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The Most Innovative City in China: Shenzhen's Model for Innovation- Based Economic Growth

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Shenzhen, reputed as China's technology capital and a global manufacturing powerhouse, has undergone an astonishing transformation from a small fishing village into an international hub of innovation in a mere 45 years. Home to global giants like Huawei, Tencent, BYD, Dajiang-Innovation and BGI Genomics, the city also nurtures a thriving ecosystem of startups in emerging fields such as biotechnology, artificial intelligence (AI), hydrogen energy and the low-altitude economy. Shenzhen stands as a testament to the wonders of urban development and represents a typical example in global technological innovation and industrial progress.

Diversified development infuses the city's industries with vitality. Shenzhen's urban growth initially hinged on a cluster of open industrial parks that attracted manufacturers from Japan, Hong Kong, Taiwan and elsewhere. However, the city did not rest on its manufacturing successes. Amidst the sweeping global trends of industrial relocation and innovation, Shenzhen has persistently fostered new industries and tapped into the intrinsic momentum driving urban industrial advancement. For instance, Shenzhen's pillar industries have evolved from outsourced processing and export-oriented manufacturing, and logistics supply chains to high-tech and strategic emerging industries.

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Today, Shenzhen is even more proactive in cultivating industries of the future, such as quantum computing and graphene. Furthermore, the city's industrial development places a strong emphasis on the seamless integration of both new and traditional growth drivers. Building on the foundations of traditional industries like bicycles, gold jewellery, women's fashion and shoes, Shenzhen's industries continue to evolve and transform. For instance, the bicycle industry has experienced a transition from traditional bikes to electric bikes, while industries like clothing and footwear are swiftly pivoting towards the fashion sphere, gradually spanning the entire spectrum from manufacturing and branding to fashion shows and modelling agencies. Particularly in the manufacturing realm, driven by the need for industrial automation, many Shenzhen companies have stepped up their digital transformation efforts, speeding the construction of fully automated and digital factories, especially in the face of labour shortages due to the pandemic.

Green power drives sustainable development. During its industrialisation process, Shenzhen faced the challenge of environmental degradation. Early on, the city recognised that developing eco-friendly industries was crucial for sustainable urban development. 20 years ago, Shenzhen began to aggressively promote the development of green economies and industries, such as the circular economy and new energy batteries. One of the most iconic examples of Shenzhen's commitment to sustainable and green development is its public transportation system's conversion to green energy. Shenzhen has become the world's first city where all taxis and buses are powered by new energy vehicles. This successful transformation has been a driving force behind the growth of the new energy vehicle industry and companies like BYD.

An inclusive and open innovation environment attracts global talent. Shenzhen is a city of immigrants, a city that embraces innovation and accepts failure. Here, no one considers failure to be shameful or embarrassing; perhaps most entrepreneurs and startups have experienced failure. It is this very atmosphere that draws individuals who have faced

setbacks in their pursuits elsewhere in China and are eager for greater challenges, as well as a diverse range of international talent.

A market mechanism committed to supporting the growth of private enterprises. Throughout the development of Shenzhen, numerous state-owned enterprises hailing from cities such as Beijing and Guangzhou played a role. However, with the progression of the city and its industries, these state-owned enterprises now account for a diminishing share in the city's economic landscape. A multitude of private enterprises has flourished. In Shenzhen, private enterprises have achieved remarkable statistics in six '90%' categories: 1) more than 90% of innovation-oriented companies are private; 2) over 90% of R&D institutions are set up within private enterprises; 3) over 90% of R&D personnel are employed by private enterprises; 4) over 90% of R&D funding is provided by private enterprises; 5) over 90% of utility model and design patents come from private enterprises; and 6) over 90% of major scientific and technological project patents originate from private enterprises.

A service-oriented government that is more closely aligned with the growth of the industry. The government of Shenzhen is committed to serving industry and innovation. Instead of placing emphasis on so-called government subsidies, the Shenzhen government focuses on creating a level playing field for innovation and establishing a policy framework that is conducive to technological advancements and the adoption of new products. Shenzhen consistently amends relevant laws and regulations to cater to the demands of emerging industries and the application of new technologies. The city leverages its urban context to nurture innovative businesses. For instance, it offers access to real-world scenarios within its subway and bus systems, allowing companies to develop and refine unmanned driving and AI technologies.

It is fair to say that Shenzhen is both the 'most global' and the 'most Chinese' city. Its 'most global' aspect is reflected in its respect for the market, enterprises and talent, which is common among other world-class international cities. However, Shenzhen is also 'most Chinese' in its boldness to open up urban scenarios, continually pushing the boundaries

of existing policies and regulations, and adapting to the rise of new technologies, products and industries. It is this very spirit of openness and Chinese characteristics that has made Shenzhen a hub of scientific discovery and technological innovation.

