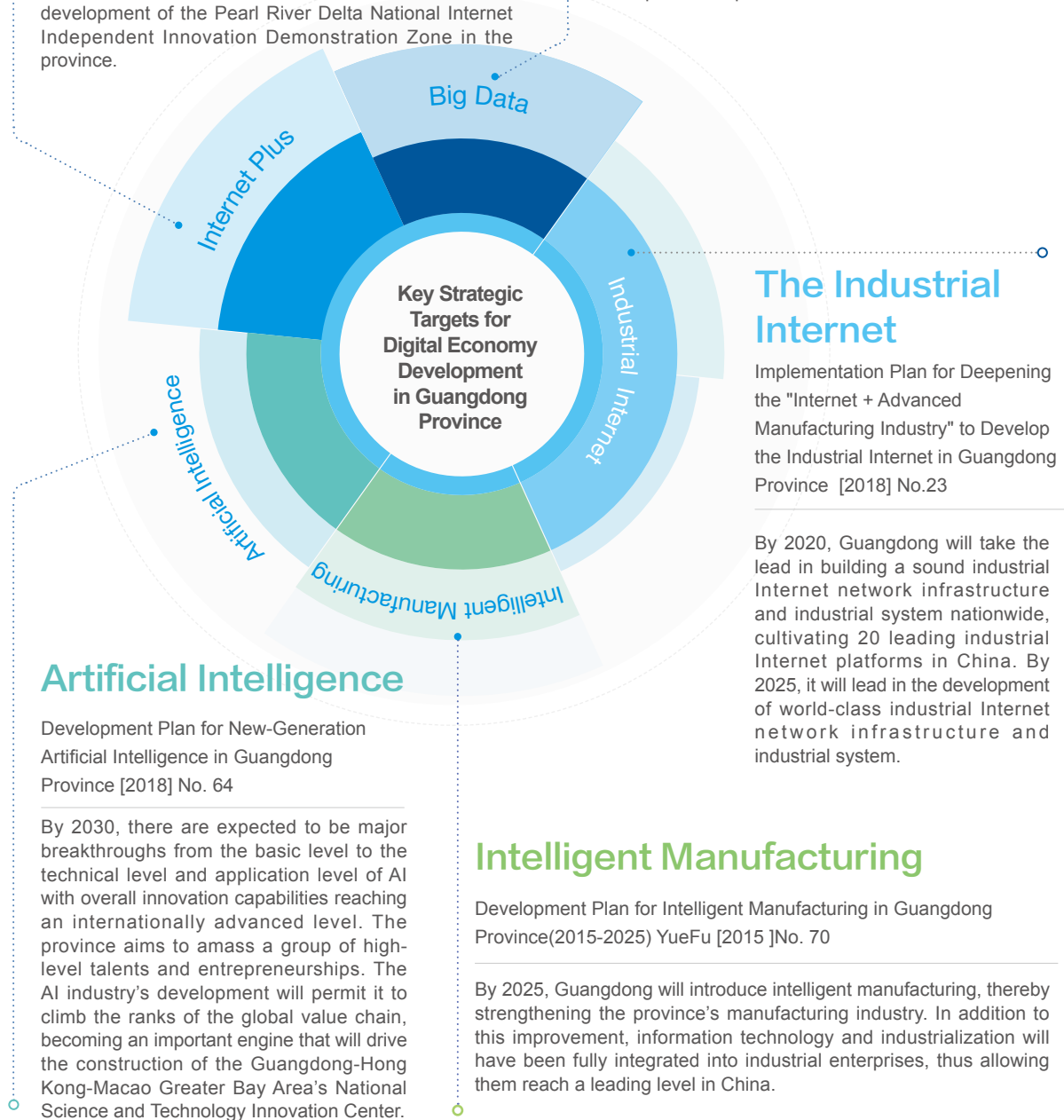
Guangdong's Provincial "Internet Plus Action Plan"
(2015-2020) No. 53, YueFuBan [2015] No.53

By 2020, the province's economic and social Internet applications are expected to have achieved significant results. The province will be established as an important base for the development of an Internet economy in China and a leading example for people's livelihood application services on the Internet, and as well as a cluster base for network entrepreneurship and innovation. Over 2,000 small to medium-sized Internet-based enterprises will be cultivated to promote the full-development of the Pearl River Delta National Internet Independent Innovation Demonstration Zone in the province.

Big Data

Action Plan for Promoting Big Data Development
in Guangdong Province (2016-2020) YueFuBan
[2016] No. 29

By 2020, big data infrastructure development, resource integration and the increased accessibility of government data will have achieved remarkable results. Big data will be implicated in all facets of the economy and society, and will have become an important economic support for the population and the driving force behind industrial transformation. It will form a foundation for the emergence of entrepreneurship and innovation on a massive scale.



Artificial Intelligence

Development Plan for New-Generation
Artificial Intelligence in Guangdong
Province [2018] No. 64

By 2030, there are expected to be major breakthroughs from the basic level to the technical level and application level of AI with overall innovation capabilities reaching an internationally advanced level. The province aims to amass a group of high-level talents and entrepreneurships. The AI industry's development will permit it to climb the ranks of the global value chain, becoming an important engine that will drive the construction of the Guangdong-Hong Kong-Macao Greater Bay Area's National Science and Technology Innovation Center.

Intelligent Manufacturing

Development Plan for Intelligent Manufacturing in Guangdong
Province(2015-2025) YueFu [2015]No. 70

By 2025, Guangdong will introduce intelligent manufacturing, thereby strengthening the province's manufacturing industry. In addition to this improvement, information technology and industrialization will have been fully integrated into industrial enterprises, thus allowing them reach a leading level in China.

Figure 2.1 Guangdong Provincial Planning and Guidance for the Digital Economy

Related Practical Actions in the Hong Kong Special Administrative Region

For many years, the Hong Kong Special Administrative Region has been ranked among the freest and most competitive economies worldwide. But for some time, Hong Kong's industrial structure has been overwhelmingly dominated by services, which account for over 90% of the GDP. To promote the development of its manufacturing industry, Hong Kong is actively encouraging the integration of "Internet plus" and industry and promoting re-industrialization, which will allow the region to better integrate with the Bay Area's growing intelligent industrial framework. This integration, combined with the growth of the digital economy, will become a driving force in Hong Kong's economic development.

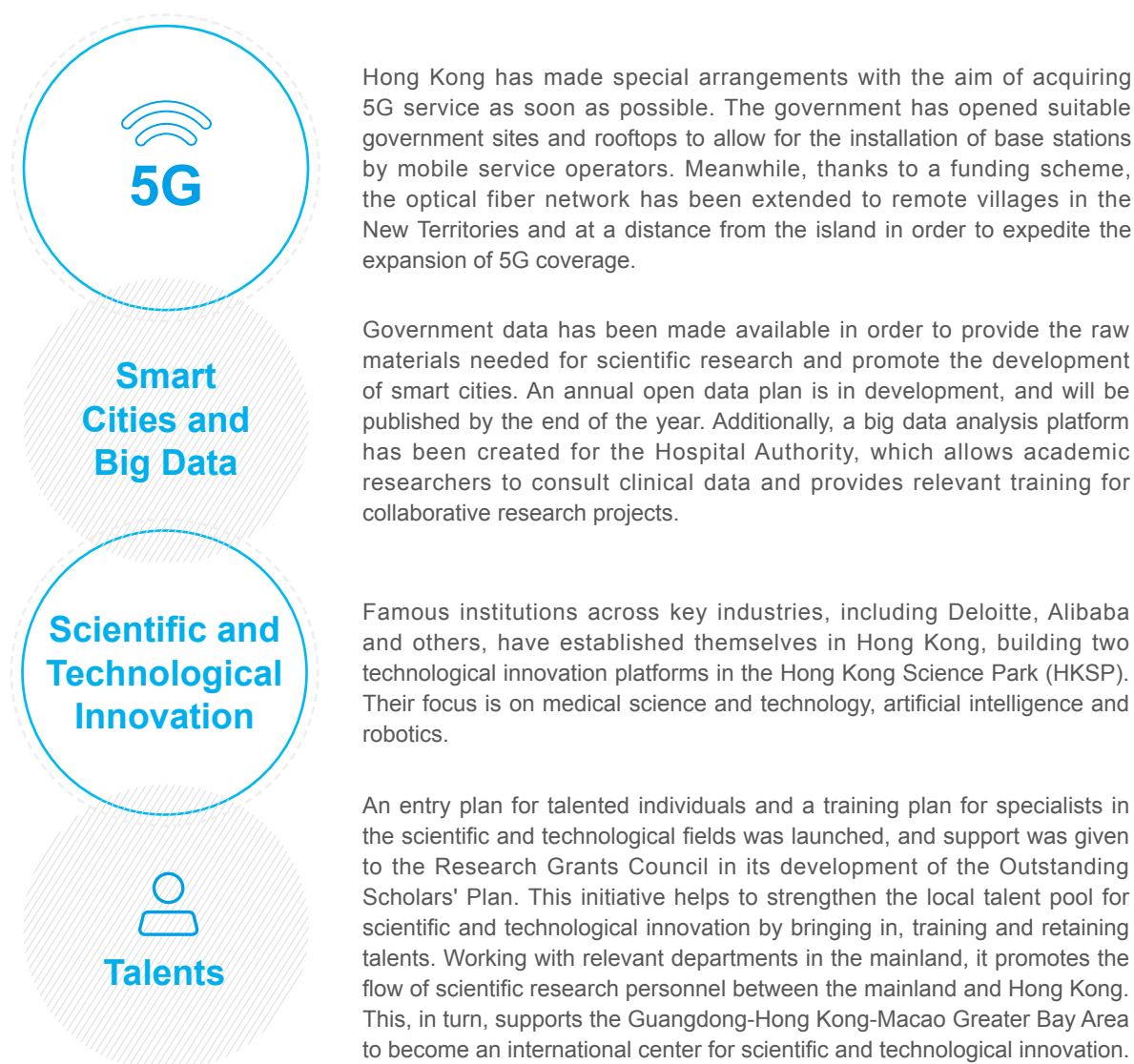


Figure 2.2 Information on the Digital Economy in Hong Kong's Policy Address 2018

Related Practical Actions in the Macao Special Administrative Region

Macao has built significant momentum in the digital economy field since its late arrival on the scene. As demonstrated in the Policy Address 2018 and the Five-Year Development Plan of Macao Special Administrative Region (2016-2020), Macao has formulated an effective development strategy, cooperating with well-known institutions at home and abroad, such as Alibaba Group, they are able to use cloud computing as the basis for smart city construction. Through the digitalization of urban services, businesses across various industries are encouraged to apply Internet technology, and talent is regarded as the top priority for digital economy development in the Macao Special Administrative Region.

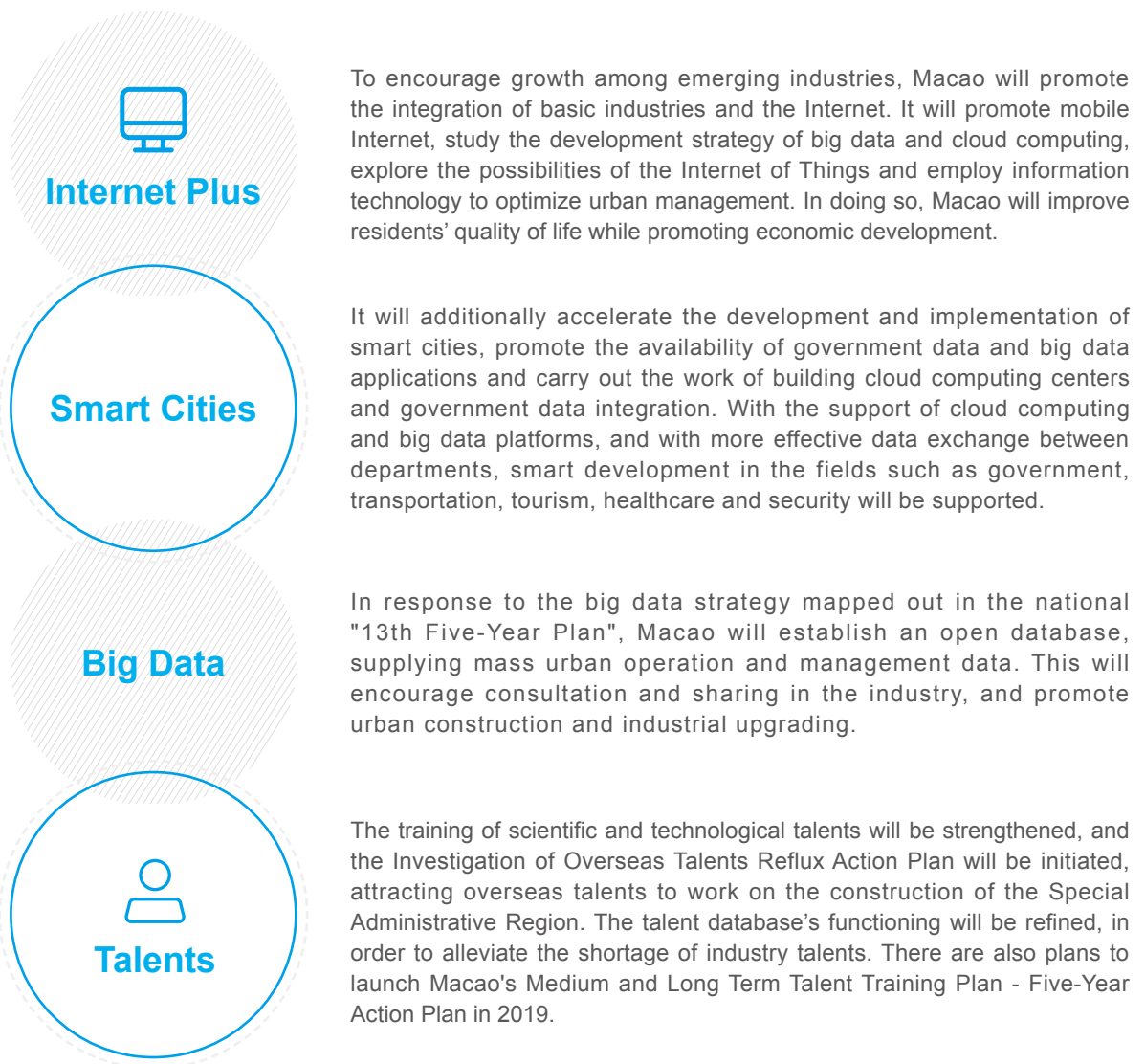


Figure 2.3 Information on the Digital Economy in Macao's Policy Address 2018 and the Five-Year Development Plan for the Macao Special Administrative Region (2016-2020)

Related Practical Actions of Shenzhen

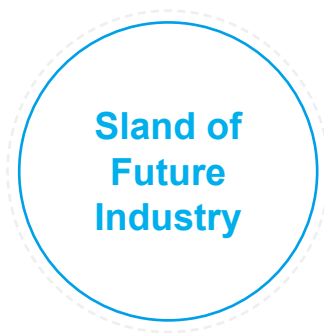
Shenzhen was one of the first cities in China to adopt the reform and opening up. A leader in China's digital economy development, the city has since made remarkable achievements in the areas of "Internet plus", big data and artificial intelligence. Tencent Research Institute's The Internet Plus Index Report in China (2018) shows that in 2018, the level of Shenzhen's digital economy development was ranked first in the country. An example of this is its performance in the realm of e-commerce. In 2017, the volume of e-commerce transactions in Shenzhen exceeded 2.3 trillion yuan. This accounted for 8% of the country's total, much higher than the proportion of its GDP in the country's total (3%). Additionally, estimates based on data supplied by the National Information Center show that Shenzhen's information society index in 2017 came first among all major Chinese cities, and that Shenzhen is the only city in the country to have reached an intermediate stage of information society development.



Figure 2.4 Shenzhen Digital Economy Planning and Guidance

Related Practical Actions of Hengqin and Zhuhai

The city of Zhuhai was also one of the earliest to adopt the reform and opening up. Its new representative national-level zone, Hengqin, occupies an important position in the Bay Area. On October 23, 2018, with the opening of the Hong Kong–Zhuhai–Macao Bridge, Zhuhai will become the core city connecting the Guangdong–Hong Kong–Macao Greater Bay Area. Hengqin New Area will also become a key factor in the coordinated development of the regional economy.



Hengqin has become an important channel used for connecting with the Macao Special Administrative Region. The two sides have worked to create an Island of Future Industry by jointly promoting the "Macao Capital+Global Technology+Innovative Talents+Hengqin Carrier" industrial cooperation model. They will now set their sights on strategic emerging industries such as information technology, biomedicine and artificial intelligence. By focusing on financial services, business exhibitions, tourism and recreation and logistics services, they will gradually realize their ambition of building a world-class, cutting-edge modern industrial system.



Zhuhai and Hengqin are cooperating with key industries at home and abroad with the aim of jointly incorporating more sophisticated technologies. In 2017, the Zhuhai city government and Hengqin New District Management Committee signed a strategic cooperation agreement with Tencent Inc. This introduced advanced technologies that included big data, cloud computing, Internet plus, Internet of Things, AI and mobile payment. It also intensified cooperation on intelligent transportation, intelligent medical treatment and other smart city characteristics, in order to jointly promote the "Internet plus" action plan, improve the development of Hengqin New Area and accelerate the digital economy in both Zhuhai and Hengqin.

Figure 2.5 Relevant Planning of Digital Economy in Hengqin and Zhuhai



2.2 Digital Economy Development Trends in the Bay Area

China's digital economy has been steadily developing, showing a rapid upward trend in recent years. According to estimates provided by ChinaInfo100, China's digital economy grew by 18.9% in 2016, securing the second place worldwide with a total of 22.6 trillion yuan. The Bay Area's focus on software research and development, hardware production and services has been an important factor in promoting the development of China's digital economy in the digital age.

Guangdong Province

As the first economic powerhouse and a manufacturing industry leader in China, Guangdong province has seen significance as a result of the investment of information capital in basic industries. ChinaInfo100 estimates that Guangdong's digital economy development in 2016 led the country in terms of scale and speed. The digital economy reached 2.71 trillion yuan, ranking first in the country and showing a growth rate higher than the national average. The digital economy accounts for over 30% of Guangdong's GDP. Among them, the basic digital economy accounts for over 800 billion yuan, ranking first in the country, and the integrated digital economy ranks second in the country with over 100 billion yuan.

Provincial data shows that in 2016, the Internet sales and purchasing rate of manufacturing enterprises across the province accounted for more than 40%, ranking it among the first in the country. By the end of 2017, 64 pilot enterprises, accounting for 10% nationwide, had passed the national ISO standards on the integration of informationization and industrialization. Cloud computing, Internet of Things and big data are each used more than 20% in manufacturing enterprises. The service industry shows a relatively high digitization, and is at an advanced level in the education, healthcare, entertainment, financial services, retail, catering and accommodation, transportation and logistics and tourism sectors. The information consumption rate and the volume of e-commerce transactions both rank first in the country. The volume of cross-border e-commerce transactions accounts for nearly 70% of the country's total, and mobile payments represent 30% of the total. This data shows that the development of an integrated digital economy based on the integration of the Internet and the manufacturing industry is gaining impressive momentum on a national scale and driving manufacturing industry upgrade.

Recently, Guangdong province has won the first prize of "Excellent Research Achievements in Industry and Information Technology" awarded by the Ministry of Industry and Information Technology, the first big data development index, the first in the Internet Development Index and the first in the Digital Economic Development Index. Digital economy has become a key way for Guangdong to promote modern economic development and realize the "four leading forces in the country"



Hong Kong Special Administrative Region

The rapid development of the digital economy in mainland China, and particularly in Guangdong province, has brought new opportunities and new impetus to Hong Kong, stimulating and driving its economic development. Hong Kong has seen an increase in the development of digital technology since 2017. Last June, 24 academics from the Chinese Academy of Sciences and the Chinese Academy of Engineering in Hong Kong wrote to Xi Jinping, General Secretary of the Central Committee of the Communist Party of China, President of the State and Chairman of the Central Military Commission, expressing their urgent desire to serve the motherland as well as their enthusiasm for developing innovative science and technology. President Xi Jinping attached great importance to this issue and delivered the following mandate: Promote scientific and technological cooperation between Hong Kong and the mainland, Support Hong Kong in becoming an international center of innovation and technology, and Support Hong Kong's scientific and technological community in their contributions toward realizing a profound rejuvenation of the Chinese nation. Hong Kong has over 100 ongoing research projects in the field of artificial intelligence. Its universities also have the world's leading research capacity in the field of intelligent technology. As a result of these advantages, Hong Kong is fast becoming the center for R&D, connecting with the intelligent manufacturing industry in the Pearl River Delta region and jointly developing intelligent industry and world-class science and technology in the Guangdong-Hong Kong-Macao Greater Bay Area. This region has become an important hub for the advancement of China's digital economy in the intelligence era.