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1 Introduction

Shenzhen, as a vital hub of innovation in China, serves as a mirror reflecting China's innovation landscape to a considerable extent. Innovation has propelled the city's continual upward trajectory. Meanwhile, Shenzhen is at the forefront of innovation in various domains across China. Over the span of 40 years, Shenzhen has transformed from an obscure agricultural county on the border into a bustling economic centre in China and a global hub for technological innovation, creating a miracle in world development history. The experiences and practices of Shenzhen have, in many instances, become integral components of the "China model" and "China's experience." Overall, the success of Shenzhen can be largely attributed to its respect for the market and enterprises, and commitment to fostering innovation.

2 China's innovation and innovative Shenzhen

More than 40 years ago, Shenzhen was nothing more than a remote fishing village adjacent to Hong Kong (Xu, 2022). Its transformation began with the establishment of the Shenzhen Shekou Industrial Zone, gradually evolving into a city known for its technology, manufacturing and innovation. Shenzhen's local GDP has surged from just RMB 1.97 billion (equivalent of USD 1.32 billion as at December 31, 1979) in 1979 to a staggering RMB 3.46 trillion (equivalent of USD 488.5 billion as at December 31, 2023) by 2023 (Wang & Liu, 2024) – a growth of nearly 17,500 times. Shenzhen, reputed as China's technology capital and a global manufacturing powerhouse, has undergone an astonishing transformation from a small fishing village to an international hub of innovation in a mere 45 years. Home to global giants like Huawei, Tencent, BYD, Dajiang-Innovation (DJI), BGI Genomics, China International Marine Containers (CIMC), China Merchants Group (CMG) and Ping An Insurance, the city also nurtures a thriving ecosystem of startups in areas such as electronics, biotechnology, artificial intelligence, hydrogen energy and the low-altitude economy. Shenzhen stands as a testament to the wonders of urban development and represents a typical example in global sci-tech innovation and industrial progress.

2.1 Innovation in China results from the collective efforts of cities engaging in independent exploration

The country's industrial innovation is driven from the bottom up, with cities taking the lead in implementing innovation strategies. In recent years, Chinese cities have displayed numerous achievements in economic growth and innovation-driven development, particularly in enhancing the *quality* of development. Among them, Shenzhen can be regarded as the 'pacesetter' of innovation in China. In its early stages of development, Shenzhen

faced scepticism. During the establishment of the Shekou Industrial Zone, to gain recognition from the central government for its innovative model, Shenzhen strategically placed billboards along Deng Xiaoping's inspection route in 1992, bearing slogans like 'Time is Money, Efficiency is Life.'⁴⁹ This move aimed to secure support and approval from the central government for Shenzhen's development and reform model. Currently, as China's economic special zone and technology hub, Shenzhen not only fuels regional growth as a pivotal driver of national economic expansion but also mirrors the country's sci-tech innovation and economic development on a national scale. It plays a significant role in both showcasing and leading China's progress.

2.2 Shenzhen's accomplishments are the result of the innovation of countless enterprises

Since the reform and opening up, China has pursued innovation through two primary avenues. One is through reliance on research institutes and universities, where the government sets the agenda and drives progress through annual science and technology initiatives. The other is exemplified by Shenzhen. Without national-level research institutions or renowned universities, innovation in Shenzhen relies mainly on enterprises, which conduct independent research aligned with market demands. Enterprises, especially private ones, are key contributors to Shenzhen's development. From DJI's drones to BYD's new energy vehicles and BGI's genetic testing services, they have all emerged from initial scepticism to become industry leaders. Today, Shenzhen has entered a stage of urban development primarily driven by innovation. In 2023, the added value of strategic emerging industries in Shenzhen accounted for 41.9% of GDP, while the added value of modern services comprised 76.3% of the total added value of services (Wang & Liu, 2024).

⁴⁹ Original slogan in Chinese: 时间就是金钱, 效率就是生命.

Picture 1. A fishing village in Shenzhen in the early 1980s
(archive photo)



Source: Xu (2022)

3 Diversified development infuses the city's industries with vitality

The vitality of Shenzhen as a city stems from its diverse industries, while its sustainable innovation owes greatly to the continual evolution of its industrial ecosystem and the ongoing expansion of its industrial value chains. While the industrial economy rapidly developed, Shenzhen did not confine itself to single-track development such as export processing and traditional manufacturing. Instead, it has actively bolstered its capabilities in scientific research and development, gradually establishing a diverse landscape of sci-tech innovation clusters. Amidst the global shifts in industrial trends and innovation, Shenzhen continues to nurture new industries, constantly tapping into the intrinsic dynamics of urban industrial development. From being home to China's first national-level science and technology park in the 1980s to the high-tech industrial development zone in the 1990s, followed by

events like the China Hi-Tech Fair (CHTF), and the establishment of institutions such as the Research Institute of Tsinghua University in Shenzhen (RITS) and the PKU-HKUST Shenzhen-Hong Kong Institution in the early 21st century, Shenzhen has closely followed global trends in industries such as electronics and information technology. It has transitioned from the basic processing model of “shop at the front, factory at the back”⁵⁰ to the high-tech driven model of “industry setting the agenda, and research answering questions.”⁵¹ Shenzhen’s pillar industries have evolved from outsourced processing and export-oriented manufacturing to high-tech and strategic emerging industries. Today, Shenzhen is expediting the cultivation of future industries such as quantum computing, brain science and brain-like intelligence.

3.1 From processing trade to traditional advantageous manufacturing

Leveraging its advantage in opening up, Shenzhen initially undertook the transfer of mid-to-low-end industries from Hong Kong, Taiwan, Japan, South Korea and others, in developing its processing trade. Shenzhen’s industrial journey began in the Shekou Industrial Zone, with the establishment and operation of the first Sino–foreign joint venture, Zhonghong Industrial Gas, followed by the influx of foreign enterprises such as Sanyo Electric, Kader Toys and Guangdong Float Glass (nowadays: CSG Holding Co., Ltd.). With its advantages in cheap labour and location, by the end of 1991, Shenzhen had attracted over 7,000 companies operating in the outsourced processing and export-oriented manufacturing sector (Duan, 2024). By 1998, Shenzhen had established a complete industrial system, particularly laying a solid foundation for subsequent industrial innovation in electronic information manufacturing. Thereafter, Shenzhen gradually expanded its

⁵⁰ In Chinese: 前店后厂

⁵¹ In Chinese: 产业出题、科研答题

business from initial raw material processing to upstream and downstream industries such as R&D, design, marketing and services, forming eight traditional advantageous industries: underwear; watches; clothing; jewellery; leather goods; eyewear; furniture; and industrial design. Taking the design industry as an example, Shenzhen now hosts over 38,000 creative design enterprises and has established 72 cultural and creative industry parks such as OCT Loft Creative Culture Park and Shenzhen Design Industrial Park. In 2023, the revenue of Shenzhen's creative design industry exceeded RMB 1 trillion (Liu et al., 2024).

3.2 From traditional manufacturing to high-tech manufacturing

Around 1999, Shenzhen began its gradual shift towards developing high-tech industries. In October 1999, Shenzhen hosted its inaugural CHTF. It was during this event that the founder of Tencent secured the first external venture capital investment – USD 2.2 million from IDG Capital and Pacific Century Cyber Works. The CHTF marked the commencement of Shenzhen's evolution into a technology hub, initiating a comprehensive transformation of the city's development model through the cultivation of high-tech industries. By 2000, Shenzhen had identified a total of 212 high-tech enterprises, with the annual output value of high-tech products reaching RMB 106.4 billion. The output value of high-tech products with independent intellectual property rights amounted to RMB 53.2 billion, representing 50.0% of the total output value of high-tech products (Shenzhen Municipal Bureau of Statistics, 2008). Shifting from outsourced manufacturing to independent innovation, the high-tech industry solidified its position as the primary driver of urban economic growth.

3.3 From high-tech manufacturing to sci-tech innovation

After the 2008 global financial crisis, Shenzhen began strategising the development of strategic emerging industries.

In 2009, Shenzhen took the lead nationwide in planning the development of industries such as biotechnology, new energy and the internet. Subsequently, from 2011 onward, it rolled out plans to revitalise and develop four major strategic emerging industries: new materials, cultural and creative industry, next-generation information technology, and energy conservation and environmental protection. Seeking to secure a foothold in future technological competition, Shenzhen proposed the development of five future industries: marine; aerospace; life sciences and health; defence industry and robotics; wearable devices and smart equipment from 2013 onwards. By 2017, the added value of Shenzhen's emerging industries totalled RMB 918.355 billion (equivalent of USD 141.15 billion as at December 31, 2017), accounting for 40.9% of GDP, up from around 30% in 2012 (Zheng, 2020). During this period, Huawei and Tencent experienced rapid growth and gradually became Fortune Global 500 companies. Huawei became the earliest Chinese private technology firm to enter the Fortune Global 500 in 2010, ranking 397th at the time (ranked 111th in 2023). Tencent entered the Global 500 in 2018, ranking 478th that year (ranked 147th in 2023). Drone manufacturer DJI began rapid development in 2012 and became the world's largest drone manufacturer in just a few years.