The Hong Kong government is committed to economic transformation and smart city development initiatives. In December 2017, the government announced the "Hong Kong Smart City Blueprint," which covered nearly 20 projects and implemented relevant policies and measures across six aspects: smart travel, smart life, smart environment, smart citizens, smart government and smart economy. The three measures detailed in the first phase are building digital personal identity, smart lamp posts and government cloud and big data analysis platforms. The Blueprint outlines the development plan for the next five years, which aims to turn Hong Kong into a global leader among smart cities. Through the application of innovative technology, it will be possible to increase the effectiveness of city management, improve people's lives, enhance the attractiveness of Hong Kong and achieve sustainable development.

Macao Special Administrative Region

The national digital economy's rapid development has also brought new opportunities to Macao. According to official statistics, Macao's Internet users grew by over 50% and the number of mobile phone users grew by more than 30% between 2013 to 2017. The region has made great strides in using information technology to optimize urban management, and the Internet and digital economy development are also on the rise. The environment for innovation and entrepreneurship in Macao has also improved. The number of new companies has increased, going from a total of 515 in 2014, to 803 in 2017. Company capital has also grown, bringing manpower and vitality to Macao's high-tech and high-tech R&D and innovation. Additionally, Macao's financial industry, and the private sector credit industry in particular, is booming, providing economic capital and security for innovative high-tech companies like, especially start-ups.

Macao attaches great importance to the construction of smart cities. In August 2017, the Macao SAR Government and Alibaba Group signed the Framework Agreement for Strategic Cooperation in Building Smart Cities. This agreement focuses on cloud computing, big data and other Internet technologies. Alibaba will assist the Macao SAR Government in improving the effectiveness of city governance through such means as cloud computing technology and professional training, thereby promoting digitization in the region. Additionally, Aliyun is cooperating with the University of Macao on a plan to include subjects such as big data and cloud computing in its Science and Technology College curriculum to provide improved training to digital talents.

Macao has taken several concrete actions toward promoting an urban digital economy and sustainable development. In September 2018, the Global Digital Economic Development Summit, themed "New Technology, New Business Form, New Consumption" was held in Macao. In November, the annual World Digital Economy Summit Forum was held in Macao, under the auspices of the World Digital Economic Organization (WDEO). These digital economic summits have had a great impact on sustainable digital economy development at both a national and international scale.

03

EMPLOYMENT STATUS OF THE GUANGDONG-HONG KONG-MACAO GREATER BAY AREA

In order to accurately show the current situation and the development trends among talents in Guangdong, Hong Kong, Macao Greater Bay Area, we performed an in-depth analysis from three categories: the overall labor force, the high-level talents and the digital talents. High-level talents refer to those who have high education background and high skills within the labor force. For this study, a sample of talents holding a bachelor's degree or higher was selected. Digital talents refer to those who have professional ICT skills and supplementary ICT skills¹.

in addition to the distribution of representative industries. However, for both high-level and digital talents, the existing official employment statistics do not lend themselves well to a multi-dimensional analysis. As a professional social networking website, LinkedIn possesses significant advantages. Firstly, LinkedIn China features a large number of users with experience in the fields of scientific research, management, technology and business, all of which are core characteristics of digital economy talents. Secondly, LinkedIn talent database has a comprehensive structure that includes not only new graduates, but also senior talents who are deeply engaged in their professional fields. Thirdly, the company provides a communication platform professionals, which can reveal the social connections and migration insights of talents. LinkedIn also provides recruitment and employment opportunities for both enterprise clients and individual users, and supports the analysis of talent supply and demand. As of August 2018, LinkedIn had 45 million users in China. These users had collectively graduated from over 12k domestic and overseas schools (high school and college), are distributed across 110k companies, and possess 23k skills. Currently, 244k open jobs are being advertised on LinkedIn China website. LinkedIn big data methodology defines user profiles by extracting characteristics over multiple dimensions. These include general talent information, types of previous employers, duration of employment, educational background and equipped skills. Based on this full data sample, we were able to extract the talent samples required for the study in two steps. Firstly, we selected 439k users who met the definition of high-level talents from among the full sample of talents in the Guangdong-Hong Kong-Macao Greater Bay Area. We then selected 118k users who met the definition of digital talents from among these high-level talents. Therefore, to a certain extent, the analysis results of digital talent samples in this study reflected the digitization of high-level talents.



¹ For the definition of digital talents and the classification of ICT skills, see Tsinghua SEM Center for Internet Development and Governance, China Economic Digital Transformation: Talents and Employment Report <http://cidg.sem.tsinghua.edu.cn>

3.1 The Overall Employment Situation of Labor Force

3.1.1 Labor Force Characteristics in the Guangdong-Hong Kong-Macao Greater Bay Area

In 2017, there were about 20 million workers employed in the Guangdong-Hong Kong-Macao Greater Bay Area, an increase of 0.24% year over year and 0.34% higher than 2015. This indicates that the Guangdong-Hong Kong-Macao Greater Bay Area has become more attractive to the labor force.

City Distribution

As shown in Figure 3.1, we used urban employees as labor samples. When looking at the Guangdong-Hong Kong-Macao Greater Bay Area as a whole, the labor force distribution in the Pearl River Delta region is generally strong in the east and weaker in the west. Shenzhen contains the largest labor force at about 4.64 million people; Hong Kong Special Administrative Region employs about 3.82 million people; and Guangzhou's labor force is made up of approximately 3.3 million people. These are the three core cities in the Bay Area. They rank among the first-class cities in the world in terms of their total economic volume, resident population, scale of labor force and industrial and urban development levels.

Compared with 2016, Dongguan and Zhuhai were the fastest growing cities in the Guangdong-Hong Kong-Macao Greater Bay in 2017, with rapid growth rates that exceeded 4.83% and 4.21% respectively. The labor force in Huizhou, Guangzhou and Shenzhen was also growing, but the annual change rates of the labor force in Zhaoqing, Jiangmen, Foshan and Zhongshan were all negative. These results indicate that the eastern cities of the Guangdong-Hong Kong-Macao Greater Bay Area (located on the eastern coast of the Pearl River) are more attractive to the labor force, while the western cities of the Bay Area (located on the western coast), with the exception of the overseas cities of the Pearl River region, are losing their labor force. These results suggest that the labor force in Guangdong, Hong Kong and Macao is showing a trend of agglomeration that goes from west to east. The labor force in Macao and Hong Kong also showed a significant downward trend, with respective labor force change rates at -2.73% and -2.55% from 2016 to 2017. This means that despite expectations for the regional economic integration of Guangdong, Hong Kong and Macao and the "Bridge Economic Belt", the labor force was flowing back inland.

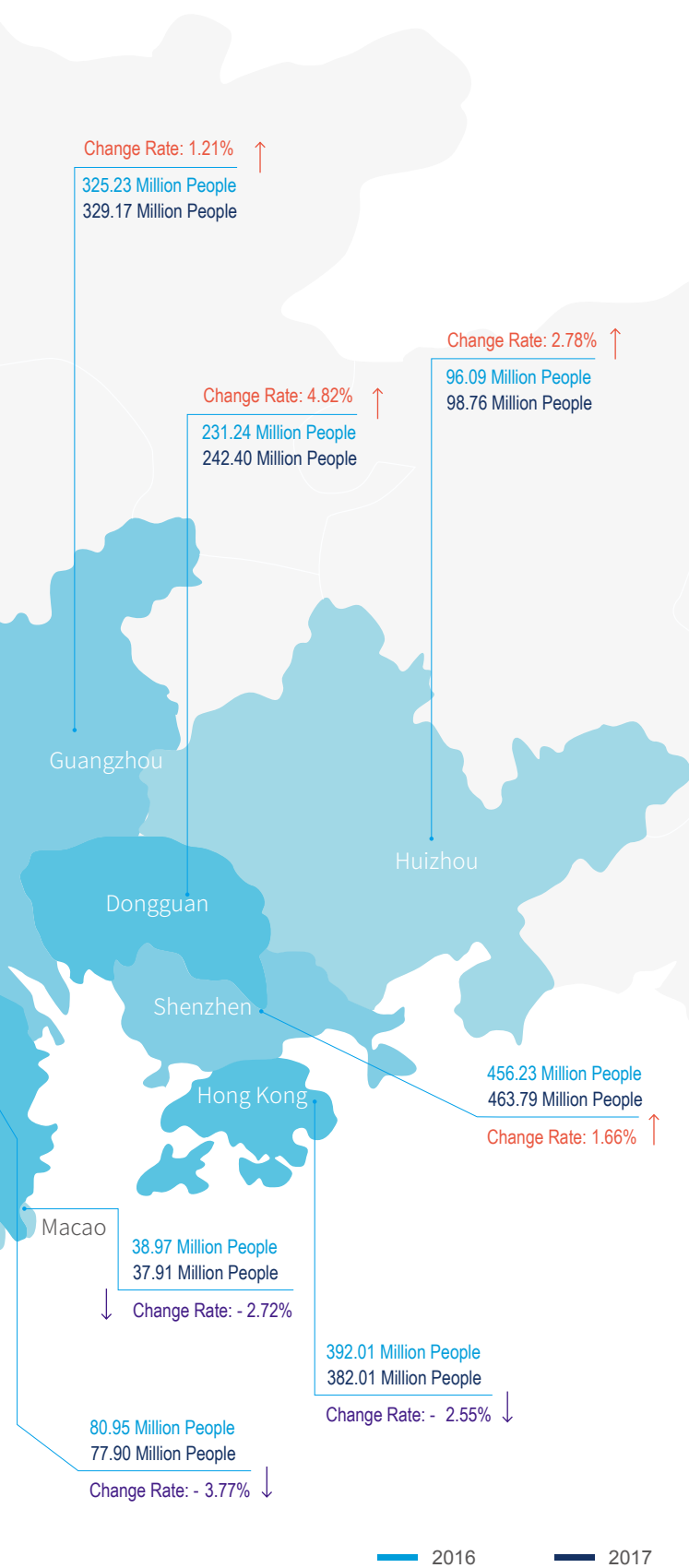


Figure 3.1 Labor Force Distribution in the Cities of the Guangdong-Hong Kong-Macao Greater Bay Area in 2016-2017

Industry Distribution

As shown in Figure 3.2, in terms of industry, the manufacturing industry’s labor force in the Guangdong-Hong Kong-Macao Greater Bay Area ranks first, totaling more than 8 million people and accounting for over 40% of the Bay Area’s total labor force. The region’s top five representative industries are wholesale and retail, construction, transportation, storage, post and education. Compared with the national level, the manufacturing labor force in the Guangdong-Hong Kong-Macao Greater Bay Area has a clear advantage, sitting 16% higher than the average. The wholesale and retail industries are 1.68% higher than the national average. The labor force in the Guangdong-Hong Kong-Macao Greater Bay has further advantages in transportation, logistics, real estate, business services, information transmission, software and information services. However, it shows significant disadvantages in construction, education, public management, social security and social organizations, health and social work industries.

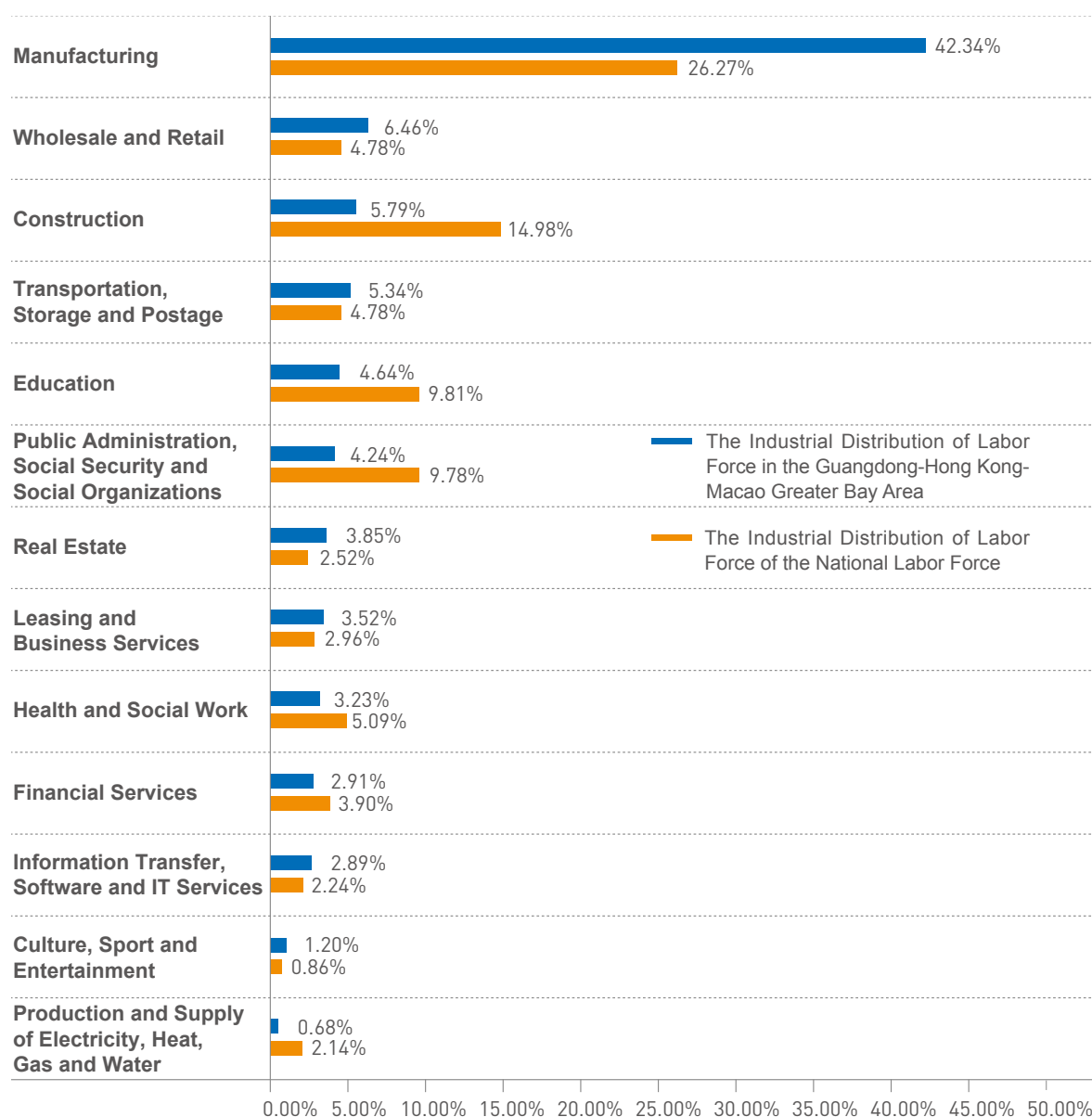


Figure 3.2 Comparison of the Industrial Distribution of Labor Force in the Guangdong-Hong Kong-Macao Greater Bay Area and the National Labor Force in 2017

3.1.2 The Employment Situation of Key Industries in the Guangdong-Hong Kong-Macao Greater Bay Area

We chose four representative industries in the Guangdong-Hong Kong-Macao Greater Bay Area for analysis of the labor force: manufacturing industry, retail industry, financial industry and information industry.

Manufacturing Industry

The manufacturing industry is an important support for the economic development of the Guangdong-Hong Kong-Macao Greater Bay Area. Its labor force accounts for 42.86% of the Bay Area's total labor force. We further analyzed the distribution of the manufacturing labor force in various cities. Among the 11 core cities in the Guangdong-Hong Kong-Macao Greater Bay Area, Shenzhen and Dongguan have prominent advantages in manufacturing labor force, accounting for more than 50% of the total. Among them, the proportion in Shenzhen is as high as 28.30%, over three times the average level in Guangzhou and the whole Guangdong-Hong Kong-Macao Greater Bay Area. Although the total labor force in Dongguan is less than that of the three core cities in the Bay Area, the manufacturing industry of Dongguan is substantial, second only to Shenzhen. In addition, the manufacturing labor force in Foshan and Guangzhou both exceed the average level of the Guangdong-Hong Kong-Macao Greater Bay Area.

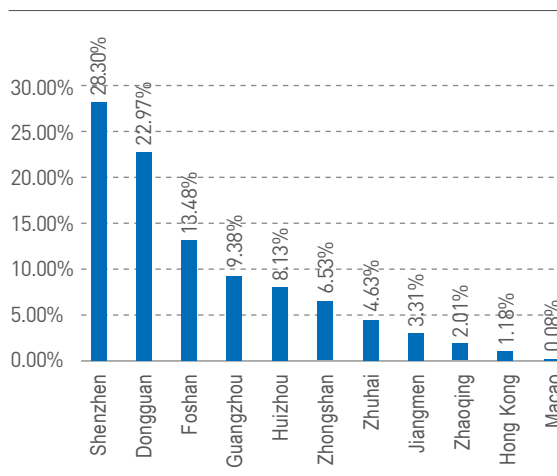


Figure 3.3 Labor Force Distribution of the Manufacturing Industry in the Guangdong-Hong Kong-Macao Greater Bay Area in 2017

Retail Industry

The retail industry is a characteristic and strong industry in the Guangdong-Hong Kong-Macao Greater Bay Area. Its labor force accounts for 6.46%, significantly higher than the national average. Hong Kong, Guangzhou and Shenzhen are among the top three retail industry cities in the Guangdong-Hong Kong-Macao Greater Bay Area, far exceeding other cities in the Bay Area and accounting for over 70%. Among them, the retail labor force in Hong Kong accounts for more than 30%, ranking it first. Macao has the least total labor force among the Bay Area cities, but its retail labor force is larger, giving it a high ranking. These findings reflect the unique characteristics and advantages of the two special administrative regions in the field of consumer goods and retail, which may be related to their economic policies.

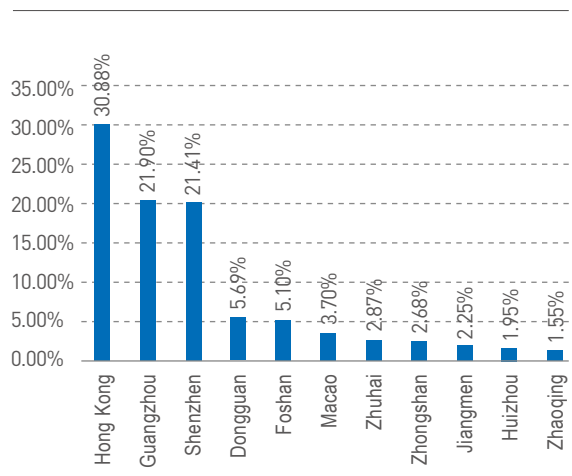


Figure 3.4 Labor Force Distribution in the Wholesale and Retail Industry in the Guangdong-Hong Kong-Macao Greater Bay Area in 2017

Information Industry

Among the cities of the Guangdong-Hong Kong-Macao Greater Bay Area, Shenzhen, Guangzhou and Hong Kong are the leaders in information industry development. The proportion of the labor force in these three cities exceeds 80%, and the level of information development is very high. It is worth noting that Zhuhai has a small population, but its labor force in the information industry ranks fourth after the three core cities. This shows the importance of the information industry and digital economy development in Zhuhai.

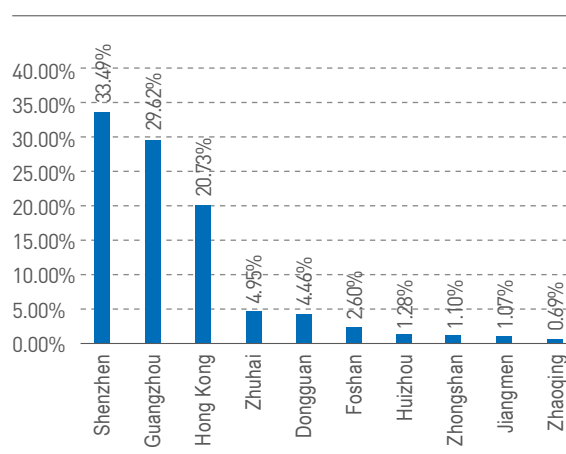


Figure 3.5 Labor Force Distribution in the Information Industry of the Guangdong-Hong Kong-Macao Greater Bay Area in 2017²

Financial Industry

The financial industry's labor force in the three core cities of the Guangdong-Hong Kong-Macao Greater Bay Area is far ahead of other cities. These cities have built a solid financial foundation and provided strong support for the economic development of the Bay Area. Among them, Hong Kong has the biggest labor force in the financial sector, accounting for 46.60% of the labor force in the Bay Area. This is much higher than that of Shenzhen (17.06%) in the second place, and that of Guangzhou (12.94%) in the third place, which highlights its position as an international financial center.