3.4 From business clustering to cluster-based innovation

As industries continue to expand, Shenzhen's industrial landscape has transitioned towards a cluster-based development model, fostering greater depth and breadth along the supply chain. In recent years, Shenzhen has remained committed to industrialisation and bolstering its manufacturing sector, proposing the '20+8' industrial cluster initiative in 2022. By 2023, Shenzhen boasted 24,700 national-level high-tech enterprises (Chen & Zeng, 2024), with over 60% of the value-added in large-scale industries coming from advanced and high-tech manufacturing. Emerging sectors like network communication, integrated circuits, high-end equipment manufacturing, new materials and biopharmaceuticals accounted

for 41.9% of GDP (Shenzhen Municipal Bureau of Statistics, 2024). Shenzhen aims to position itself at the forefront of global technology and industrial development by strategically planning the growth of strategic emerging industries and future sectors, refining the 8 strategic emerging industries into 20 distinct clusters (Industry and Information Technology Bureau of Shenzhen Municipality, 2024). Enterprises and industrial clusters grounded in sci-tech innovation have flourished in Shenzhen, emerging as the city’s new economic pillar.

Table 1. Clusters of strategic emerging industries and future industries in Shenzhen

Seven Clusters of Strategic Emerging Industries	Next-generation Electronic Information (Network and Communication; Semiconductor and Integrated Circuits; Ultra-high-definition Video Display; etc.)
	Digital Fashion (Software and Information Services; Artificial Intelligence; Digital Creativity; Modern Fashion)
	High-end Equipment (High-end Equipment and Instruments; Low-altitude Economy and Aerospace; Robotics)
	Green and Low-carbon Industry (New Energy; Safety, Energy Conservation and Environmental Protection; Intelligent and Connected Vehicles)
	New Materials (High-performance Materials)
	Biopharmaceuticals and Health (Biopharmaceuticals; High-end Medical Devices; etc.)
	Marine Economy
Eight Major Future Industries	Synthetic Biology
	Optoelectronic Information
	Intelligent Robotics
	Cell and Gene
	Brain Science and Brain-machine Engineering
	Deep Earth and Deep Sea
	Quantum Information
	Advanced New Materials

Source: Industry and Information Technology Bureau of Shenzhen Municipality (2024)

4 Green power drives sustainable development

Green and low-carbon innovation is a pivotal domain within the ongoing wave of technological revolution and industrial transformation. Advancing towards a new industrial era necessitates a comprehensive drive towards green industrial development, and fostering a resource-efficient and environmentally friendly production framework. During its industrialisation process, Shenzhen has also faced the challenge of environmental degradation. Early on, the city recognised that developing eco-friendly industries was crucial for sustainable urban development. 20 years ago, Shenzhen began to aggressively promote the development of green economies and industries, such as the circular economy and new energy batteries, positioning the green development of industries as the primary path for Shenzhen's development.

Early on, Shenzhen adopted a clear stance: "Heavily polluting projects are generally not welcomed, while projects with high technological sophistication and minimal or no pollution are encouraged" (Xiao, 2022). Measures such as the publication of a "list of environmentally restricted development projects" on a regular basis and the establishment of the "basic ecological control line" (Xiao, 2022), covering half of the city's area, ingrained the essence of industrial greening into Shenzhen's urban fabric. In recent years, Shenzhen has ramped up efforts in industrial energy conservation, intensified comprehensive resource utilisation, and strengthened initiatives to cultivate safe, energy-efficient and eco-friendly industrial clusters. Shenzhen has elevated the level of green development, promoting industrial carbon peaking with multiple measures. By 2022, Shenzhen had already achieved an energy consumption per unit of GDP below 0.16 tons of standard coal per RMB 10,000 (equivalent of USD 1435.83 as at December 31, 2022), and carbon emissions per unit of GDP below 0.2 tons of

carbon dioxide per RMB 10,000 (equivalent of USD 1435.83 as at December 31, 2022), which is one third and one fifth of the Chinese average, respectively (Zou & Shen, 2023).

4.1 Promoting green energy utilisation

Shenzhen's proactive pursuit of green energy utilisation is exemplified in its transformation of public transportation. Shenzhen stands as the world's first city with an entire fleet of taxis and buses comprising new energy vehicles. This successful transition to green energy sources has not only propelled the growth of Shenzhen's new energy vehicle industry but has also bolstered the development of companies like BYD. By 2024, the penetration rate of new energy electric vehicles in Shenzhen soared to an impressive 67.9% (Dou, 2024). Driven by the city's green development strategy and a plethora of green application scenarios, Shenzhen's new energy vehicle industry has experienced exponential growth, with the industrial chain ecosystem gradually taking shape. This has culminated in the establishment of a comprehensive industrial chain encompassing vehicle manufacturing, power batteries, motor control, autonomous driving, intelligent cabins, charging infrastructure and automotive aftermarket. This integrated ecosystem, led by industry giants like BYD, has fostered high synergy within the industrial supply chain. Concurrently, Shenzhen is aggressively advancing the construction of a 'city of supercharging,' aiming to establish 300 supercharging stations by 2025, with the supercharging stations to gas stations ratio reaching 1:1, a pioneering initiative nationwide. By 2035, Shenzhen is projected to have over 2,000 supercharging stations, ensuring widespread access to charging infrastructure along every road (Wang, 2023).