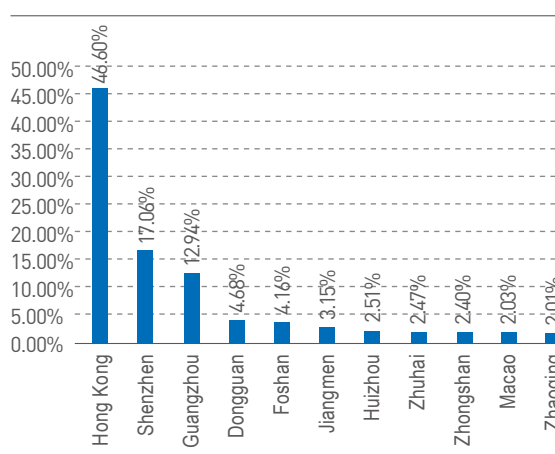


Figure 3.6 Labor Force Distribution in the Financial Industry in the Guangdong-Hong Kong-Macao Greater Bay Area in 2017

Based on the distribution of the labor force, we can see that the Guangdong-Hong Kong-Macao Greater Bay Area has a very rich labor reserve in advantageous industries. The core cities, namely Shenzhen, Guangzhou and Hong Kong have their own unique advantageous industries, showing a diversified development trend. If they can gain from each other's strengths to make up for their weak spots, they will acquire a strong, comprehensive competitiveness.

3.2 Employment Status of High-Level Talents and Digital Talents

Based on LinkedIn's sample data of high-level talents and digital talents with high education, this section analyses regional distribution, industry distribution, education background and skill characteristics among high-level talents and digital talents in Guangdong-Hong Kong-Macao Greater Bay Area. It also analyses the digitization degree of talents from the perspective of industry, education, skills and positions, so as to further highlight the Bay Area's developmental characteristics.

² There is no information industry data listed in Macao's official statistics, so the labor force distribution in Macao's information industry must be regarded as unavailable.

3.2.1 Regional Distribution of Talents

As shown in Figure 3.7, when looking at talent distribution across cities, high-level talents are concentrated in Shenzhen, Guangzhou and Hong Kong, accounting for 28.66%, 26.69% and 23.36% respectively. Digital talents show a similar law of concentration. The three cities with the largest proportion are Shenzhen, Hong Kong and Guangzhou, accounting for 34.78%, 24.78% and 22.93% respectively. Compared with high-level talents, digital talents are mainly concentrated in Shenzhen, with their proportion in other cities having declined significantly.

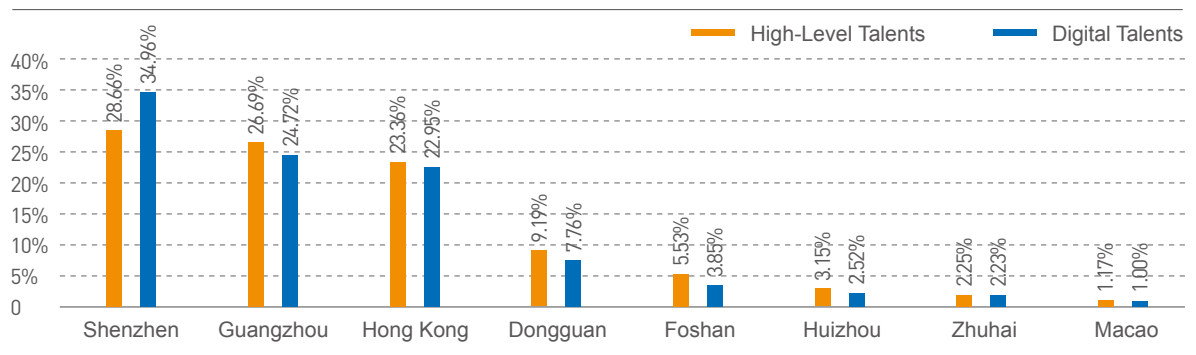


Figure 3.7 Regional Distribution of High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area³

In order to analyze the overall level of digitization, we calculated the percentage of digital talents among high-level talents in cities. The average digitization level of the Guangdong-Hong Kong-Macao Greater Bay Area is 26.98%. As shown in Figure 3.8, Shenzhen, Zhuhai and Hong Kong rank in the top 3, and Shenzhen's level is particularly high. However, Zhuhai and Hong Kong rank lower than the average digitization level in the Guangdong-Hong Kong-Macao Greater Bay Area. The level in Foshan is lowest, at less than 20%. In spite of a relatively substantial number of high-level talents, the digitization level in Guangzhou is fairly low, at less than 25%, the Guangdong-Hong Kong-Macao Greater Bay Area shows an unbalanced digitization trend, with the overall level in need of improvement.

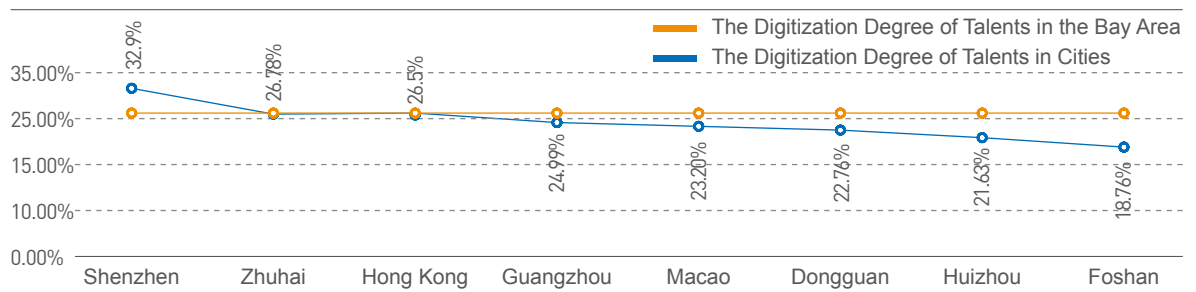


Figure 3.8 Digitization Degree of Cities in the Guangdong-Hong Kong-Macao Greater Bay Area

³ Due to limited data, we only selected eight major cities - Guangzhou, Shenzhen, Zhuhai, Dongguan, Foshan, Huizhou, Hong Kong and Macao - in order to analyze the Guangdong-Hong Kong-Macao Greater Bay Area's high-level and digital talents.

3.2.2 The Industry Distribution of Talents

As Figure 3.9 shows, industry development in the Guangdong-Hong Kong-Macao Greater Bay Area is relatively balanced, and can be roughly divided into four categories according to the number of talents in each. Manufacturing, consumer goods and ICT industries, in which the proportion of high-level talents is higher than 12%, are the dominant industries in the Bay Area, while the financial services and business services industries, in which the proportion of high-level talents is over 5%, are secondary. The tourism and vacation, retail, transportation, logistics, education, media and communications and non-profit industries, in which the proportion of high-level talents is over 3%, are considered as characteristic industries in the region, while industries such as construction, real estate, healthcare, entertainment, design, energy and mineral resources, law and health protection, in which the proportion of high-level talents is below 3%, are considered as emerging industries in the region.

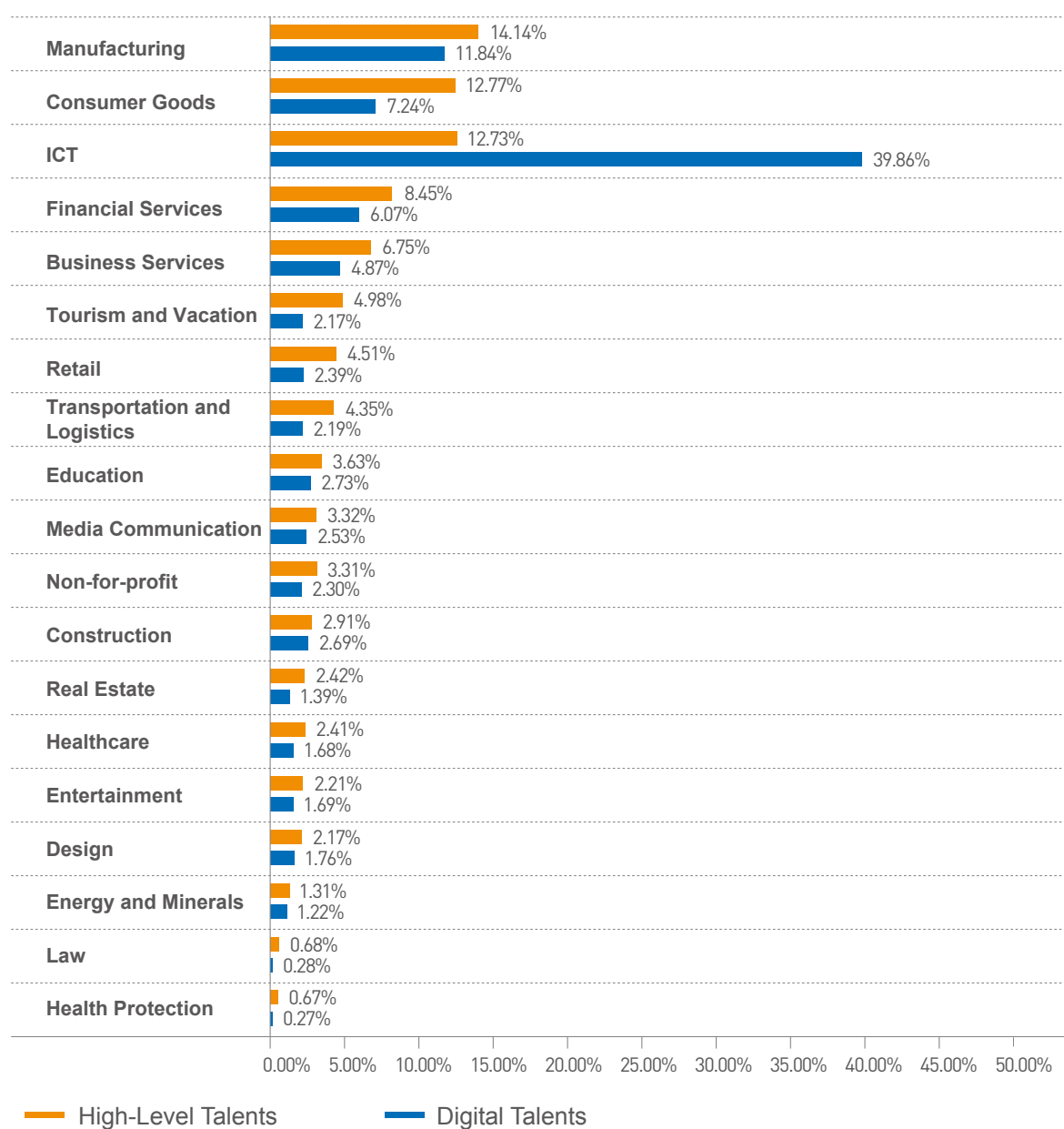


Figure 3.9 The Industrial Distribution of High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

law and health protection in which the proportion of high-level talents is close to or less than 3%, are relatively weak industries in the Guangdong–Hong Kong–Macao Greater Bay Area. Compared with high-level talents, the industry distribution of digital talents ranks roughly the same, but the proportion of talents in the ICT industry is close to 40%, far higher than the proportion of high-level talents in the ICT industry, showing an obvious concentration, and the proportion of these talents in other industries is significantly lower.

Compared with the labor force data of the Guangdong–Hong Kong–Macao Greater Bay Area, the proportion of high-level talents and digital talents in the manufacturing industry is greatly lower. This data suggests that the Guangdong–Hong Kong–Macao Greater Bay Area are somewhat lacking in high-level talent and digital integration within their manufacturing industries, instead relying on labor-intensive production methods. However, the number of both high-level and digital talents has increased significantly within the information and financial industries. This reflects both the growing need for these types of talent, as well as the Bay Area's talent resources investment and digital development within these two industries.

As shown in Figure 3.10, we calculated the proportion of high-level and digital talents in the Guangdong–Hong Kong–Macao Greater Bay Area's primary industries in order to analyze their overall digitization levels. Digitization of the ICT industry shows a digitization degree of over 80%, far higher than that of other industries. This reflects the development strength of the basic digital economy in the Bay Area. The manufacturing industry's proportion of digitization is lower than that of the ICT industry at 22.59%. However, it remains the basic industry with the highest degree of digital integration in the Bay Area, with other basic industries like retail, financial services and business services showing a relatively low level overall. These results demonstrate that the Guangdong–Hong Kong–Macao Greater Bay Area's basic digital economy possesses strong advantages, and that the integrated digital economy is dominated by the manufacturing industry. However, it is still necessary to strengthen the digital integration of basic industries through the basic economic advantages.

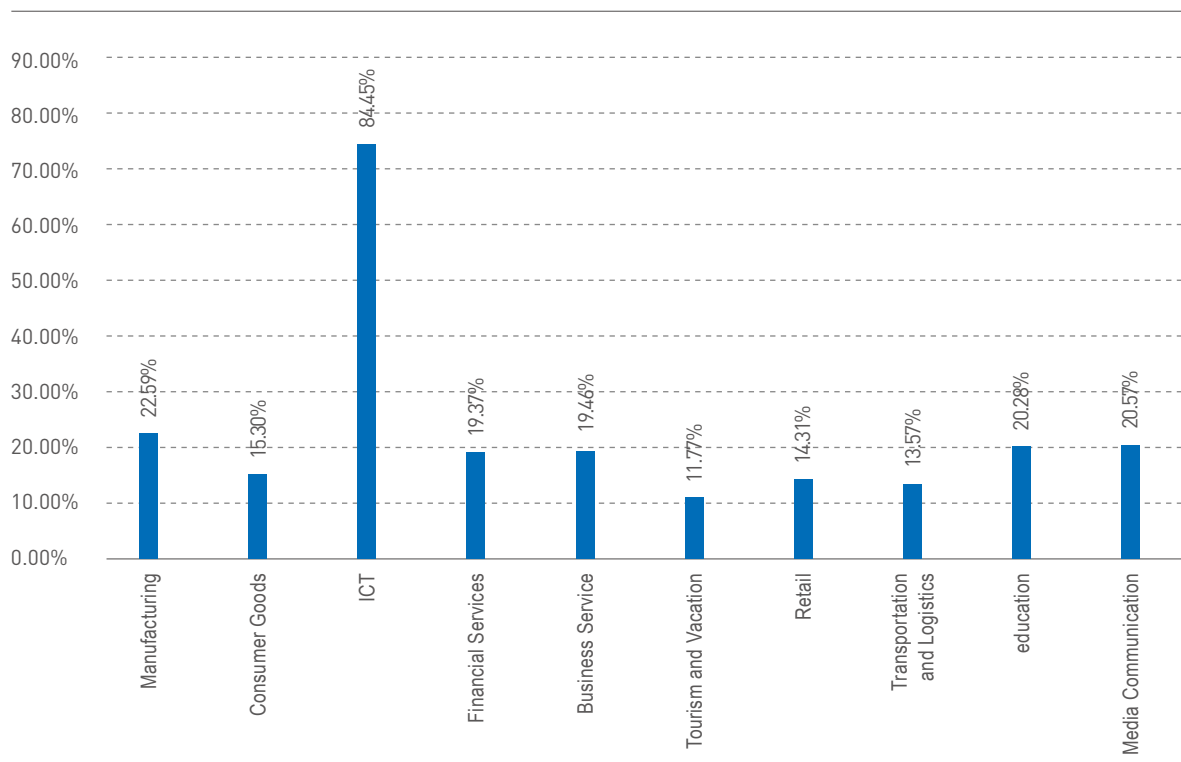


Figure 3.10 The Digitization Degree of Talents in Major Industries

3.2.3 Education Background of Talents

This study analyses three aspects of the education of talents in the Guangdong-Hong Kong-Macao Greater Bay Area: graduate institutions, education backgrounds and majors.

Graduate Institutions

As shown in Figure 3.11, the proportion of graduates from domestic universities (excluding universities in the Guangdong-Hong Kong-Macao Greater Bay Area) is highest among high-level talents and digital talents in Guangdong-Hong Kong-Macao Greater Bay Area, accounting for over 40%. More than 30% of talents graduated from universities in the Guangdong-Hong Kong-Macao Greater Bay Area, and over 25% of talents graduated from an international university. Generally speaking, talents in the Guangdong-Hong Kong-Macao Greater Bay Area come from diverse graduate institutions, and include both domestically-educated talents and those with an international education.

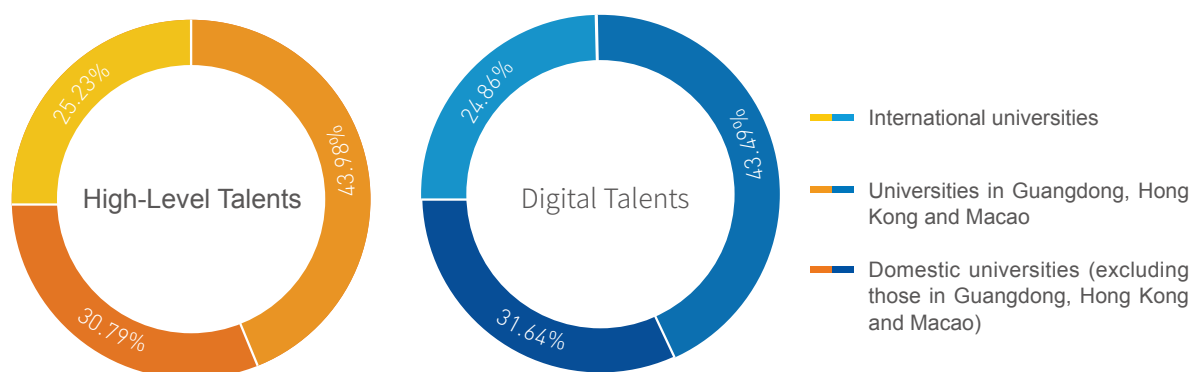


Figure 3.11 Distribution of Graduate Institutions Supplying High-Level Talents and Digital Talents to the Guangdong-Hong Kong-Macao Greater Bay Area

As shown in Table 3.1, we further analyzed the top 10 universities that have produced the most talents by university classification. Among the three classifications of universities, the top 10 universities that have supplied high-level talents are similar to those that have supplied digital talents. To take high-level talents as an example, of the top 10 international universities, seven are UK, 2 are Australian and 1 is Canadian. And all of which are well-known international universities. The top 10 domestic universities are mainly found in Beijing, Hunan-Hubei region and eastern coastal regions. Among these, 3 are located in Beijing, 3 in Wuhan and 4 in Zhejiang, Shanghai, Fujian and Hunan. None are restricted by geographical distance, and all are well-known institutions in China. Most universities in the Guangdong-Hong Kong-Macao Greater Bay Area are located in Hong Kong, and the 6 most-famous public universities in Hong Kong occupy the top six positions. The remaining four are in Guangdong Province, with three in Guangzhou and one in Shenzhen. Generally speaking, the great popularity of graduate institutions in the Guangdong-Hong Kong-Macao Greater Bay Area means that talents possess a good education background.

Table 3.1 Graduate Institution Rankings for High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

Ranking	International universities (including those in Taiwan)		Domestic universities (excluding those in Guangdong, Hong Kong and Macao)		Universities in Guangdong, Hong Kong and Macao	
	High-Level Talents	Digital Talents	High-Level Talents	Digital Talents	High-Level Talents	Digital Talents
1	the London School of Economics and Political Science	University College London	Peking University	Peking University	the University of Hong Kong	The Hong Kong Polytechnic University
2	University College London	The University of Warwick	Wuhan University	Wuhan University	The Chinese University of Hong Kong	The Chinese University of Hong Kong
3	The University of New South Wales	Coventry University	Tsinghua University	Huazhong University of Science and Technology	The Hong Kong Polytechnic University	City University of Hong Kong
4	The University of Warwick	Imperial College London	Huazhong University of Science and Technology	Tsinghua University	City University of Hong Kong	The University of Hong Kong
5	Edinburgh Napier University	The University of New South Wales	Renmin University of China	Zhejiang University	The Hong Kong University of Science and Technology	The Hong Kong University of Science and Technology
6	The University of Manchester	University of British Columbia	Zhejiang University	Xiamen University	Hong Kong Baptist University	Hong Kong Baptist University
7	University of British Columbia	the London School of Economics and Political Science	Xiamen University	Renmin University of China	Sun Yat-sen University	Sun Yat-sen University
8	Monash University	The University of Manchester	Fudan University	Fudan University	Guangdong University of Foreign Studies	Guangdong University of Foreign Studies
9	Imperial College London	Monash University	Central South University	Shanghai Jiao Tong University	Shenzhen University	South China University of Technology
10	Coventry University	Edinburgh Napier University	Zhongnan University of Economics and Law	Sichuan University	South China University of Technology	Shenzhen University

Education

As Figure 3.12 shows, most of the Guangdong-Hong Kong-Macao Greater Bay Area's high-level talents hold undergraduates, accounting for 67.37%. The proportion of talents with a master's degree is 29.69%, the percentage of those with a doctorate is only 2.94%. The distribution of digital talents is similar to that of high-level talents, but the proportion of digital talents who hold a master's degree or higher is greater than that of high-level talents. This suggests that digital talents require higher academic qualifications, which reflects the need for highly-educated talents in the digital economy.

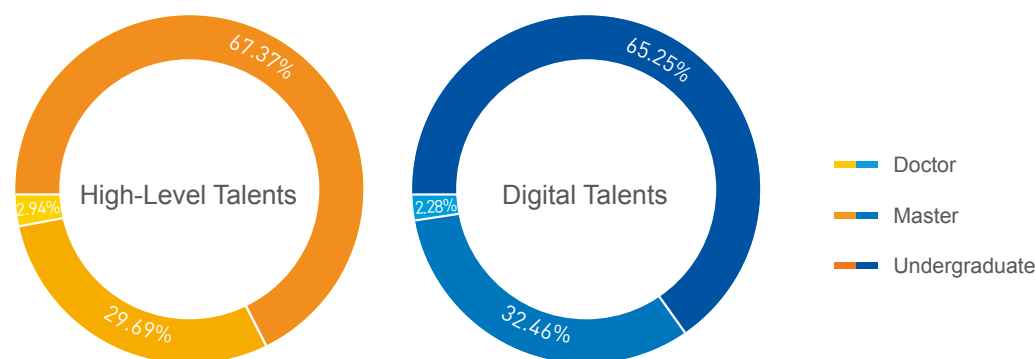


Figure 3.12 Education Distribution Among High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

Majors

We then analyzed the majors of high-level talents and digital talents. As Table 3.2 shows, the top 10 majors among high-level talents in Guangdong, Hong Kong and Macao are business administration, economy, financial services, marketing, accounting and international business. The prevalence of financial majors corresponds to the Guangdong, Hong Kong and Macao area’s position as a world financial center. Humanities majors rank relatively high, with English language and literature ranking the second. Technical majors, such as mechanical science, electrical and electronic engineering, also occupy an important position in Guangdong, Hong Kong and Macao, indicating that the development of the ICT industry is well supported. Digital talents show a distribution of majors that is similar to that of high-level talents. The ranking of business administration majors is still high, but the ranking of ICT-related majors increases significantly, confirming that ICT industry in this region has a firm foundation in terms of talents.

Table 3.2 Majors of High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

Ranking	High-Level Talents	Digital Talents
1	Business Administration	Business Administration
2	English Language and Literature	Computer Science
3	Economics	Electrical and Electronic Engineering
4	Financial Services	Economics
5	Marketing	Marketing
6	Accounting	Financial Services
7	Computer Science	English Language and Literature
8	Electrical and Electronic Engineering	Information Technology
9	Accounting and Financial Services	Information Science
10	International Business	Accounting

3.2.4 Position Grade Distribution of Talents

Figure 3.13 shows that over 40% of the high-level talents in Guangdong, Hong Kong and Macao are in junior positions. Over 20% of high-level talents hold senior professional positions, 16% hold management positions, and 18% are at director levels or above. Compared with high-level talents, the distribution of position grades among digital talents is similar, but shows a higher concentration of talents in junior positions at nearly 50%. Only 13% of these talents hold management positions, which shows that there is a need for greater digital integration in this region.

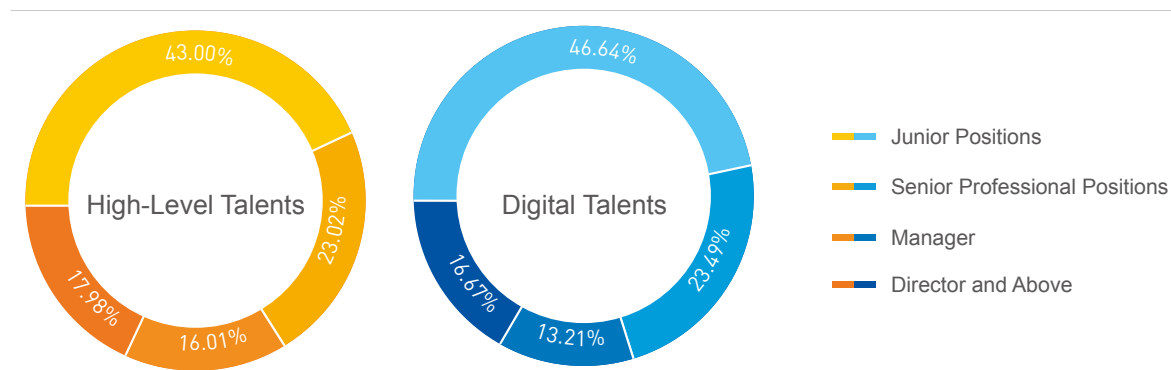


Figure 3.13 Position Grade Distribution of High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

3.2.5 Skill Characteristics of Talents

Skills are a key factor to consider when evaluating talents. Analyzing talents' skills reveals the industry advantages possessed by Guangdong, Hong Kong and Macao. Using a sample of high-level talents from LinkedIn, we performed a full skills analysis. As shown in Table 3.3, we found that soft skills, which include management, leadership and negotiation, rank higher in this region, regardless of high-level talents or digital talents. The high ranking of sales, marketing and other retail industry skills reflects the strong development of the retail and consumer goods industries in the Guangdong–Hong Kong–Macao Greater Bay Area. When we further examine the functional division of skills, it can be seen that strategic planning has a relatively high ranking among strategic management skills, project management has a relatively high ranking among product R&D skills and customer service has a relatively high ranking among operational talent skills.

Table 3.3 The Top 10 Skills of High-Level Talents and Digital Talents in the Guangdong–Hong Kong–Macao Greater Bay Area

Ranking	High-Level Talents	Digital Talents
1	Management	Project Development
2	Microsoft Office Software	Management
3	Customer Services	Microsoft Office Software
4	Project Development	Customer Services
5	Leadership	Leadership
6	Strategic Planning	Business Expansion
7	Business Expansion	Strategic Planning
8	Sales	Marketing
9	Marketing	Sales
10	Negotiation	Business Strategy

Different industries demand different skills. Analyzing talents' skills in different industries is helpful in understanding the development of the Guangdong–Hong Kong–Macao Greater Bay Area. As shown in Table 3.4, we selected six representative⁴ industries in order to analyze the skills of high-level talents and digital talents. These skills can be roughly divided into two categories. The first represents commonly used skills needed in various industries, including leadership, management, business strategy and office software. The second represents specialized industry skills, which are in higher demand in certain industries. For example, the high-level talents employed in the consumer goods industry possess more marketing-related skills, while the financial industry seeks out high-level talents with banking, investment and financial management, risk management and other associated skills. While all industries in Guangdong, Hong Kong and Macao share the same foundation in terms of talent skills, they also develop industry-specific skill requirements. As Table 3.5 shows, the top 10 skills for digital talents are similar to those for high-level talents in most industries. However, there are obvious differences within the manufacturing industry. Skills in both the manufacturing and engineering industries are in the top 10, which reflects the integration of digital talents in the manufacturing industry.

⁴ Among the six representative industries, software and IT services and computer networks and hardware are the two basic industries of ICT.

Table 3.4 The Top 10 Skills of High-Level Talents in Major Industries in the Guangdong-Hong Kong-Macao Greater Bay Area

Ranking	Consumer Goods	Business Services	Financial Services	Manufacturing	Software and IT Services	Computer Network and Hardware
1	Management	Management	Management	Management	Project Development	Management
2	Customer Services	Microsoft Office Software	Microsoft Office Software	Project Development	Management	Project Development
3	Microsoft Office Software	Project Development	Project Development	Microsoft Office Software	Microsoft Office Software	Microsoft Office Software
4	Marketing	Customer Services	Financial Analysis	Customer Services	Leadership	Telecommunication
5	Sales	Leadership	Customer Services	Business Expansion	Customer Services	Business Expansion
6	Project Development	Business Expansion	Banking	Product Development	Business Expansion	Customer Services
7	Business Expansion	Strategic Planning	Leadership	Negotiation	Marketing	Leadership
8	Marketing Strategy	Business Strategy	Risk Management	Sales Management	Strategic Planning	Product Management
9	Strategic Planning	Marketing	Business Strategy	Sales	Java	Sales
10	Sales Management	Financial Analysis	Investment Banking	Strategic Planning	Sales	Strategic Planning

Table 3.5 The Top 10 Skills of Digital Talents in Major Industries in the Guangdong-Hong Kong-Macao Greater Bay Area

Ranking	Consumer Goods	Business Services	Financial Services	Manufacturing	Software and IT Services	Computer Network and Hardware
1	Management	Management	Management	Project Development	Project Development	Management
2	Project Development	Project Development	Project Development	Management	Management	Project Development
3	Product Development	Microsoft Office Software	Microsoft Office Software	Microsoft Office Software	Microsoft Office Software	Microsoft Office Software
4	Microsoft Office Software	Leadership	Business Service	Product Development	Leadership	Telecommunication
5	Marketing	Business Expansion	Leadership	Manufacturing	Customer Services	Business Expansion
6	Customer Services	Business Strategy	Financial Analysis	Customer Services	Business Expansion	Customer Services
7	Business Expansion	Customer Services	Risk Management	Business Expansion	Marketing	Leadership
8	Marketing Strategy	Strategic Planning	Business Strategy	Engineering	Strategic Planning	Product Management
9	Leadership	Marketing	Banking	Leadership	Java	Sales
10	Sales	Strategy	Business Expansion	Strategic Planning	Sales	Strategic Planning

Table 3.6 shows that, with the exception of the two basic industries of ICT, the top 10 digital skills of high-level talents in the main industries of Guangdong, Hong Kong and Macao include Photoshop, data analysis, business analysis and other applied digital skills. These results indicate that the application of digital skills in basic industries is still at an early stage, and will require more extensive integration. Engineering, electronics and other technical digital skills rank first in the manufacturing industry, reflecting a greater depth of digital integration. In addition to this, the digital skills of high-level talents rank higher in manufacturing and financial services industries, which shows the higher demand for digitization in those two industries.

Table 3.6 The Top 10 Digital Skills and their Rankings of High-Level Talents Among All Major Industries in the Guangdong–Hong Kong–Macao Greater Bay Area

Ranking	Consumer Goods	Business Services	Financial Services	Manufacturing	Software and IT Services	Computer Network and Hardware
1	Photoshop [20]	Data Analysis [27]	Business Service [18]	Engineering [15]	Java [9]	Cloud Computing [25]
2	Data Analysis [42]	Business Service [38]	Data Analysis [24]	Electronics [29]	SQL [13]	Linux [29]
3	Business Service [74]	Photoshop [40]	SQL [45]	Photoshop [33]	Business Service [14]	Java [30]
4	Engineering [77]	SQL [91]	VBA [52]	Data Analysis [40]	JavaScript [16]	IP [32]
5	SAP Product [96]	Java [97]	Java [55]	Testing [57]	Software Development [18]	Electronics [35]
6	Electronics [99]	VBA [109]	Photoshop [62]	Business Service [69]	Photoshop [20]	C++ [37]
7	Windows [114]	Business Intelligence [112]	C++ [78]	SAP Product [73]	Cloud Computing [21]	Software Development [39]
8	Testing [120]	Science of Engineering [114]	Python [81]	Windows [89]	Linux [22]	Integration [42]
9	ERP [130]	HTML [127]	SDLC [95]	C++ [92]	Data Analysis [24]	Network Construction [44]
10	HTML [132]	Security [130]	Demand Analysis [98]	Matlab [96]	HTML [25]	C [46]

3.2.6 Demand for Talents

The 10 Fastest-growing Positions and Skills in Guangdong, Hong Kong and Macao

Table 3.7 shows the top 10 positions and skills with the fastest growth rate for high-level and digital talents in Guangdong, Hong Kong and Macao between 2014 and 2017. These 10 positions largely involve professional functions and fields, including legal advisers and information technology directors, and most are intermediate and senior positions. This shows the increasing diversification and specialization of industrial development in Guangdong, Hong Kong and Macao. The demand for digital marketing managers in the top 10 positions show more clearly the penetration of digital technology into basic industries. In addition to this, the demand for senior research professionals, such as post-doctoral researchers and data scientists, has risen among high-level talents and digital talents. This confirms the great importance that the Guangdong–Hong Kong–Macao Greater Bay Area attaches to matters of research and development.

There are several distinct characteristics common to the fastest-growing skills among high-level talents. Firstly, the rapid growth of conference-related skills, such as public speech and event planning, reflects the increased demand for internal communications in the Guangdong-Hong Kong-Macao Greater Bay Area. Secondly, digital skills, such as social media and social media marketing, are also seeing rapid expansion. In terms of digital talents, the fastest-growing skills are primarily search engine optimization, Python, machine learning, R and other technical skills, which shows that the Guangdong-Hong Kong-Macao Bay Area prioritizes emerging technologies and has a strong development capacity.

Table 3.7 The Top 10 Fastest-Growing Positions and Skills in the Guangdong-Hong Kong-Macao Greater Bay Area

Ranking	Positions		Skills	
	High-Level Talents	Digital Talents	High-Level Talents	Digital Talents
1	Investment Manager	Solution Architect	Data Analysis	Search Engine Optimization
2	Marketing Executive	Business Director	Public Speech	Public Speech
3	Business Expansion Director	Business Development Executive	Social Media	Python
4	Office Assistant	Data Scientist	Activity Planning	Data Analysis
5	Law Consultant	Chief Operating Officer	Communication	Website Analysis
6	Postdoctoral Researcher	Analysis Manager	VBA	UI Design
7	Marketing Assistant	Customer Director	Social Media Marketing	Search Engine Marketing
8	Information Technology Supervisor	Product Director	Event Management	Machine Learning
9	Chief Operating Officer	Risk Director	Consultation	Integrated Marketing
10	Business Development Manager	Digital Marketing Manager	Editing	R

The 10 Positions with the Highest Demand Across Major Industries in the Guangdong-Hong Kong-Macao Greater Bay Area

As shown in Table 3.8, in order to analyze the role of various positions, we assessed the top 10 in-demand⁵ positions across different industries in the Guangdong-Hong Kong-Macao Greater Bay Area. While in-demand positions vary across industries, there is a strong demand for commonly used positions across all industries. Account managers and project managers are among the top 10 in demand within all industries. Similar to the industry ranking of skills among talents, the demand for particular positions varies among different industries. The consumer goods industry shows significant demand for marketing and sales positions; software and IT services have greater demand for technical positions, such as developers and R&D personnel; computer networks and hardware have a greater demand for application engineers and R&D engineers; the financial industry has a greater demand for financial advisers, fund accountants and financial management specialists; and company services has more demand for human resources and recruitment positions.

⁵ Method of calculating position demand intensity: the number of position vacancies/the number of occupied positions

Table 3.8 The Fastest-Growing In-Demand Positions Across Major Industries in the Guangdong-Hong Kong-Macao Greater Bay Area

Ranking	Manufacturing	Consumer Goods	Software and IT Services	Computer Network and Hardware	Financial Services	Business Services
1	Key Account Manager	Account Manager	Mobile Application Developer	Application Engineer	Finance Consultant	Data Consultant
2	Sales Consultant	Marketing Manager	Account Manager	Sales Manager	Fund Accountant	Salespeople
3	Salespeople	CRM Assistant	Business Development Director	Marketing Manager	Underwriter	HR Assistant
4	Business Development Manager	Purchasing Assistant	HR	Sales Director	Financial Specialist	Project Manager
5	Sales Manager	Operation Specialist	R & D Scientist	Project Manager	Account Manager	Recruitment Consultant
6	Business Specialist	Acoustic Engineer	Business Development Manager	R & D Engineer	Business Specialist	Information Technology Consultant
7	Sales Engineer	Information Technology Manager	Account Manager	Software Engineer	Customer Service Specialist	Sales Manager
8	Sales Assistant	Sales Manager	Human Resources Business Partner	Product Manager	Product Manager	Headhunt Consultant
9	Account Manager	Salespeople	Product Manager	Account Manager	Finance Consultant	Account Manager
10	Project Manager	Business Specialist	Software Engineer	Strategic Brand Management	Administrative Assistant	Accountant

3.2.7 Analysis of the Advantages and Disadvantages of Urban Talents

To assess industry development characteristics of cities in the Guangdong-Hong Kong-Macao Greater Bay Area, firstly we selected the top 10 industries: software and IT services, computer networks and hardware, manufacturing, consumer goods, financial, business services, tourism and vacation, retail, transportation and logistics and education and analyzed the advantages and disadvantages of these industries from the perspective of high-level talents and digital talents. We then introduced the concept of talent concentration to delineate the advantages and disadvantages of talents. The degree of talent concentration is the ratio of the proportion of talents in various industries within a particular city to the proportion of talents in corresponding industries in the Guangdong-Hong Kong-Macao Greater Bay Area⁶. In Shenzhen, for example, the talent concentration of an industry is equal to 1, which means that the proportion of talents in this industry in Shenzhen is equal to the Guangdong-Hong Kong-Macao Greater Bay Area's overall level. A talent concentration that is greater than 1 indicates that Shenzhen has a talent advantage in this industry when compared with the overall level of the Guangdong-Hong Kong-Macao Greater Bay Area, while being less than 1 indicates that Shenzhen has a talent disadvantage.

⁶ $\text{High-Level Talents Concentration of Shenzhen} = \text{High-Level Talents Percentage of an Industry in Shenzhen} / \text{High-Level Talents Percentage of an Industry in the Guangdong-Hong Kong-Macao Greater Bay Area}$

$\text{Digital Talents Concentration of Shenzhen} = \text{Digital Talents Percentage of an Industry in Shenzhen} / \text{Digital Talents Percentage of an Industry in the Guangdong-Hong Kong-Macao Greater Bay Area}$

As shown in Figure 3.14, each of the 8 major cities has its own distinct characteristics in terms of high-level talent concentration. Although Guangzhou does not have the highest number of talents, its talent distribution across industries is the most balanced. However, in such fields as software and IT services, consumer goods, tourism and vacation, retail, transportation and logistics and education, Guangzhou has a lesser advantage than Guangdong-Hong Kong-Macao Greater Bay Area. The other 7 cities have obvious development characteristics. Shenzhen has a very high concentration of high-level talents in the ICT (software and IT services, computer network and hardware) industry, and a leading talent advantage. Shenzhen shows a talent advantage in the manufacturing, transportation and logistics industries. Zhuhai has a talent advantage in the manufacturing and tourism and vacation industries due to its geographically unique location. Dongguan, Foshan and Huizhou all have talent advantages in the manufacturing and consumer goods industries. Generally speaking, the talents in the cities of Guangdong province have much in common, but have disadvantages in the financial and educational industries. Compared with the overall level of the Guangdong-Hong Kong-Macao Greater Bay Area, Hong Kong has a very high concentration of talents in financial education, business services and other industries, while Macao has strong advantages in the education, tourism and vacation industries, with tourism and vacation being the region’s most distinctive industry. Therefore, the talent pool in Hong Kong and Macao can complement that of other Guangdong cities.



Figure 3.14 An Analysis of the Industry Advantages and Disadvantages of High-Level Talents in the Guangdong-Hong Kong-Macao Greater Bay Area Cities

As shown in Figure 3.15, Guangzhou is still the most balanced city in the Guangdong-Hong Kong-Macao Greater Bay Area, but it has fewer digital talents, and only their software and IT services industries maintain a high concentration of digital talents. Shenzhen still has the greatest talent advantage in ICT, and Zhuhai's digital talents are more concentrated in manufacturing industry. Dongguan, Foshan and Huizhou have a digital talent advantage in the manufacturing and consumer goods industries. Among the two special administrative regions, Hong Kong's digital talent advantage is clear. In industries such as financial services, education, tourism and vacation, business services, transportation and logistics and retail, the concentration of digital talent is relatively high, and that of digital talents in the financial industry is as high as 2.02. Macao has a very high concentration of digital talents in the tourism and vacation industry, reaching as high as 11.04, as well as in the education industry.