4.2 Facilitating the green transformation of industries

A long-standing commitment in Shenzhen is to guide enterprises towards greener, low-carbon transformation, prioritising green

renovation, underpinned by innovative green technologies and bolstered by robust policy frameworks and standards. The Green Manufacturing Project has been a focal point, yielding tangible results, alongside active engagement in carbon emission control and trading. As of June 2023, Shenzhen boasts the successful establishment of 79 national-level green factories, 14 green supply chains, 2 green parks, 92 green design products and 13 demonstration enterprises for green product design (Peng, 2023). Notably, in 2022, the China National Offshore Oil Corporation (CNOOC) Shenzhen branch achieved significant energy savings of 74,000 tons of standard coal and a reduction of 135,000 tons of carbon dioxide emissions, which is roughly equivalent to planting 1.22 million trees (China National Offshore Oil Corporation, 2023).

4.3 Emphasising the development of green consumption

In parallel with the development of new energy vehicles, Shenzhen is extending the new energy consumption chain, actively fostering green industries like advanced energy storage. In 2023, the city unveiled the world's first integrated photovoltaic charging, discharging and storage network, along with the 2.0 version of a virtual power plant (Wang, 2023). These initiatives are part of Shenzhen's vision to become a world-class automotive and supercharging city, and to establish itself as a vanguard in digital energy innovation. Over many consecutive years, Shenzhen has been hosting events such as climate science popularisation in schools, the International Low Carbon City Forum and the Handle Climate Change Film Festival. As of 2022, Shenzhen has established 61 public environmental education facilities (Li, 2024), successfully integrating the concept of green and low-carbon living into the fabric of the city, and a virtuous cycle of social carbon reduction is gradually taking shape.

5 An inclusive and open environment attracts global innovators

Shenzhen is a city of immigrants, a city that embraces innovation and tolerates failure. Here, no one considers failure to be shameful or embarrassing; perhaps most entrepreneurs and startups have experienced failure. It is this very atmosphere that attracts individuals who have faced setbacks in their pursuits elsewhere in China and are eager for greater challenges, as well as a diverse range of international innovators.

5.1 An innovators' haven of inclusiveness and openness

A city's attitude toward failure reflects its capability to innovate. It is Shenzhen's tolerance for failure and encouragement of exploration that have led to numerous pioneering endeavours and made it the leading city for the private economy, where giant firms stand tall and SMEs thrive. Many notable figures, from Yuan Geng, the former vice-chairman of the Shekou Industrial Zone and China Merchants Group, Ren Zhengfei of Huawei, Ma Mingzhe of Ping An Insurance and Terry Gou of Foxconn, to Ma Huateng of Tencent, Wang Chuanfu of BYD and Frank Wang of DJI, all started as young, unknown individuals in Shenzhen and grew into prominent entrepreneurs under the city's innovative and inclusive environment. They have become bright stars in the business history of China and even that of the world. Statistics show that in 2023, Shenzhen saw 565,000 new market entities, bringing the total to 4.226 million (Peng, 2024), meaning that in Shenzhen, 1.1 new enterprises are born every minute and one out of every five people is a boss. This density of entrepreneurship is much higher than that of cities like Beijing, Shanghai and Guangzhou, ranking first among China's large and medium-sized cities. In the European Commission's list of the top 2,500 corporate R&D spenders, Huawei has been ranked first among Chinese enterprises for many years and once ranked second globally. In the latest report

released at the end of 2023, Huawei and Tencent were the only two Chinese enterprises to make it into the top 20, both hailing from Shenzhen (Zhang et al., 2024). Additionally, *Regulations of Shenzhen Special Economic Zone on Personal Bankruptcy* have established a failure exit mechanism for honest and trustworthy entrepreneurs who have experienced business failures, providing a ‘safety net’ for entrepreneurs coming to Shenzhen and further stimulating the entrepreneurial enthusiasm of market players (Justice Bureau of Shenzhen Municipality, 2021).