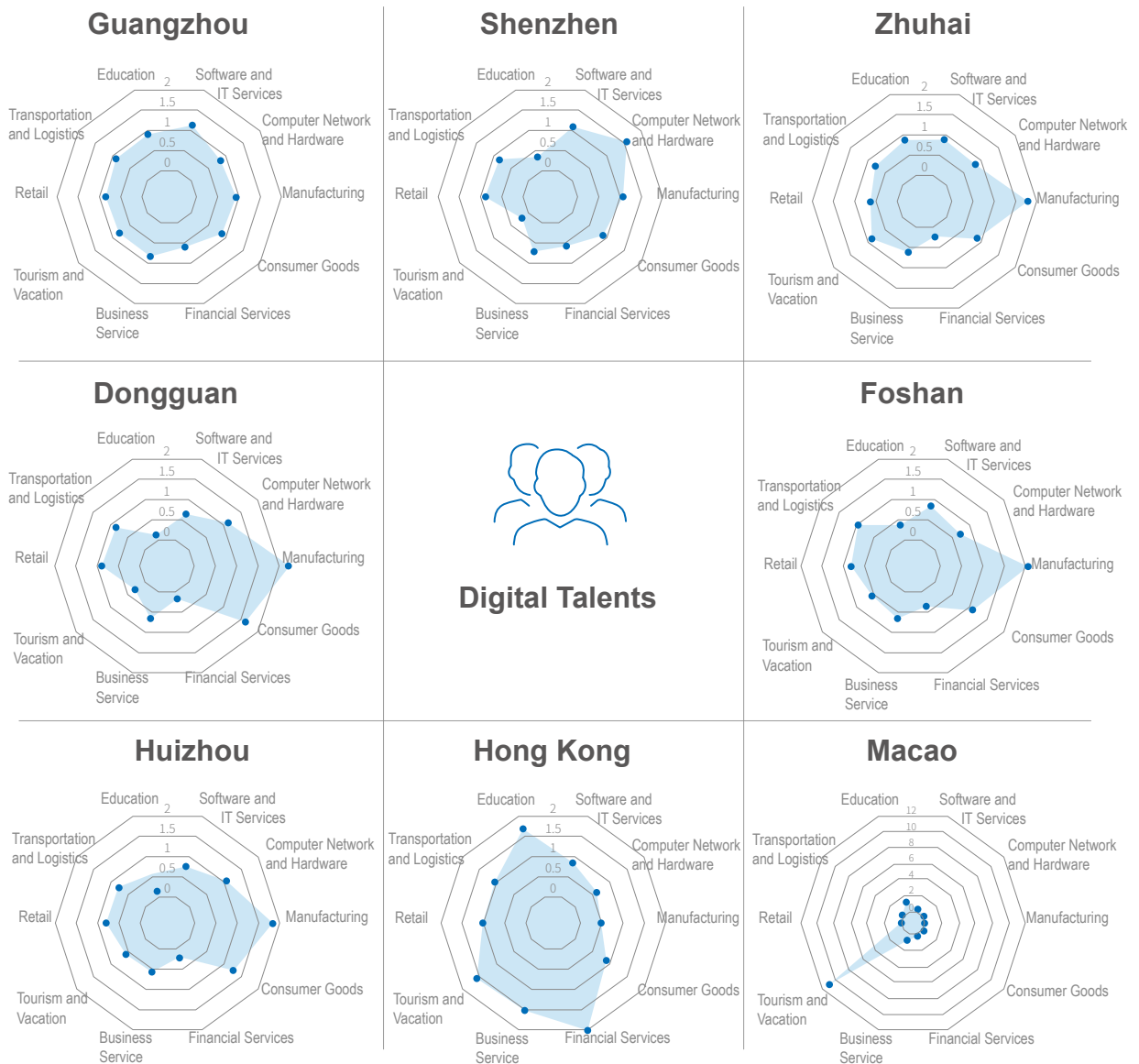


Figure 3.15 Analysis of Industry Advantages and Disadvantages of Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area Cities

Given their varying strengths and weaknesses in terms of high-level talents and digital talents, complementary relationships could be established between cities in the Guangdong-Hong Kong-Macao Greater Bay Area. Guangdong's cities focus on ICT, manufacturing, consumer goods and other industries, while Hong Kong and Macao have the advantage in fields such as education, financial and business services. This strong complementarity is capable of becoming a driving force for the development of the Guangdong-Hong Kong-Macao Greater Bay Area.

04 TALENT MIGRATION IN THE GUANGDONG-HONG KONG-MACAO GREATER BAY AREA

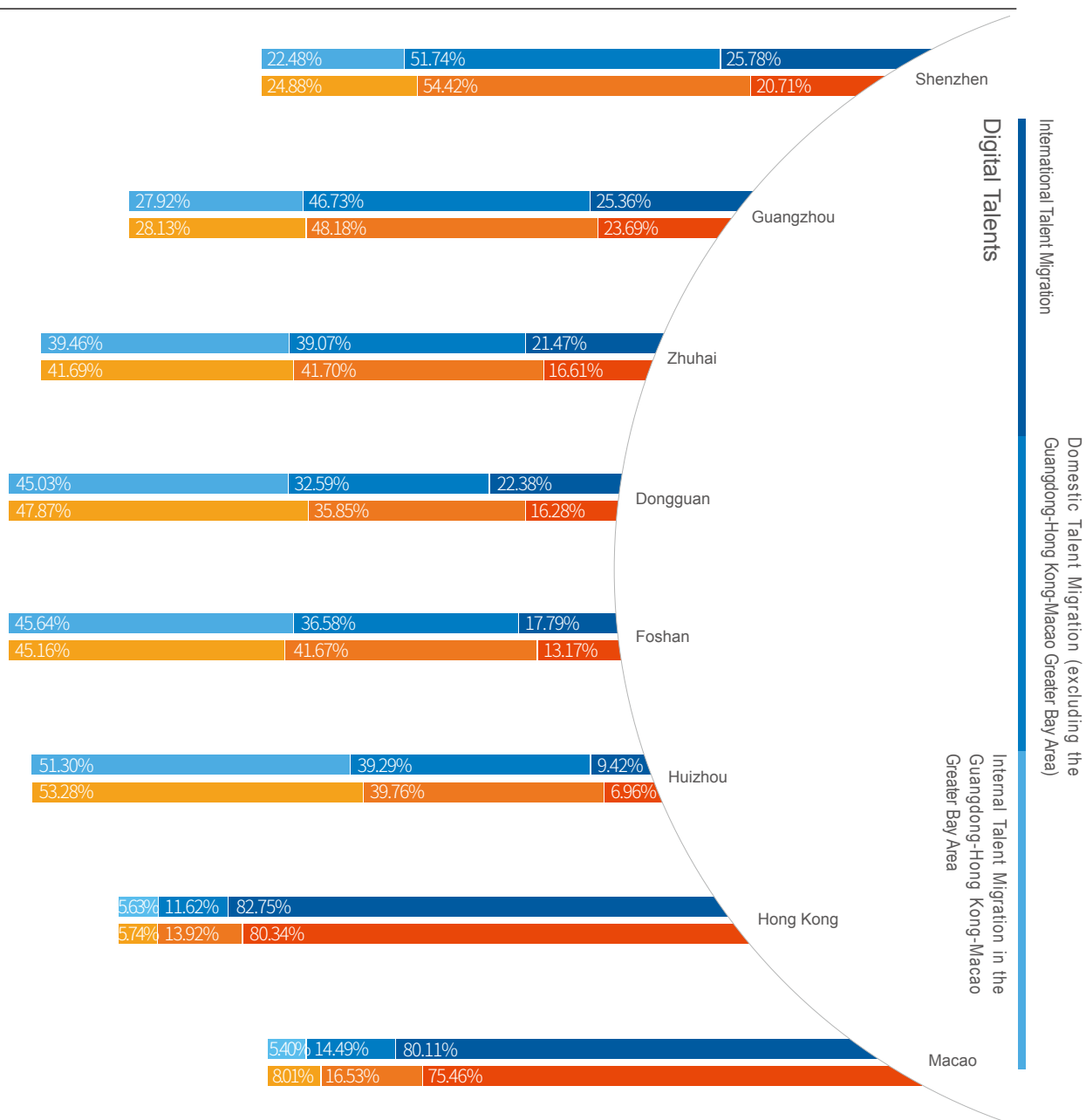


Figure 4.1 Proportion of High-Level Talents and Digital Talents Migrating into Cities of the Guangdong-Hong Kong-Macao Greater Bay Area

Figures 4.1 and 4.2 show that Hong Kong and Macao are dominated by the migration of international talents, while Guangzhou and Shenzhen are dominated by migration of domestic talents. Zhuhai, Dongguan, Foshan and Huizhou are dominated by the internal migration of talents within the Guangdong-Hong Kong-Macao Greater Bay Area, and their attractiveness to digital talents at both the domestic and international level needs improvement. The migration of digital talents from international areas is higher than that of high-level talents, indicating that the Guangdong-Hong Kong-Macao Greater Bay Area is attractive to digital talents overseas.

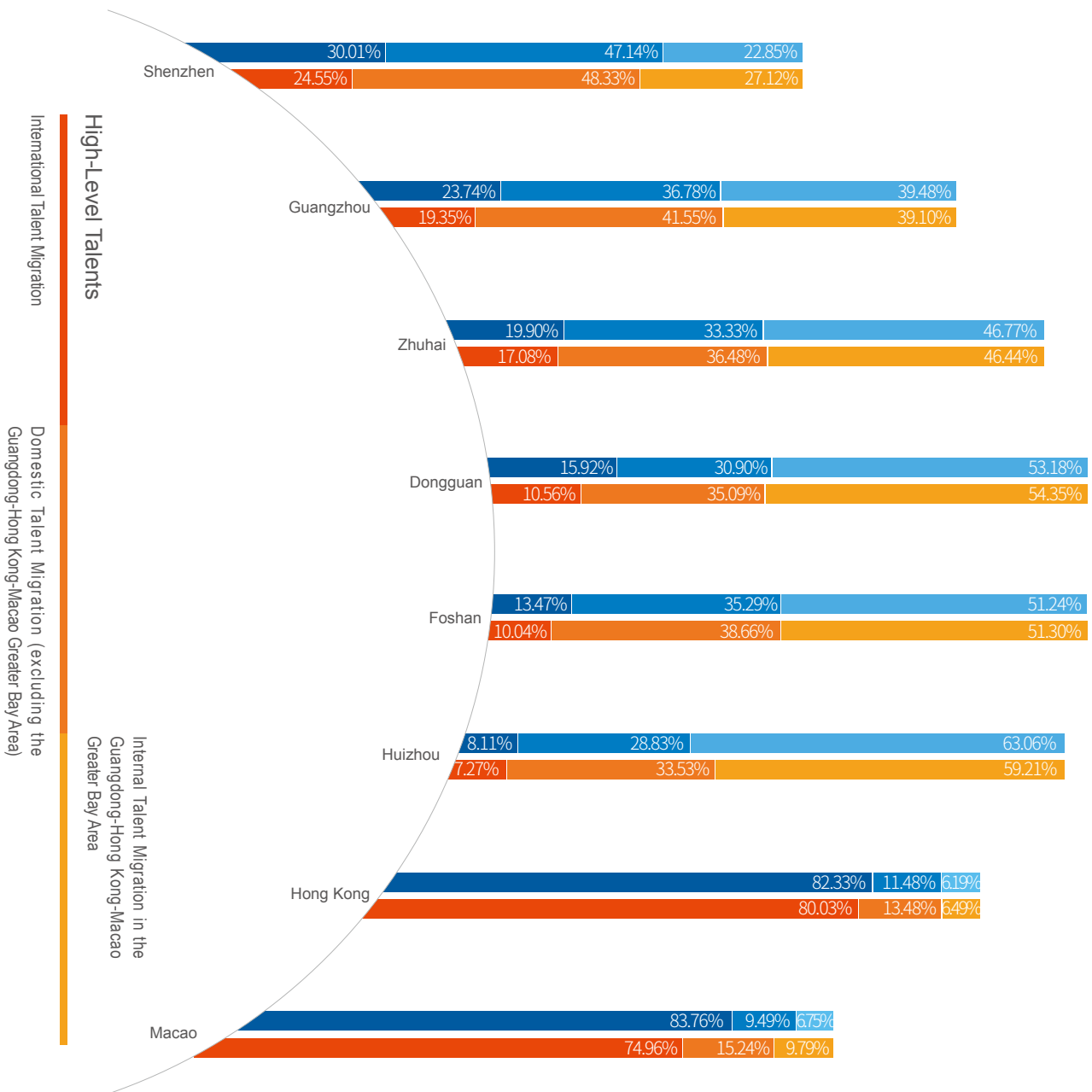


Figure 4.2 Proportion of High-Level Talents and Digital Talents Migrating from Cities of the Guangdong-Hong Kong-Macao Greater Bay Area

4.1 Analysis of International Talent Migration

4.1.1 Overview of International Talent Migration

Generally speaking, the Guangdong-Hong Kong-Macao Greater Bay Area shows a net inflow of high-level and digital talents. We analyzed the in-depth talent migration insights talent migration in more details from the international, domestic and the Bay Area perspectives levels. Figures 4.3 and 4.4 show that the international sources of high-level and digital talents in the Guangdong-Hong Kong-Macao Greater Bay Area are primarily the United States and UK, which together account for over a third of the international talents in the Bay Area. In terms of digital talents, the proportion of those coming from Singapore and India has increased significantly. Similar to the sources of talent inflow, the major international destinations for high-level and digital talent outflow are the United States and UK, which account for one third of the total, as well as Canada, which ranks in the top 5. In addition, the proportion of talents migrating into the Bay Area from the United States and UK is higher than that the proportion of talents migrating out from the Bay Area into those countries. Conversely the proportion of talents migrating into the Bay Area from Australia and Singapore is lower than the proportion of talents migrating out from to those countries. These findings indicate that the Guangdong-Hong Kong-Macao Greater Bay Area is somewhat attractive to international talents, but its attractiveness needs further strengthening.

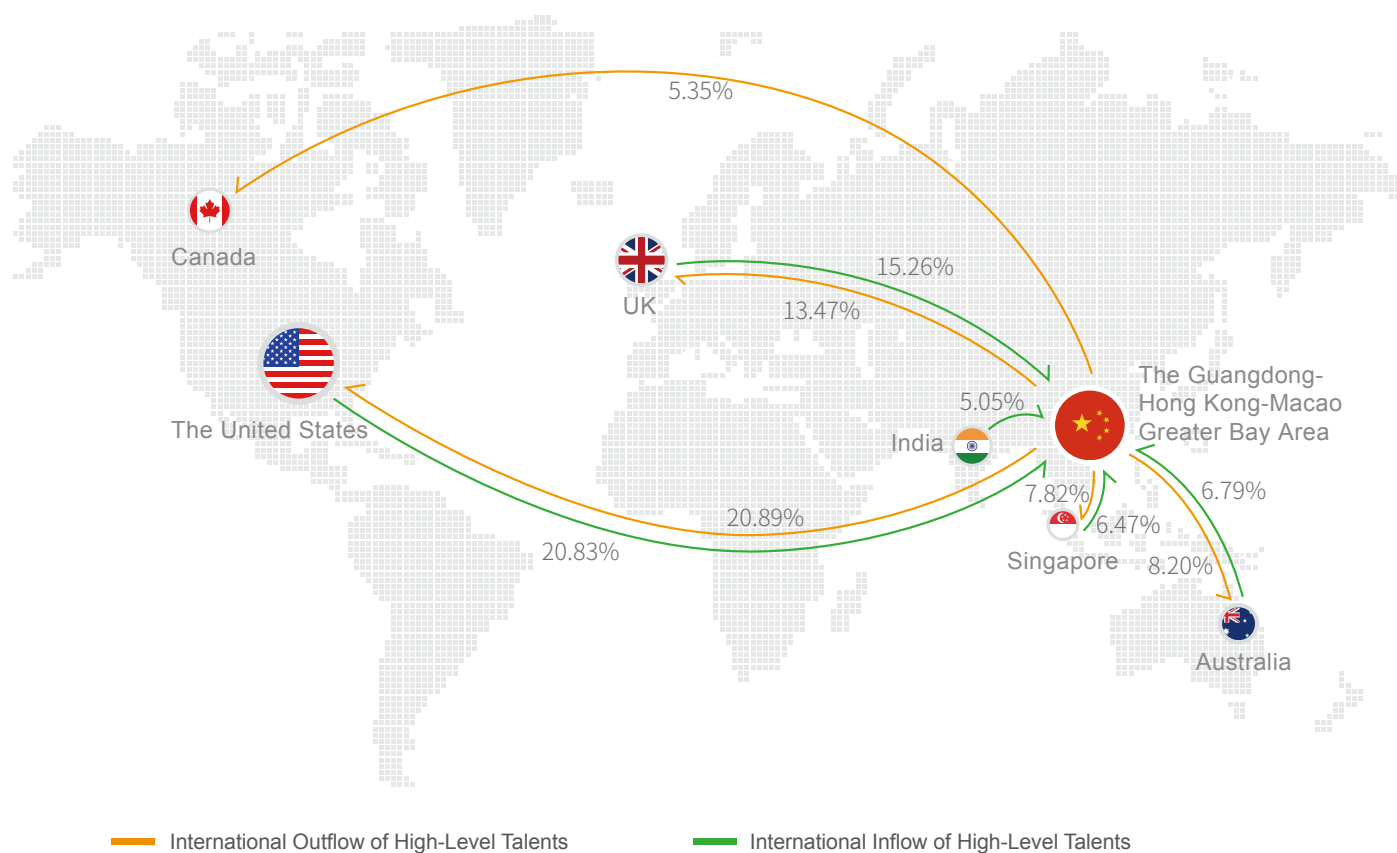


Figure 4.3 The Top 5 International Sources and Destinations of High-Level Talents

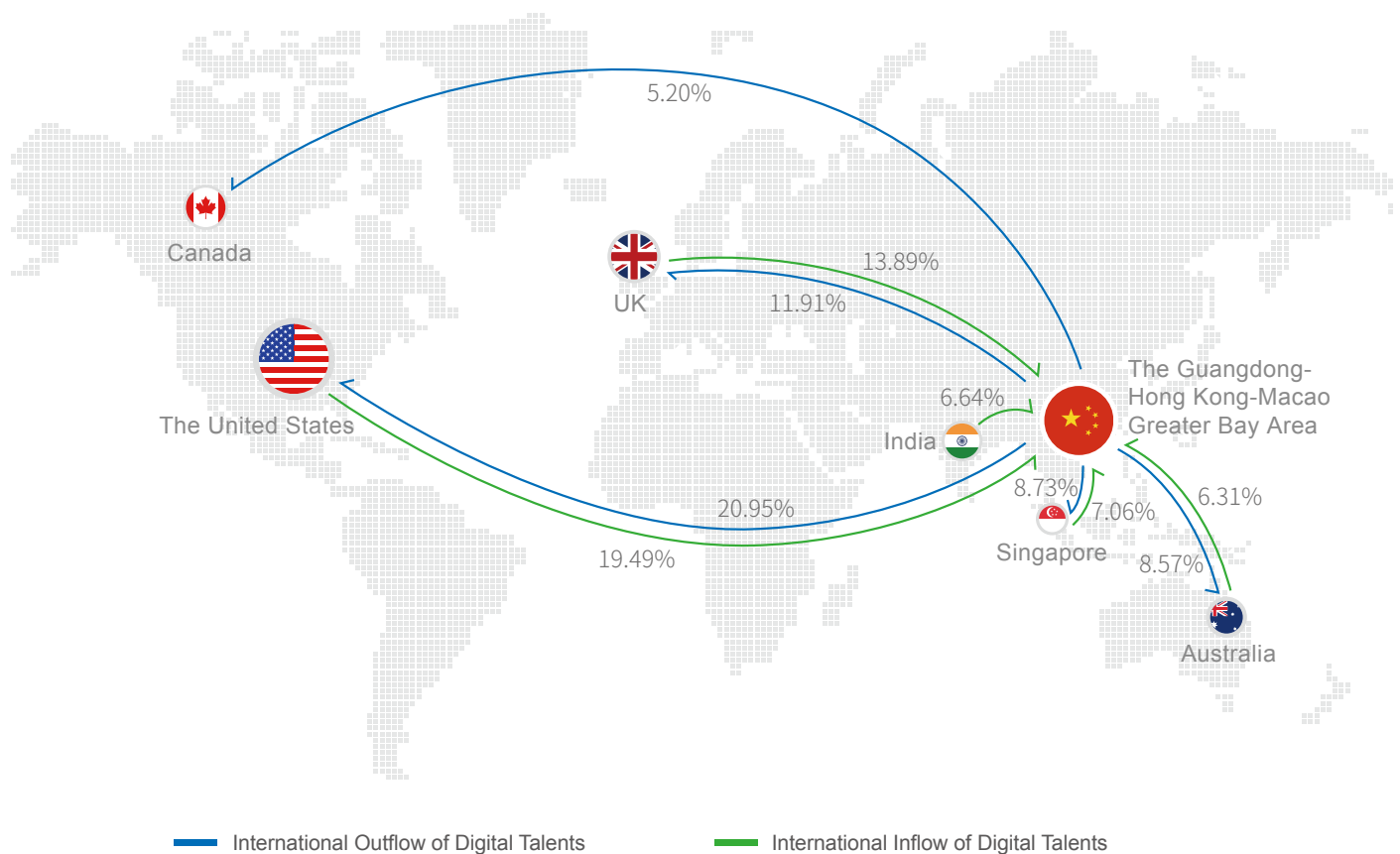


Figure 4.4 The Top 5 International Sources and Destinations of Digital Talents

4.1.2 Inflow/Outflow Ratio of International Talents

We calculated the ratio of talent inflow to talent outflow (hereafter referred to as the "talent inflow/outflow ratio") in order to analyze talent migration in cities. The talent inflow/outflow ratio being greater than 1 indicates that a region or a city is in a net talent inflow state within the monitored time range, and the talent inflow/outflow ratio being less than 1 indicates that it is in a net talent outflow state.

As shown in Figure 4.5, Shenzhen is the city with the highest international talent inflow/outflow ratio in the Guangdong-Hong Kong-Macao Greater Bay Area, with an inflow-outflow ratio of high-level talents and digital talents of 1.65 and 1.68 respectively. The attraction and retention rate for international talents is high in this region. Additionally, Dongguan, Foshan and Hong Kong are also very attractive to international high-level talents and digital talents. Guangzhou is attractive to international high-level talents, but is currently in a state of talent outflow in the category of digital talents, which further reflects the shortage of digital talents in Guangzhou. Huizhou shows a talent outflow for high-level talents, but a state of net talent inflow for digital talents. Zhuhai and Macao are losing both high-level and digital talents to other regions of the world, and show a low talent retention rate.