5.2 Basic research to address gaps in sci-tech innovation

Shenzhen’s journey in scientific and technological development can be traced through phases, including the exploratory stage of outsourced processing and export-oriented manufacturing, followed by periods of imitation-based innovation and absorption, and finally, independent innovation and development. This trajectory has propelled Shenzhen to achieve a notable feat: ranking second globally in the Shenzhen – Hong Kong – Guangzhou science and technology cluster for three consecutive years. Over the past decades, Shenzhen has transitioned from catering to industrial demands to supplying technological expertise. This transformation has shifted Shenzhen from a ‘science and technology desert’ to an ‘innovation oasis,’ currently pivoting towards prioritising basic research and fostering original innovation. By the end of 2022, Shenzhen had established a total of 3,223 innovation hubs, including national, provincial and municipal key laboratories, engineering technology research centres and corporate technology research centres, among others, with 153 at the national level and 1,278 at the provincial level (Wen, 2023a).

5.3 Strengthening government support for basic research

To ensure sustained investment in sci-tech innovation, Shenzhen has fortified government support for basic research through

local legislation. Shenzhen mandates that no less than 30% of municipal scientific research funds must be allocated annually to basic research and applied basic research. In 2022, Shenzhen's investment in basic research amounted to RMB 12.2 billion, elevating the proportion of R&D investment in society by 2.5 percentage points to reach 7.25%. This marked the first time Shenzhen surpassed the average levels of both Guangdong Province (6.9%) and China (6.5%) (Wen, 2023b).

Bridging gaps to enhance higher education services. As early as 1983, Shenzhen built its own university, Shenzhen University. By 2000, the city government had started collaborations with Tsinghua University, Peking University and Harbin Institute of Technology in a bid to establish a number of universities and research institutes. In 2007, Shenzhen further reinforced its educational landscape with the establishment of the Southern University of Science and Technology (SUSTech), bolstering the city's role in nurturing talent and fostering innovation in science and technology. Since 2016, Shenzhen has ramped up efforts, creating institutions like the Tsinghua Shenzhen International Graduate School (Tsinghua SIGS), Shenzhen Technology University, Harbin Institute of Technology (Shenzhen) and Sun Yat-sen University Shenzhen Campus, alongside collaborative ventures with overseas counterparts such as the Chinese University of Hong Kong (Shenzhen) and Shenzhen MSU-BIT University. Today, Shenzhen boasts a roster of 16 universities (Qin, 2024).

5.4 Creating platforms to attract global sci-tech talent

In tandem with its research endeavours, Shenzhen has been actively attracting talent from across the globe. Initially, the focus was on attracting international talent through overseas startup teams. In 2008, for instance, BGI (founded by a postdoctoral research team from the University of Washington) answered Shenzhen's call (Yantian District People's Government of

Shenzhen, 2008), while Royole Technologies, founded by three Stanford returnees, soared to a unicorn valuation of USD 6 billion (Ma, 2020). In recent years, the city's efforts have expanded from start-up teams to renowned scientists and Nobel Prize-winning teams. Shenzhen has now established over ten Nobel Prize labs, led by Nobel laureates or Turing Award recipients. These distinguished individuals are required to spend at least one month working in Shenzhen annually (Qian & Wang, 2020). In a significant move in 2022, esteemed scientist Yan Ning resigned from Princeton University to return to China for full-time work, lending her expertise to the establishment of the Shenzhen Medical Academy of Research and Translation, a novel research institution focusing on the translation of research achievements and talent cultivation (Chen, 2022).

6 A market mechanism committed to supporting the growth of private enterprises

Shenzhen is a fertile ground for the development and innovation of the private economy. Here, businesses dare to innovate, encouraged by a government that fosters the spirit of innovation. As a result, private enterprises flourish in this ecosystem. Not only does Shenzhen boast a multitude of private technology firms leading their respective industries with robust R&D capabilities and a solid foundation in terms of intellectual property, but it is also a primary hub for China's unicorn companies. The city nurtures numerous specialised, differential, refined and innovative (SDRI) enterprises, brimming with vitality and growth potential.

6.1 Developing an ecosystem that supports innovation in the private economy

Shenzhen has developed an innovation ecosystem with enterprises as the primary players, fostering efficient collaboration among industry, universities and research entities. In 2022, Shenzhen's R&D investment reached 7.25% of its GDP, with private enterprises contributing a staggering 94.0% of the total R&D investment of the society (Chen, 2023). In Shenzhen, private enterprises have achieved remarkable feats marked by six different '90%' figures: 1) more than 90% of innovation-oriented companies are private; 2) over 90% of R&D institutions are set up within private enterprises; 3) over 90% of R&D personnel are employed by private enterprises; 4) over 90% of R&D funding is provided by private enterprises; 5) over 90% of utility model and design patents come from private enterprises; and 6) over 90% of major scientific and technological project patents originate from private enterprises (Su, 2023). Across various metrics such as enterprise count, entrepreneurial density, sci-tech innovation achievements and the number of industry leaders, Shenzhen's private economy ranks among the nation's best. In the 2023 list of China's top 500 private enterprises released by the All-China Federation of Industry and Commerce (ACFIC), 4 of the top 10 hail from Shenzhen (All-China Federation of Industry and Commerce, 2023). For example, in the drone industry, an innovation ecosystem has flourished, spearheaded by companies such as DJI, Autel Robotics and Chasing-Innovation Technology, with widespread societal engagement and support fuelling the industry's growth.