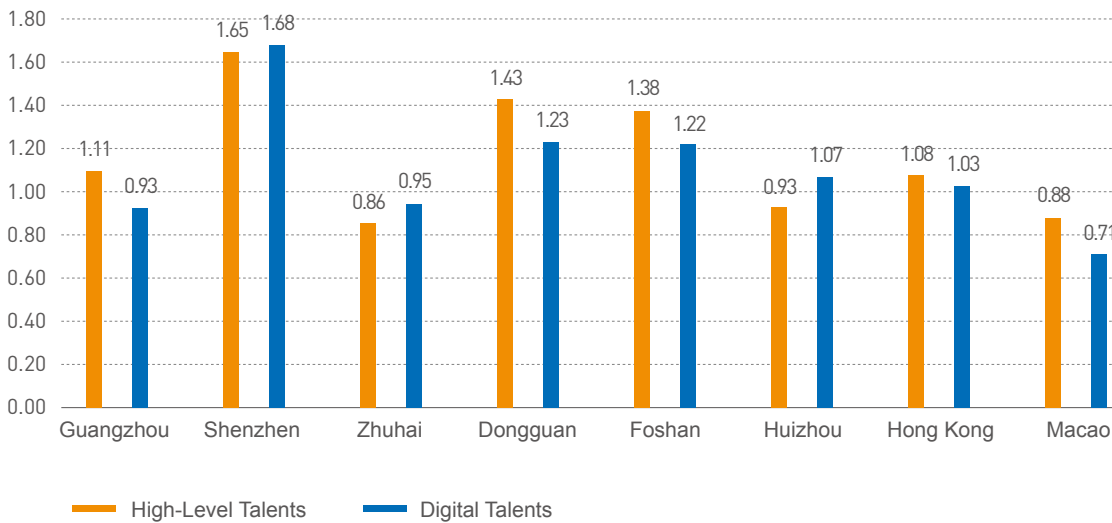


Figure 4.5 International Inflow/Outflow Ratio of High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

4.2 Analysis of Domestic Talent Migration

4.2.1 Overview of Domestic Talent Migration

As shown in Figures 4.6 and 4.7, Beijing and Shanghai are the main sources of high-level talent migration to Guangdong, Hong Kong and Macao Greater Bay Area, accounting for more than 10% of the total. The top 5 cities accounted for about 30% of the total talent inflow, indicating that the source cities for high-level talent present a pluralistic distribution. The sources of digital talents are more concentrated than those of high-level talents, and their proportion of digital talents in the top 5 cities is higher than that of high-level talents, in Beijing and Shanghai in particular. Hangzhou ranks among the top 5 sources of digital talents.

High-level talents mainly migrate to Shanghai and Beijing, accounting for more than 12% of the total outflow. The proportion of talent outflow in the top five cities is higher than that of talent inflow, and the outflow of talents is relatively concentrated. The destinations of digital talents are more concentrated than that of high-level talents, and the proportion of digital talent outflow in the top 5 cities is higher. Among them, the proportion of digital talents migrating to Shanghai and Beijing is over 15%, among which that to Shanghai is close to 25%.

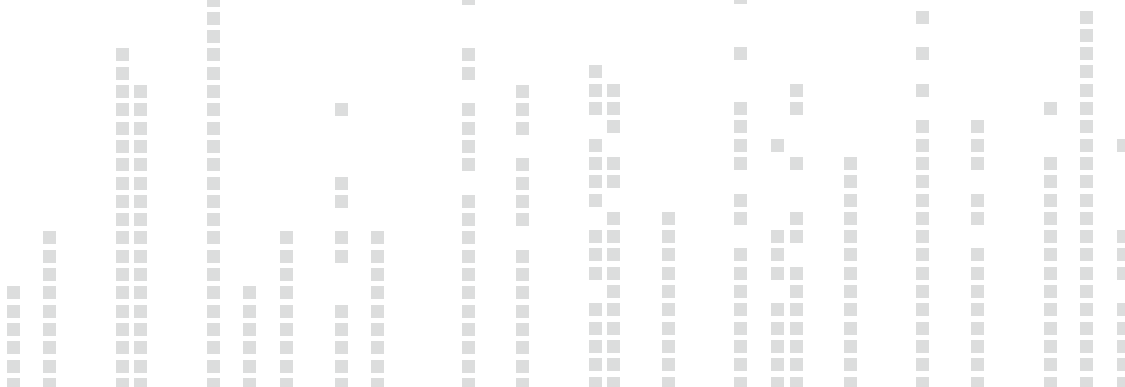




Figure 4.6 The Top 5 Domestic Sources and Destinations of High-Level Talents

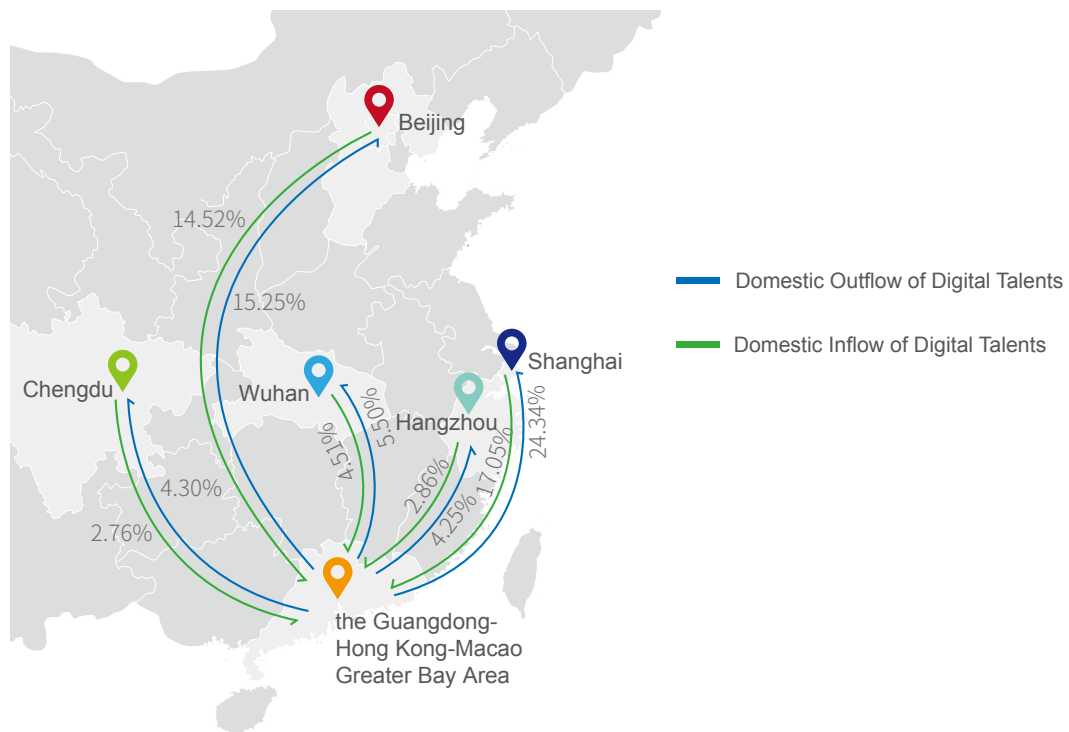


Figure 4.7 The Top 5 Domestic Sources and Destinations of Digital Talents

4.2.2 Attraction Index of Digital Talents in the Bay Area

In order to better understand the domestic sources and destinations of digital talents in the Guangdong-Hong Kong-Macao Greater Bay Area, we used the urban digital talent attraction index⁷ to analyze the migration of digital talents in Beijing, Shanghai, Hangzhou, Chengdu and Wuhan, the five core cities of the digital economy, and the Guangdong-Hong Kong-Macao Greater Bay Area. Figure 4.8 shows a positive net inflow of talents from Beijing and Wuhan to the Bay Area. The ratio of digital talent inflow into the Bay Area to that of the city is 1.41 and 1.58, respectively, which indicates that Beijing and Wuhan are the main sources of digital talents in the Guangdong-Hong Kong-Macao Greater Bay Area. The net inflow of talents from Hangzhou to the Bay Area is negative. The ratio of digital talent inflow to the Bay Area and digital talent inflow to Hangzhou is only 0.77, which means that many of the digital talents in the Guangdong-Hong Kong-Macao Greater Bay Area have migrated to Hangzhou, and over 60% digital talents of the Bay Area's high-level talents have migrated there as well. Shanghai is a different case. The city attracts high-level talents from Guangdong, Hong Kong and Macao Greater Bay Area. However, in terms of digital talents, the number of digital talents migrating from Shanghai to the Bay Area is nearly equal to that of those migrating from the Bay Area to Shanghai. This demonstrates that the two regions have a similar level of attractiveness for digital talents, and that Chengdu and Shanghai's situations are similar.

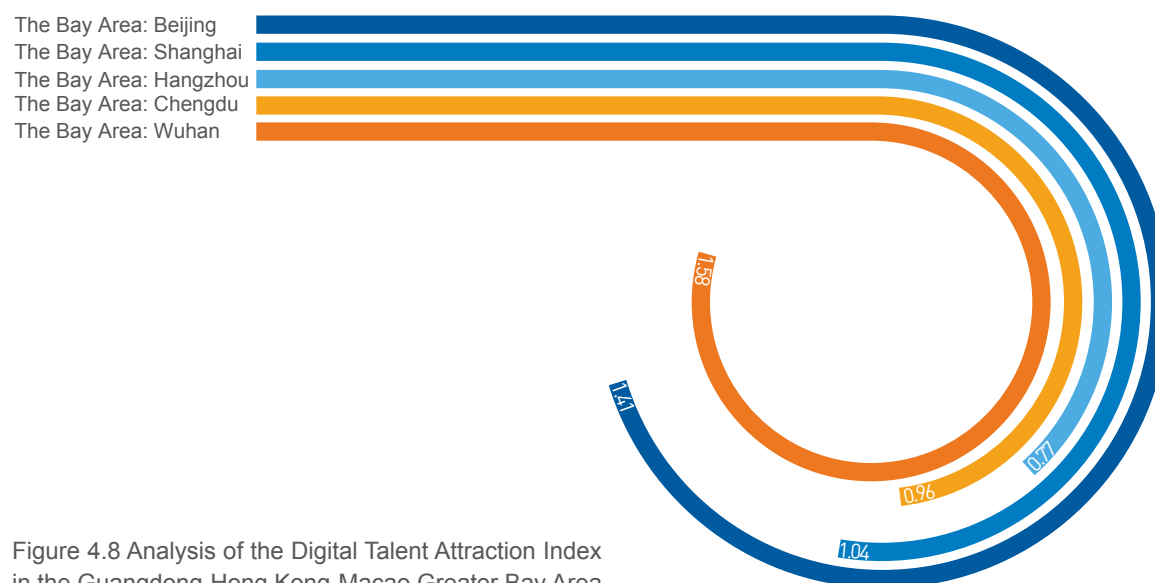


Figure 4.8 Analysis of the Digital Talent Attraction Index in the Guangdong-Hong Kong-Macao Greater Bay Area

4.2.3 Domestic Talent Inflow/Outflow Ratio

In Figure 4.9, by calculating the talent inflow/outflow ratio for cities in The Guangdong-Hong Kong-Macao Greater Bay Area for domestic talent migration, we see that Shenzhen is still the most attractive city, with an inflow/outflow ratio for high-level and digital talents of more than 2. In addition, Guangzhou, Zhuhai, Huizhou and Hong Kong are experiencing net inflow of high-level talents and digital talents. While Foshan has a net inflow of high-level talents, it is in a state of net outflow for digital talents, who are migrating to other regions of

⁷ Digital Talent Attraction Index. Taking Beijing as an example, the Digital Talent Attraction Index of the Guangdong-Hong Kong-Macao Greater Bay Area = the Number of Digital Talents Migrating from Beijing to the Guangdong-Hong Kong-Macao Greater Bay Area / the Number of Digital Talents Migrating from the Guangdong-Hong Kong-Macao Greater Bay Area to Beijing

China. Macao, on the other hand, is losing its high-level talents to other regions of the country, while its digital talents are in a state of net inflow. Dongguan is losing both its high-level and digital talents to other regions of the country. However, with the exception of Shenzhen and Huizhou, the talent inflow/outflow ratio of other cities is close to 1, without obvious fluctuations in talent absorption and loss.

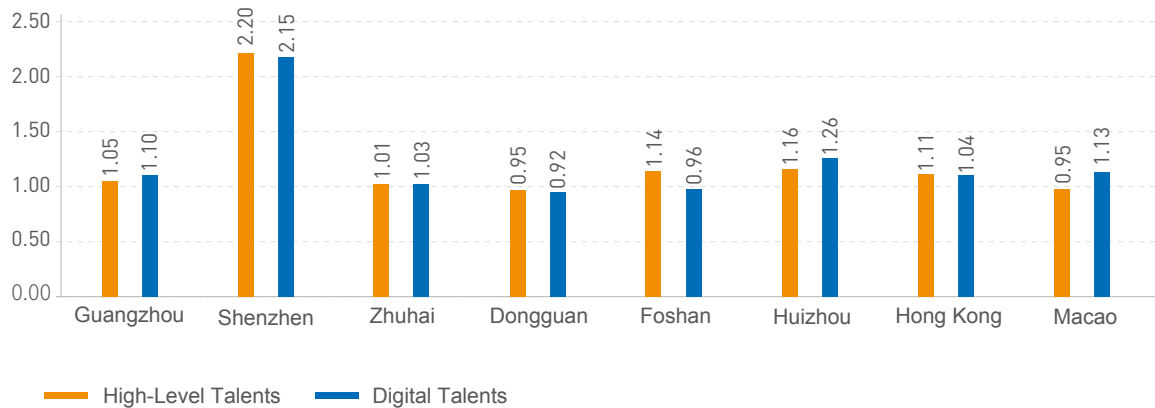


Figure 4.9 Domestic Inflow/Outflow Ratio of High-Level Talents and Digital Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

4.3 Analysis of Talent Migration in the Bay Area

4.3.1 Summary of Talent Migration in the Bay Area

We analyzed talent migration among the cities in the Bay Area with the aim of assessing the cities' attractiveness to talents. As shown in Figure 4.10, Guangzhou and Shenzhen account for between 50% and 80% of the total talent migration in other cities. Compared with Guangzhou, Shenzhen has a lower proportion of talent source cities, but a higher number of talent destinations, reflecting the unique status of Shenzhen and Guangzhou in terms of talent migration in the Guangdong-Hong Kong-Macao Greater Bay Area. Huizhou and Macao have the lowest level of talent exchange with other cities, and its attractiveness to talents is not high enough. Zhuhai is the city with the closest connection with Macao. It is not only the main source of talents in Macao, but also the main destination of talents in Macao. Hong Kong and Shenzhen have the closest ties. The proportion of talents in the Bay Area who are from Shenzhen to that of talents in the Bay Area going to Shenzhen is over 50%, which is the core border across which Hong Kong can integrate into the mainland.

As shown in Figure 4.11, Shenzhen and Guangzhou are the main sources of digital talents in the major cities of the Guangdong-Hong Kong-Macao Greater Bay Area. Dongguan's position has risen significantly, and it now ranks the third among digital talent sources in the cities, reflecting the importance Dongguan attaches to digital economy development. However, its retention rate for digital talents needs improvement. Shenzhen is in a relatively stable leading position in the outflow of digital talents in various cities, which confirms Shenzhen's key role in the growing digital economy of the Guangdong-Hong Kong-Macao Greater Bay Area. Additionally, Zhuhai's ranking has risen significantly among sources of digital talent and destinations of digital talent in various cities, reflecting the vitality of its digital economy and attractiveness to digital talents.

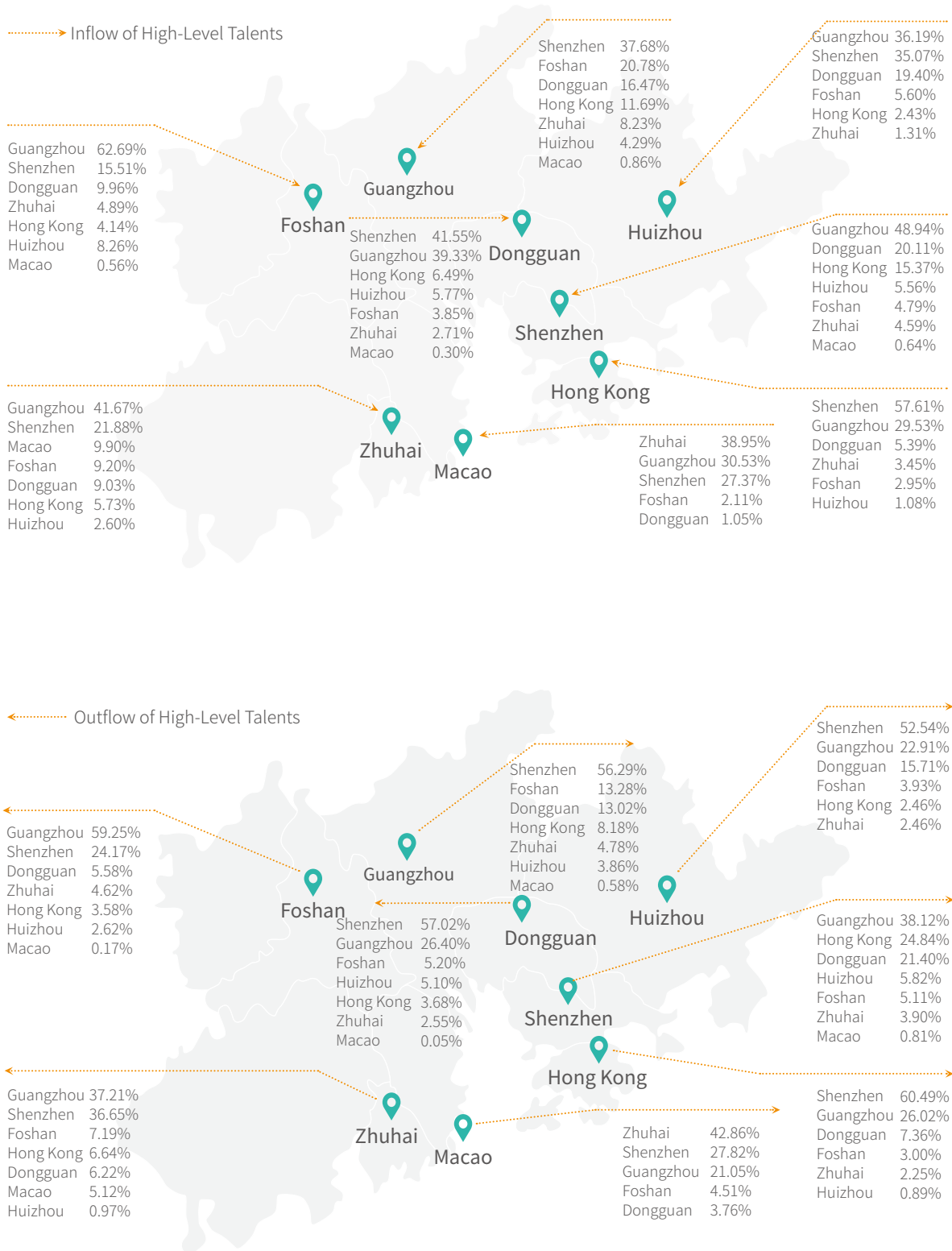


Figure 4.10 Migration of High-Level Talents Among Major Cities in the Guangdong-Hong Kong-Macao Greater Bay Area