6.2 Commitment to continually strengthening intellectual property protection

Over its 40-year history of reform and opening up, the city has seen numerous new market players and private enterprises emerge amidst intense market competition. From Huawei's

founder Ren Zhengfei, who started the company as a technology professional, to the property rights reform in the 1990s when state-owned enterprise employees in Shenzhen began holding shares, to the rapid rise of numerous emerging industry companies like DJI, Shenzhen's path of reform and opening-up is a miniature of China's pursuit of property rights reform and the evolution of its ownership structures. Shenzhen considers intellectual property (IP) protection crucial to fostering a conducive business environment and views sci-tech innovation and intellectual property protection as key drivers of the city's growth. In recent years, in tandem with the ongoing rollout of judicial norms for IP protection, Shenzhen has taken the lead in developing an internationally leading IP protection framework. This framework includes digital IP protection, a pioneering model of cases handled by technology investigation officers and credit commitment mechanisms in emerging fields. These initiatives have substantially strengthened Shenzhen's IP protection architecture, securing the city's innovative endeavours.

6.3 Enhancing public services to better accommodate the needs of enterprises

Unlike private enterprises, Shenzhen's state-owned enterprises (SOEs) are more specialised in urban infrastructure construction and public services. While the former serves as the primary driver of innovation, the latter acts as a development safeguard. These two sectors complement each other, fostering the growth of Shenzhen's modern industrial system and high-tech industries. In recent years, Shenzhen has been encouraging state-owned enterprises to play a more active role in developing industrial spaces, enabling them to act as operators in the construction and management of sci-tech innovation infrastructure. This includes constructing industrial buildings suitable for the development of emerging industries and providing them to innovation-oriented SMEs at relatively low prices.

7 A government supporting industrial development

The Shenzhen government is committed to serving as a facilitator for industry and innovation, embracing a ‘hands-off unless necessary, and responsive when requested’ approach. It steers away from relying heavily on subsidies, instead concentrating on levelling the playing field and fostering an enabling policy environment conducive to technological advancements and the adoption of new products.

7.1 Cultivating a fair business environment

Initiatives range from reinforcing property rights protection and easing market access to encouraging fair competition and refining credit supervision systems. The city has also focused on enhancing the level of support factors and streamlining government services, including the implementation of instant approval for business registrations and the integration of government and banking credit data for mutual recognition of documents. Shenzhen has long viewed a business-friendly environment as crucial for economic growth, innovation and market dynamism. Since 2018, optimising the business environment has been a primary goal, earning Shenzhen the reputation of being a national leader in this aspect. Currently, Shenzhen hosts approximately 4.08 million commercial entities, with a business density of 232.39 entities per thousand people (Deng, 2023), ranking among the nation’s top performers. In recent years, Shenzhen’s efforts to enhance the business environment have expanded beyond registration processes to include bankruptcy and exit mechanisms. Initiatives have included lowering thresholds of pre-reorganisation for bankrupt businesses, addressing gaps in oversight of individual bankruptcy administrators, and establishing specialised or simplified bankruptcy procedures for SMEs. As reported by the All-China Federation of Industry and Commerce’s 2023 *Evaluation*

of Business Environment by Ten Thousand Private Enterprises, Shenzhen has earned the distinction of being the “Best-Praised City for Business Environment” in China for four consecutive years (Yuan, 2023).

7.2 Supporting enterprises by offering them access to real-world scenarios

In Shenzhen, supporting enterprises goes beyond simple financial subsidies: it involves providing them with practical application scenarios and access to market opportunities. BYD’s success story is not just about its commitment to sci-tech innovation, but also owes much to Shenzhen’s support for the new energy sector. Shenzhen has long been a pioneer in urban electrification of public transportation, replacing traditional buses with new energy vehicles and creating market demand for enterprises. Furthermore, More importantly, Shenzhen has become the ultimate showcase for BYD’s ‘electrification of urban public transport’ strategy, helping it transition from a national player to a global one. This has attracted international interest, with delegations from transportation sectors in the United States, the United Kingdom, Brazil and elsewhere visiting Shenzhen to learn from BYD’s advancements. In recent years, Shenzhen has continually made adjustments in laws and regulations to accommodate new industries and technologies, providing urban scenarios for innovation-oriented enterprises to thrive. For instance, opening up subway, bus and taxi scenarios to facilitate training in unmanned driving and AI technologies.