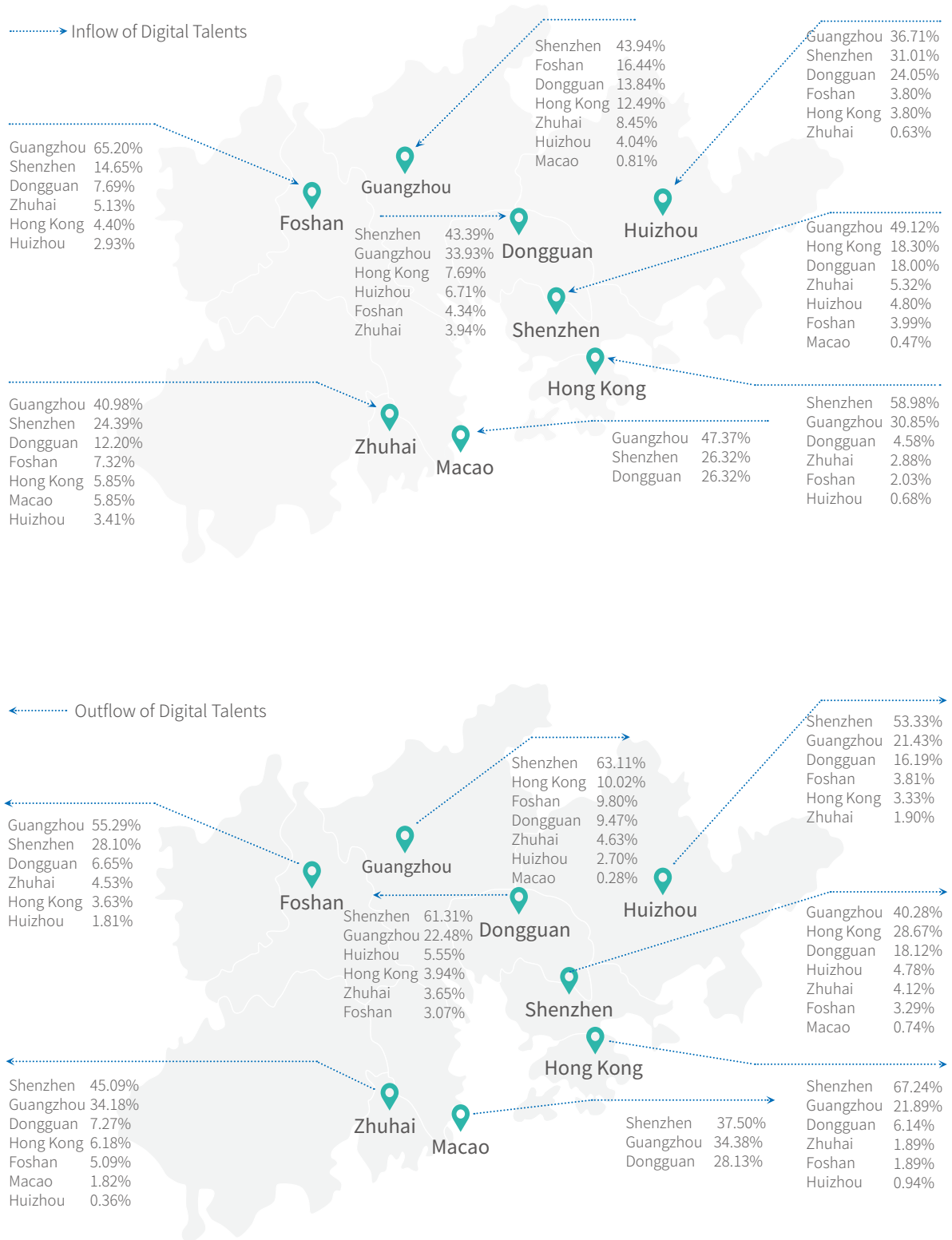


Figure 4.11 Migration of Digital Talents among Major Cities in the Guangdong-Hong Kong-Macao Greater Bay Area

4.3.2 Talent Migration Quantities among Cities in Bay Area

In order to further clarify the positions of the cities in the Guangdong-Hong Kong-Macao Greater Bay Area in terms of talent migration, we analyzed talent migration in each city against the total talent migration in the entire Bay Area. As shown in Figure 4.12, the cities with the highest talent inflow are Shenzhen, Guangzhou, Dongguan, Hong Kong, Foshan, Zhuhai, Huizhou and Macao. Among them, Shenzhen's high-level talent inflow is nearly twice that of Guangzhou, which ranks the second, and it has a higher digital talent inflow. In Hong Kong, digital talent inflow exceeds high-level talent inflow. At the same time, the proportion of digital talent inflow into Dongguan has put it in third place, showing a growing digital transformation trend. However, the digital talent inflow into the other 6 cities is lower than the high-level talent inflow, which indicates that these cities need to increase their digitization development.

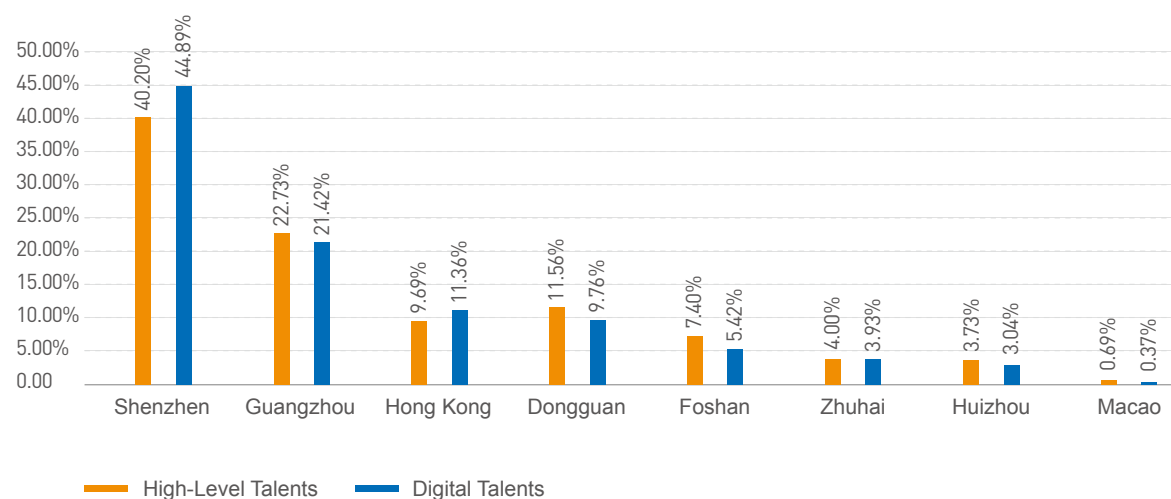


Figure 4.12 The Proportion of High-Level Talents to Digital Talents Migrating into Major Cities in the Guangdong-Hong Kong-Macao Greater Bay Area

As shown in Figure 4.13, the cities with the largest talent outflow in the Bay Area are Guangzhou, Shenzhen, Dongguan, Hong Kong, Foshan, Zhuhai, Huizhou and Macao. Their ranking is well-aligned with the city rankings for talent inflow, with the only differences being in the first two positions. Guangzhou has become the city with the biggest talent outflow in the Bay Area, with Shenzhen ranking the second. The outflow distribution of digital talents is very similar to that of high-level talents. Shenzhen, Hong Kong and Zhuhai are three major cities in which digital talent outflow exceeds high-level talent outflow, which indicates that they are capable of contributing to the digital development of the Bay Area. However, talent outflow in the three cities is not high enough, especially for Shenzhen and Hong Kong, which are the two most talent-intensive cities.

The proportion of talent outflow in other cities is higher than that of talent inflow, with the exception of Shenzhen. This highlights Shenzhen's attractiveness and core position in the talent pool of the Guangdong-Hong Kong-Macao Greater Bay Area. There are few talent exchanges between Macao and other cities. Although Hong Kong ranks among the top 3 in the Bay Area, the talent exchanges with other cities in the Bay Area are much more minimal than those of Shenzhen and Guangzhou. The sharing of talent between the two special administrative regions and Guangdong province needs further strengthening.

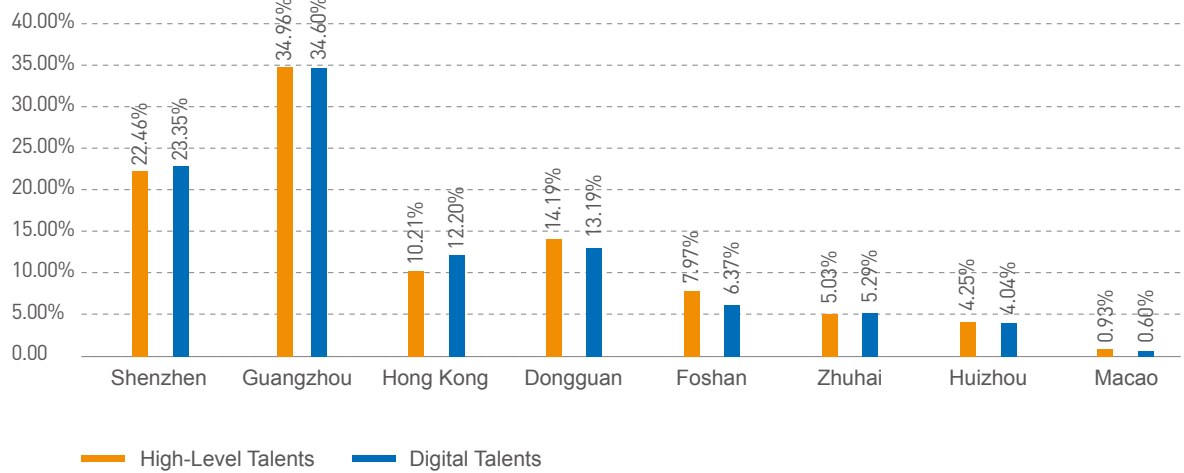


Figure 4.13 Proportion of Outflow of High-Level Talents to Digital Talents Migrating from Major Cities in the Guangdong-Hong Kong-Macao Greater Bay Area

4.3.3 Talent Inflow/Outflow Ratio in the Bay Area

As shown in Figure 4.14, we calculated the talent inflow/outflow ratio of cities in the Guangdong-Hong Kong-Macao Greater Bay Area. Among the major cities in the Bay Area, Shenzhen is the most attractive to high-level and digital talents, with the ratio of inflow/outflow reaching 1.79 and 1.92 respectively. Other cities have a net outflow of talents, with the talents from these cities being concentrated in Shenzhen. Guangzhou has the lowest inflow/outflow ratio for both high-level and digital talents, and the greatest level of brain drain. In contrast, there is less brain drain in Hong Kong, and an inflow/outflow ratio for high-level and digital talents is close to 1. This indicates that the links between Hong Kong and mainland cities need more strengthening. The proportion of brain drain for digital talents in cities is higher than that of high-level talents, which confirms Shenzhen's position as the digital economic center of the Guangdong-Hong Kong-Macao Greater Bay Area.

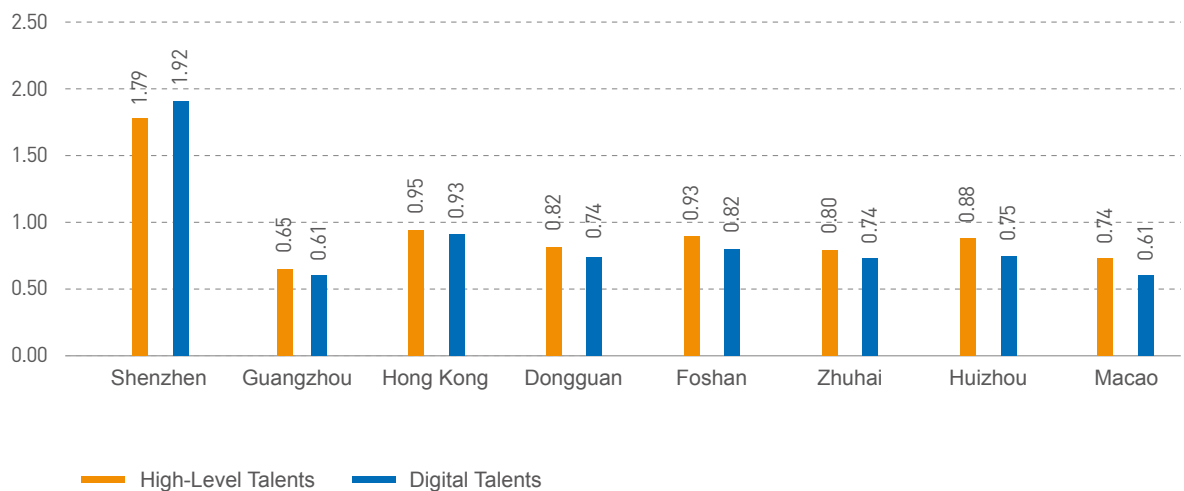


Figure 4.14 The Inflow/Outflow Ratio of High-Level Talents and Digital Talents in the Major Cities of the Guangdong-Hong Kong-Macao Greater Bay Area



05

ASSESSMENT OF the BAY AREA TALENT

To best depict the current situation and the potential of talents in the Guangdong-Hong Kong-Macao Greater Bay Area, we selected two representative international bay areas in the Asia-Pacific Region to analyze alongside it. The talent migration between the two bay areas' countries and the Guangdong-Hong Kong-Macao Greater Bay Area is in a state of net inflow and net outflow respectively, thus we can analyze talent situation across the bay areas and the Guangdong-Hong Kong-Macao Greater Bay Area objectively. The first is the San Francisco Bay Area, famous for Silicon Valley, a global leader in terms of innovative talents, which has a positive net inflow of talents from the United States to the Guangdong-Hong Kong-Macao Greater Bay Area. The second is Sydney Bay, which has a high level of industrial development and talent, especially in the tertiary and manufacturing sectors. The net talent inflow from Australia to the Guangdong-Hong Kong-Macao Greater Bay Area is negative. Finally, we chose Shenzhen, the Bay Area's most representative city, to participate in the analysis, in order to shed more light on the characteristics of digital talents in the Bay Area.

5.1 Reserve of Key Talents

In order to analyze the innovation and entrepreneurship strength of the selected bay areas, we extracted the proportion of entrepreneurs in these regions for analysis. As shown in Figure 5.1, entrepreneurs account for over 8% in all three major bays, but the Guangdong-Hong Kong-Macao Greater Bay Area has the lowest proportion, while the San Francisco Bay's is over 13%. Shenzhen, the most attractive and innovative city in the Bay Area, has a lower proportion of entrepreneurs at less than 8%, which implies that there are fewer digital entrepreneurs in the area.

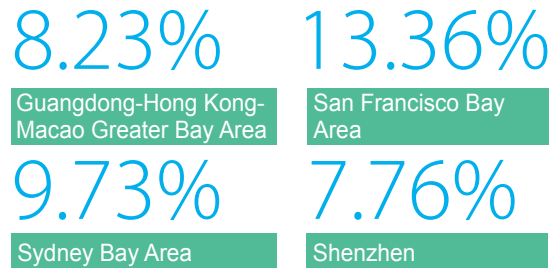


Figure 5.1 Proportion of Entrepreneurs in the Bay Areas

In order to analyze the three bay areas' scientific research capabilities, we divided scientific research talents into two categories: those who perform scientific research at universities and those who are engaged in R&D in enterprises. As shown in Figure 5.2, there is a relatively high proportion of R&D personnel of enterprises in all three bay areas. Sydney employs a fairly similar proportion of both types of scientific research personnel. By contrast, the Guangdong-Hong Kong-Macao Greater Bay Area's R&D personnel account for over 80% of the total, and while its enterprises show a strong capacity for innovation, the research capacity of its universities is weak. Shenzhen, as the core technology city of the Guangdong-Hong Kong-Macao Greater Bay Area, has over 90% R&D personnel. This highlights the Guangdong-Hong Kong-Macao Greater Bay Area's most prominent characteristics.

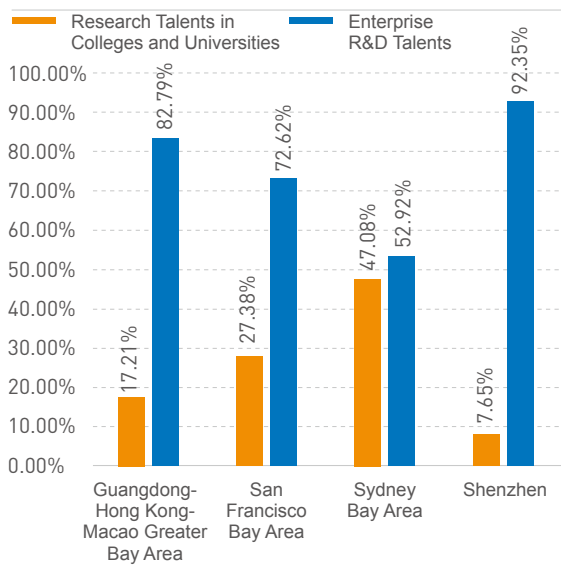


Figure 5.2 Proportion of Research Talents in the Bay Areas

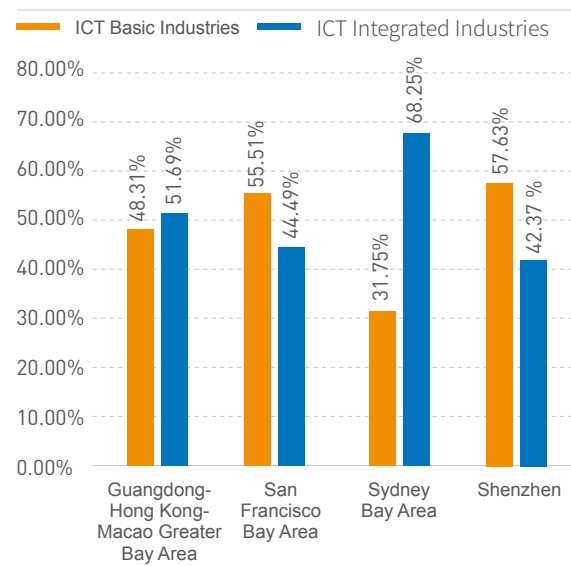


Figure 5.3 Proportion of Digital Talents in the Bay Areas

In order to assess digital economy orientation in the bay areas, we analyzed the industrial distribution of digital talents, dividing industries into ICT basic and integrated industries. As shown in Figure 5.3, each of the three major bays shows its own development characteristics. The San Francisco Bay is dominated by ICT basic industries, while Sydney Bay focuses more on developing ICT integrated industries. The Guangdong-Hong Kong-Macao Greater Bay Area shows balanced development across both industries, with basic and ICT integrated industries each occupying a relatively high proportion. As the Guangdong-Hong Kong-Macao Greater Bay Area's primary ICT city, Shenzhen's industrial development is similar to that of the San Francisco Bay Area. It mainly focuses on ICT basic industries and possesses scientific and technological strength supporting the digital integration of Bay Area industries.

5.2 Talent Characteristics

We analyzed the talent characteristics of the Guangdong-Hong Kong-Macao Greater Bay Area, the San Francisco Bay Area and the Sydney Bay Area according to 4 aspects: education background, age, work year and position grade.

Firstly, as shown in Figure 5.4, the proportion of undergraduate degree holders is highest among the talent groups in the three major bay areas. However, the Guangdong-Hong Kong-Macao Greater Bay Area shows an overall lower level of education than the San Francisco Bay and Sydney Bay areas, particularly in the case of doctoral degrees. Additionally, Shenzhen, as the core innovative city in the Guangdong-Hong Kong-Macao Greater Bay Area, accounts for over 70% of undergraduates and less than 2% of doctoral degree holders. The education qualifications of talents are lower than the average level in the Guangdong-Hong Kong-Macao Greater Bay Area, and require further strengthening.

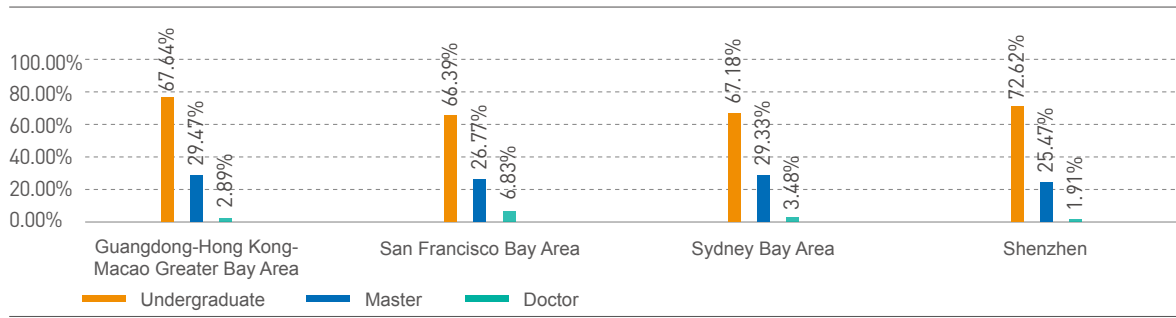


Figure 5.4 Distribution of Education Background of Talents in the Bay Areas

Secondly, as shown in Figure 5.5, the age distribution of talents in the three bay areas shows the highest proportion of talents between 25 and 34 years old, with a proportion of over 40% in the San Francisco Bay Area. This shows that talents in this age group are central force in the Bay Areas' development. The Guangdong-Hong Kong-Macao Greater Bay Area has a lower proportion of talents over 35 years of age than San Francisco Bay and Sydney, with the highest proportion between 25 and 34 years of age, approaching 60%. This younger talent pool has its own unique characteristics. The proportion of talents aged 25-34 in Shenzhen is close to 70%, which shows that the Guangdong-Hong Kong-Macao Greater Bay Area has a strong talent force that is highly motivated.

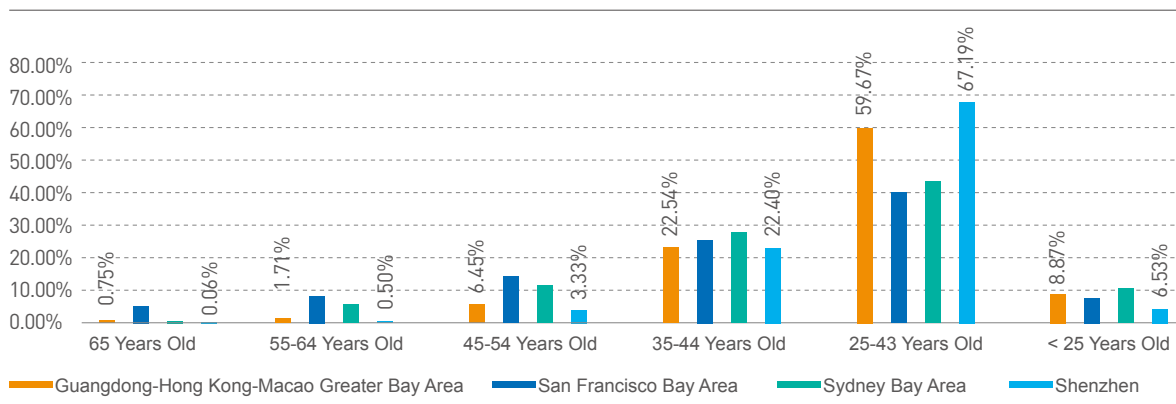


Figure 5.5 Talent Age Distribution of in the Bay Areas

Thirdly, as shown in Figure 5.6, in terms of the work year of talents, the proportion of those who have worked for more than 5 years is high, being over 70% in all three bay areas and over 80% in the San Francisco Bay area. The proportion in the Guangdong-Hong Kong-Macao Greater Bay Area is slightly lower, although it does have the highest proportion of talents who have worked for 3-5 years and 1-3 years. The proportion of talents who have worked for less than 1 year is similar to that of the San Francisco Bay Area and lower than that of the Sydney Bay Area. This shows that the talent team in the Guangdong-Hong Kong-Macao Greater Bay Area is young and full of vitality, but not "too young", since there is a low proportion of new recruits. The characteristics of talents in Shenzhen are consistent with those of the Guangdong-Hong Kong-Macao Greater Bay Area. The proportion of talents who have worked for 3-5 years is very high, but the proportion of talents who have worked for less than 1 year is lower than that of the San Francisco Bay Area.

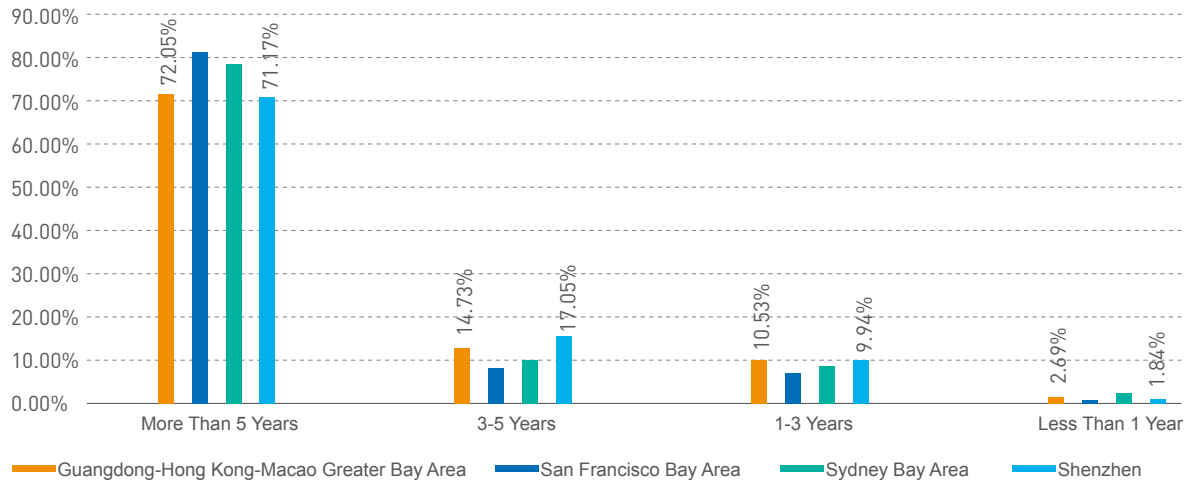


Figure 5.6 Distribution of Work year Among Talents in the Bay Areas

As shown in Figure 5.7, in terms of position grade distribution, the proportion of talents in junior positions is highest in all three major bay areas, with all approaching or surpassing 40%. In contrast with the San Francisco Bay Area and the Sydney Bay Area, the Guangdong-Hong Kong-Macao Bay Area has a relatively low number of talents working as directors and above and in senior professional positions, and a relatively high proportion of talents in manager and junior positions. This indicates that the talent structure of the Guangdong-Hong Kong-Macao Greater Bay Area needs further optimization, particularly for senior and professional positions. In Shenzhen, the proportion of talents holding director and senior professional positions is lower than that of the Guangdong-Hong Kong-Macao Greater Bay Area as a whole, and needs further improvement.

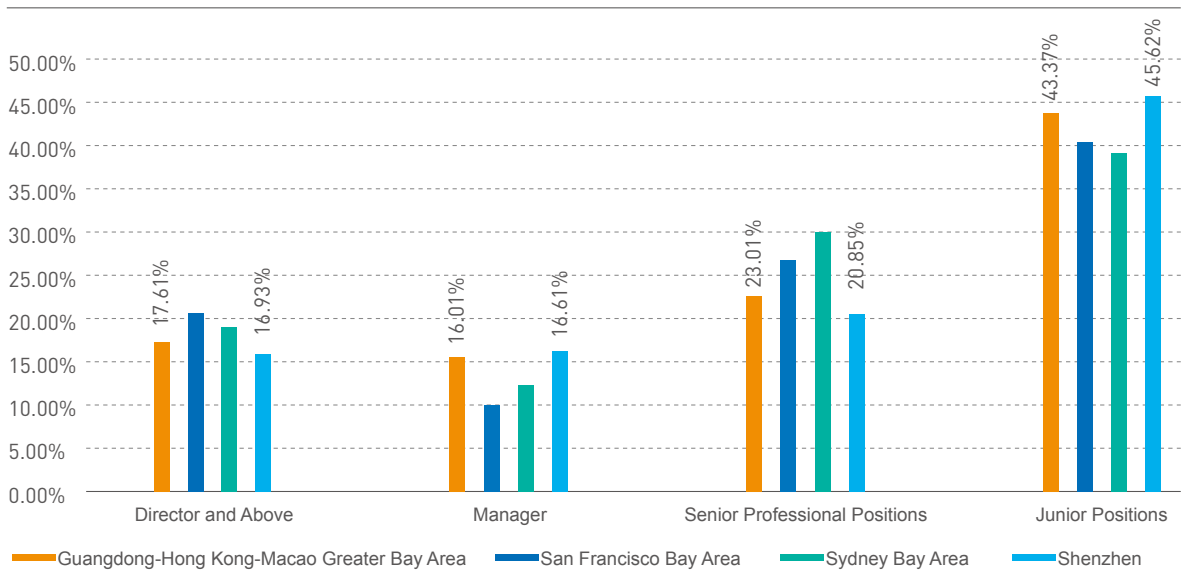


Figure 5.7 Distribution of Talent Position Grades in the Bay Areas

5.3 International Connectivity of Talents

By analyzing the migration of talents between the three bay areas and international regions, we uncovered the international connections of talents in the three bay areas. We found that both developed and developing countries have frequent contact with San Francisco Bay Area and Sydney Bay Area talents. Among them, the top 5 talent sources and destinations for the San Francisco Bay Area include developed countries such as UK and Canada, as well as developing countries such as India and China. Developing countries rank very high, reflecting the San Francisco Bay Area's strong international influence. The situation in Sydney is very similar, with the proportion of talents from developing countries, such as India, being very high.

The Guangdong-Hong Kong-Macao Greater Bay Area shows a different situation. The ranking and proportion of talents from developing countries has decreased significantly, which is most obvious in Shenzhen. However, the proportion of talents from the United States is close to 70%, which shows that Guangdong-Hong Kong-Macao Greater Bay Area is highly dependent on talents from developed countries, but less attractive to talents from developing countries. International influence within the country need to be further developed. The Bay Area is an important node of the "Belt and Road" Initiative. However, the attractiveness to talents on the "21st-Century Maritime Silk Road" needs to be strengthened. Only India ranks fifth among talent sources.

Last but not least, it is worth noting that China has frequent talent exchanges with both the San Francisco Bay Area and the Sydney Bay Area. China is the fourth most important talent destination and source in the San Francisco Bay Area. Additionally, the number of talents migrating to China is higher than the number of talents coming from China, which reflects China's attractiveness to talents from the San Francisco Bay Area. This suggests that China (including the Guangdong-Hong Kong-Macao Greater Bay Area) is gradually increasing its global influence.

Table 5.1 Inflow of International Talents in the Bay Areas (including Taiwan)

Ranking	San Francisco		Sydneyaa		Guangdong-Hong Kong-Macao		Shenzhen	
	1	India	25.65%	UK	16.86%	The United States	20.83%	The United States
2	Canada	7.41%	India	16.32%	UK	15.26%	UK	9.39%
3	UK	7.19%	The United States	9.12%	Australia	6.79%	France	8.76%
4	China	5.65%	China	3.91%	Singapore	6.47%	Australia	8.65%
5	France	3.87%	Singapore	3.84%	India	5.05%	Germany	6.46%

Table 5.2 Outflow of International Talents in the Bay Areas (including Taiwan)

Ranking	San Francisco		Sydneyaa		Guangdong-Hong Kong-Macao		Shenzhen	
	1	India	19.71%	UK	21.31%	The United States	20.89%	The United States
2	UK	7.90%	The United States	14.45%	UK	13.47%	Australia	14.10%
3	Canada	7.19%	New Zealand	5.85%	Australia	8.20%	France	7.84%
4	China	6.21%	India	5.33%	Singapore	7.82%	Germany	6.58%
5	France	4.69%	Singapore	4.38%	Canada	5.35%	Taiwan	4.75%

06

SUMMARY AND SUGGESTIONS

The Guangdong-Hong Kong-Macao Greater Bay Area is a strategic region of national reform and opening up, and it has made remarkable achievements over the course of 40 years' development. With the growing trend of industrialization and informatization, the digital economy has become an important part of GDP in the Guangdong-Hong Kong-Macao Greater Bay Area. Accelerating the digital economy's development is an important strategy for realizing the economic transformation of the Bay Area.

The rapid development of the digital economy depends on a solid team of digital talents. Focusing on the theme of talent insights, based on national statistical data and LinkedIn China's big data talent samples, this study analyzed current talent development in the Guangdong-Hong Kong-Macao Greater Bay Area, and the characteristics of industrial digital transformation in the Bay Area from the perspective of digital talents. To give a holistic overview of the talent pool, this study covered many aspects: regional distribution, industry distribution, education background, skill characteristics, position grades and others and focused on the leading industries of talents in each city. This study further analyzed the talent migration situation in the Guangdong-Hong Kong-Macao Greater Bay Area from 3 dimensions: international (including Taiwan), domestic and internal. Additionally, this study further clarified the positioning, talent characteristics and advantages of the Guangdong-Hong Kong-Macao Greater Bay Area at an international level by comparing the talent situation between the Guangdong-Hong Kong-Macao Greater Bay Area and the two famous international bay areas.

Current Talent Situation

The labor force distribution in Guangdong-Hong Kong-Macao Greater Bay Area ("Bay Area") is more strongly concentrated to the east of the Pearl River, with Shenzhen, Hong Kong and Guangzhou as the three core cities. When it comes to the changes in the labor force from 2016-2017, it can be seen that the eastern cities of the Bay Area are more attractive to talents, while the western cities, with the exception of Zhuhai, are losing their labor force. These findings suggest that the Guangdong-Hong Kong-Macao Greater Bay Area's labor force is more strongly concentrated to east from west. In terms of industry distribution, the top 5 industries in the Guangdong-Hong Kong-Macao Greater Bay Area are manufacturing, wholesale and retail, construction, transportation, warehousing, post and education. The Bay Area has clear advantages in manufacturing, transportation and logistics, real estate, business services, information transmission, software and information services when contrasted with the national situation.

The proportion of high-level talents in Shenzhen, Guangzhou and Hong Kong is collectively nearly 80%, with Shenzhen possessing the highest proportion at nearly 30%. Major industries can be divided into 4 echelons according to talent advantages. Manufacturing, consumer goods and ICT are the Guangdong–Hong Kong–Macao Greater Bay Area's first-echelon industries, while financial and business services represent the second. The third echelon industries include tourism and vacation, retail, transportation and logistics, education, media and communication and non-profit. The fourth echelon includes construction, real estate, healthcare, entertainment, design, energy and minerals, laws and health protection. Unlike high-level talents, the industry distribution of digital talents is generally consistent in ranking, but the proportion of digital talents in ICT industries is close to 40%, far higher than the proportion of high-level talents in ICT industries. This concentration has resulted in a significantly higher digitization in ICT industries versus other industries. This reflects the high-level of basic digital economic development in the Guangdong–Hong Kong–Macao Greater Bay Area, and the domination of the manufacturing industry in the integrated digital economy.

The Guangdong–Hong Kong–Macao Greater Bay Area shows a strong education background, with the highest proportion of graduates from domestic universities (excluding the Guangdong–Hong Kong–Macao Greater Bay Area) at over 40%. The top 10 universities in graduate institution rankings are located all over the country, and are not limited by geographical distance. Over 25% of the talents have an international (including Taiwan) education background, and the top 10 international (including Taiwan) universities are all well-known universities, most of which are UK. Over 30% of talents graduated from universities in the Guangdong–Hong Kong–Macao Greater Bay Area, and the top 6 universities are well-known universities in Hong Kong. The education degree distribution of talents is relatively balanced. The proportion of talents with a graduate degree and above is more than 30%, but the number of doctoral degree holders is relatively small. The position grade distribution is dominated by junior positions, which account for over 40%. Digital talents are more widely distributed in junior positions, accounting for nearly 50%. Skills are dominated by commonly used skills, such as soft power skills. The application of digital skills in basic industries is still at an early stage. Digital skills rank higher in manufacturing and financial industries.

When the current situation of high-level and digital talents is examined, it can be seen that the digital transformation level of industries in the Guangdong–Hong Kong–Macao Greater Bay Area is relatively high. The development of ICT basic industries is very high, with manufacturing being the main industry in ICT integrated industries. The distribution of digital talents is relatively centralized in ICT basic industries. Digital talents in the basic industries are difficult to meet the need for transformation. The application level of digital skills is low, their popularization is not high enough.

Analysis of Advantages and Disadvantages of Talents in Core Cities

Regardless of high-level talents and digital talents, the development of each city in the Guangdong–Hong Kong–Macao Greater Bay Area shows particular characteristics. To take high-level talents as an example, while Guangzhou does not have the highest number of talents, its talent distribution is the most balanced across various industries. Shenzhen has the leading talent advantage in ICT industries, Zhuhai has obvious advantages in the manufacturing, tourism and vacation industries, Dongguan, Foshan and Huizhou all have talent advantages in the manufacturing and consumer goods industries, and cities in Guangdong province have the advantage of talent. Hong Kong has a very high concentration of talents involved in financial, education and business services industries, while Macao has advantages in the education, tourism and vacation industries. It is not difficult to see that the major cities in the Guangdong–Hong Kong–Macao Greater Bay Area each have their own advantages, which could lead to the formation of a complementary relationships. In particular, Hong Kong's strong financial and education industries could compensate for the shortcomings of cities in Guangdong province.

Talents and Skill Demands

The fastest-growing positions in the Guangdong–Hong Kong–Macao Greater Bay Area cover a wide range of fields, including investment managers, marketing directors, business development directors, office assistants and legal advisers. Most of them belong to intermediate and senior positions, which indicates that the industrial development in the Guangdong–Hong Kong–Macao Greater Bay Area is becoming more diversified, specialized and mature. In the field of digital talents, the demand for digital positions like digital marketing managers has increased significantly, reflecting the penetration of digital technology into basic industries. It

is worth noting that the demand for research talents, such as postdoctoral researchers and data scientists, has increased significantly in the Guangdong-Hong Kong-Macao Greater Bay Area. This shows that the Bay Area attaches great importance to research and development. The Guangdong-Hong Kong-Macao Greater Bay Area has significant characteristics when it comes to the fastest-growing skills, which are mainly reflected in two aspects. First of all, the Guangdong-Hong Kong-Macao Greater Bay Area has a higher demand for communication skills. Secondly, there is an obvious growth of digital skills. These two skill types play a crucial role in the development of the Bay Area.

Talent Migration

The Guangdong-Hong Kong-Macao Greater Bay Area is in a net inflow of high-level and digital talents. In terms of talent sources, the international regions (including Taiwan) with the most frequent talent exchanges with the Guangdong-Hong Kong-Macao Greater Bay Area are the United States and the UK, while the domestic regions are Beijing and Shanghai. Hong Kong and Macao are the two major sources of international talent inflow and Guangzhou and Shenzhen are the two major sources of domestic talent inflow, while Zhuhai, Dongguan, Foshan and Huizhou are the major sources of internal talent inflow in the Guangdong-Hong Kong-Macao Greater Bay Area.

Shenzhen has the highest net inflow of talents and the strongest attractiveness to talents among the cities of the Guangdong-Hong Kong-Macao Greater Bay Area, especially within the Bay Area, the main gathering center for talents. Guangzhou is attractive to international high-level talents, but less attractive to digital talents. Dongguan, Foshan and Hong Kong have attracted a large number of high-level talents and digital talents from international regions, but they are less attractive to domestic talents. Zhuhai and Macao, on the contrary, are losing both high-level and digital talents to other regions of the world, but they retain a certain attractiveness to domestic digital talents. According to the quantity of talent migration within the Bay Area, Guangzhou and Shenzhen have the largest talent migration and the closest contact with other cities. However, Guangzhou has less talent inflow and more talent outflow than Shenzhen, which indicates the different status of the two cities in the internal talent migration in the Guangdong-Hong Kong-Macao Greater Bay Area.

The Guangdong-Hong Kong-Macao Greater Bay Area leads in attractiveness to digital talents when contrasted with other domestic digital economic centers like Beijing and Wuhan. These two big cities are also the main sources of digital talents in the Guangdong-Hong Kong-Macao Greater Bay Area. Compared with Shanghai and Chengdu, the number of digital talents migrating from the two big cities into the Guangdong-Hong Kong-Macao Greater Bay Area is nearly equal to the migration from the Bay Area to the two big cities, indicating that their attractiveness is close to that of the Guangdong-Hong Kong-Macao Greater Bay Area. The net inflow of talents from Hangzhou to the Guangdong-Hong Kong-Macao Greater Bay Area is negative, and over 60% of the high-level talents migrating from the Bay Area to Hangzhou are digital talents.

Bay Area Assessment

The Guangdong-Hong Kong-Macao Greater Bay Area has a smaller proportion of talents who have worked for more than 5 years than either the San Francisco Bay Area or the Sydney Bay Area. However, it possesses the largest proportion of talents who have worked for 1-5 years. The Guangdong-Hong Kong-Macao Greater Bay Area also has the highest proportion of young talents aged 25-34, which reflects its development ability and potential. Additionally, the Guangdong-Hong Kong-Macao Greater Bay Area attaches great importance to the ICT basic industries and ICT integrated industries, with a focus on their balanced development. Shenzhen's development model is similar to that of the San Francisco Bay Area, in which ICT basic industries are the main industry.

However, there are some shortcomings in the talents of the Guangdong-Hong Kong-Macao Greater Bay Area. Firstly, the proportion of entrepreneurs is relatively low, especially in Shenzhen, which is the core innovation city of the Guangdong-Hong Kong-Macao Greater Bay Area. There are also fewer talents in senior positions in the Bay Area. Secondly, the education level among talents in the Guangdong-Hong Kong-Macao Greater Bay Area is relatively low, especially the proportion of doctoral degrees. The proportion of university researchers is therefore correspondingly low. Thirdly, the Bay Area has a relatively low number of talents associating with other countries, especially developing countries. It has a relatively low attractiveness to talents from developing countries, but a fairly high degree of dependence on talents from developed countries.



Tsinghua SEM Center for Internet Development and Governance

Tsinghua SEM Center for Internet Development and Governance (CIDG), founded in April 2016, was established by School of Economics and Management, Tsinghua University in response to the National Strategy of Reinvigorating China through Network on the basis of the college in the research on Internet economy and management, talent training advantage, and international influence. Committed to leading the digital transformation of China's economy by thought, the center integrates the global resources of top-level experts, makes full use of cutting-edge technologies including Internet, big data, etc., carries out research work focusing on the fields of digital economy, business innovation in the era of global interconnection, digital transformation of Chinese economy, Internet governance, etc., provides objective reference suggestions for improving the scientific decision-making level of government and boosting technology and business innovation and the development of public service, and also constructs the platform for cooperation for promoting the development of digital economy and industrial innovation.

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LinkedIn's vision is to create economic opportunities for every member of the global workforce, and create the world's first Economic Graph. The LinkedIn Economic Graph is a digital representation of the global economy based on 50k skills, 30 million employers, more than 20 million open jobs, 90k educational institutions and 19 billion dynamic pageviews. With this data, LinkedIn can analyze and predict economic trends, such as cross-regional talent migration and skills gap analysis. These insights will help every member of the global workforce, as well as global policy makers and educational and training institutions, and better connect people to economic opportunity.

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