7.3 Welcoming global investors

Shenzhen’s growth story is deeply intertwined with its commitment to openness and international investment. Its early development relied on industrial parks that attracted foreign investment, drawing manufacturing giants from Japan, Hong Kong and Taiwan. In recent years, Shenzhen has further eased

access to foreign investment and expanded opportunities in sectors such as telecommunications, healthcare, finance and energy through regional pilot programmes, enhancing its appeal to global investors. Presently, over 300 Fortune Global 500 companies from outside China have made Shenzhen their home (Yue, 2023). In 2023, the city housed 8,002 foreign-invested enterprises. In the first two months of 2024 (Zou, 2024), the number of newly established foreign-invested enterprises in Shenzhen reached 1,121, a nearly 30% increase year-on-year, accounting for 15.7% of the national total, with the number of foreign enterprises in the scientific research and technology service industry growing by 97.1% (He, 2024).

7.4 Enhancing digital government services

Shenzhen continues its efforts to streamline operations for micro, small and medium-sized enterprises (MSMEs) through digital government platforms. For instance, the 深i企 (Shen i Qi) online platform offers a comprehensive range of services in eight modules, including policy updates, government affairs and financial support. As of November 2023, the platform boasted 2.92 million individual users and 2.72 million business entity users, providing access to over 14,000 corporate policies and more than 3,500 funding support initiatives (Yue, 2023).

8 What can developing countries learn from Shenzhen’s experience?

Shenzhen is both the ‘most global’ city in China and the ‘most Chinese’ city in the world. It is ‘most global’ because its successful experience is drawn from practices of globally developed cities such as Silicon Valley, Hong Kong and Singapore. Like other world-class cities, Shenzhen respects the market, enterprises

and talent. Yet, it is also the ‘most Chinese’ city, daring to open up urban scenarios for enterprises, to continuously go beyond existing policies and regulations to adapt to new technologies, products and industry development, and ready to foster a first-class environment for innovation. It is this spirit of openness and Chinese characteristic that has made Shenzhen a city of sci-tech innovation. Shenzhen’s development experience holds valuable lessons for cities worldwide, particularly for developing countries.

8.1 Emphasis on fostering a favourable business environment

The key to a city’s appeal to businesses, capital and talent lies in its business environment. Shenzhen prioritises two key aspects. Firstly, it emphasises a balanced relationship between enterprises and the government, exemplified by its ‘small government’ approach that minimises interference in the market, with the government’s priority being to serve the enterprises. Secondly, it invests heavily in urban public services such as music halls, libraries, city parks, top hospitals and high-quality schools, aiming to attract talent by creating a better living environment.

8.2 Dedication to inclusive and fair policies

Shenzhen’s industrial policies are marked by a relative competition neutrality, where policies are inclusive and fair, seldom tailored to individual companies or certain types of businesses. Typically, the Shenzhen government introduces broad and sector-specific support policies, with enterprises applying based on predefined requirements. Generally, those meeting the requirements can enjoy corresponding policy support. In tendering processes for government projects and procurement, local enterprises in Shenzhen, those from other cities and foreign invested ones are treated equally, ensuring fair participation and competition for all.

8.3 Commitment to opening up urban scenarios to nourish industries

With a population exceeding 17 million and a density of over 7,000 people per square kilometre (Zhang, 2024), Shenzhen serves as a vibrant testing ground for industrial innovation in the construction of a new smart city. To drive industrial development, the Shenzhen government is keen on further opening up urban public services. From allowing shared bicycles on city roads in the past to currently facilitating drone aerial performances in city parks, the opening up of urban scenarios provides ample market opportunities for enterprises. For example, in the field of autonomous driving, Shenzhen has granted relevant taxi operation licenses to autonomous driving companies, thus facilitating the development of the industry.

8.4 Resolute and timely policy adjustments to support new economies, technologies and products

Endowed with local legislative powers, Shenzhen promptly adjusts local laws and regulations to foster a conducive legal environment for the development of new economies. For instance, legislation on big data and AI aims to eliminate or adapt outdated policies hindering industry development and sci-tech innovation.

8.5 Commitment to an inclusive urban cultural environment

Shenzhen embraces innovation and newcomers without discrimination, providing a favourable environment for innovators and entrepreneurs to thrive. Additionally, the city maintains relatively low barriers in areas such as healthcare, education and residency registration. The mentality of ‘once you arrive, you’re a Shenzhener’ fosters a sense of belonging and value for countless newcomers in Shenzhen.

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