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Urbanization in Hangzhou of China, 1978 – 2021:

Causes and Consequences from Dual Track Urbanization Perspective

Abstract:

This paper examines the urbanization process in Hangzhou of China from 1978 to 2021 from the perspective of dual-track urbanization. The first track urbanization is sponsored by local government and state, and the second is a spontaneous track. This paper studies the relative roles of spontaneous and state-sponsored urbanization and their impacts on the spatial pattern, industrial structures, economic patterns, and characteristics of Hangzhou's urbanization. It is found that government plays the leading role in urbanization, implementing policies on spatial structure, master plan, and economy. Spontaneous urbanization plays an important role in the process of urbanization, resulting in population migration, tertiary industry change, and economic innovation. Both tracks together guide Hangzhou's urbanization into a pattern of its characteristics. The level of population urbanization is constantly improving; The development of urban and rural areas (spatial structure) is more coordinated; Remarkable achievements have been made in the construction of the digital economy, forming many strong private enterprises, characteristic towns, and development zones. The digital economy and private sectors have been booming since the 1990s, bring economic prosperity and urbanization. At this point, one could consider these as the distinguishing feature in Hangzhou's urbanization, engendering the city's modernization and urbanization.

Keywords:

Dual-track urbanization; State-sponsored urbanization; Spontaneous urbanization; Hangzhou; China;

1. Introduction

1.1 Urbanization in China and dual-track urbanization

Urbanization refers to the process of expansion in urban population, urban scale, and the corresponding series of economic and social changes (Guan et al., 2018). Urbanization in China during the Maoist period was largely a consequence of centralized planning and Soviet-type industrialization dominated by the growth of cities (Ma & Fan, 1994). After economic reform in 1978, China witnessed a rapid growth in urbanization, in step with urban population growth and surplus labors moving from primary industry into non-agricultural jobs (Pannell, 1995). Since the start of the open and reform policy in the late 1970s, the number of urban inhabitants in China has ballooned from 172 million (or 18% of the total population) in 1978 to 901 million (or 64% of the total population) in 2020 (National Bureau of Statistics of China, n.d.). Apart from fast development in urban population, the most obvious difference between the reform period and in the pre-reform period is the process of urbanization (Shen & Lin, 2017).

Friedmann (2006) argued that China's urbanization is best viewed as an endogenous process, namely the form of its development is best understood as having its source and origin within China. The accordingly viewed driving factors, such as economic, political, and cultural globalizing forces are not the prime mover, and all of them act as complementary to and intersecting with an endogenous dynamic. Two concepts of urbanization had been proposed, "urbanization from above" and "urbanization from below" (Ma & Fan, 1994). The former model refers to industrial development or city expansion caused by large state investments from the 1950s to the 1970s. The latter refers to spontaneous, unplanned growth of the economy in which private investment rather than the central government's play a key role. However, the above two notions could not explain urbanization triggered by foreign investment, which is called exo(genuous)-urbanization, prevailing in the Pearl River Delta of South China (Sit & Yang, 1997).

Many studies used the term dual-track urbanization, but their usages of terms are different. For instance, Shen, Wong, and Feng (2002) highlighted that the urbanization process in the Pearl River Delta was led by the hukou system separating two groups of the population into two tracks: state-sponsored urbanization concerning nonagricultural population and spontaneous urbanization concerning agricultural population. The former was triggered by investment or policy support to the urban sector or township and village enterprises (TVEs) by central or local governments and is indicated by the non-agricultural population. The latter refers to rural urbanization driven by TVEs and the migration of temporary population to an urban area and was measured by the size of the temporary population and the number of TVE employees. Buckingham and Chan (2018) argued that China's rural-urban dual system-generated China's urban development, resulting in the feature of Chengzhongcun, or "village-in-the-city". From a different perspective, Liu and Zhang (Liu & Zhang, 2020) considered that Chinese urbanization is driven by two tracks rooted in the country's land ownership: one is a state-led track relying on land financing and expropriation, facilitated capital accumulation, infrastructure construction, and the provision of public goods; the other is an informal track based on collective land ownership and self-governance resulted in village-in-the-city, a form of informal and irregular settlements for migrants who cannot afford formal housing and other services. While Shen et al.(2002) and Buckingham and Chan (2018) refer to the dual-track urbanization as a rural-urban dualism, which has been used in the study of the urbanization process in China (Shen, 2006) and the Pearl River Delta region (Wong et al., 2003), Liu & Zhang (2020) refer to it as the coexistence of a state-led track and an informal track based on China's land regime and associated financial issues. These are different from our definition of dual-track urbanization, which refers to the coexistence of a state policy-led track and an informal track based on people's spontaneous innovation.

1.2 Urbanization in Hangzhou

Hangzhou is the capital of Zhejiang Province in east China, located in the south part of the Yangtze River Delta, the lower reaches of the Qiantang River. About 180

km from the ‘dragon head’ Shanghai, Hangzhou is the second largest metropolis in the Yangtze River Delta Region (Qian, 2015b). China began the open door and economic reform policy in 1978, however, Hangzhou stepped into a fast urbanization phase after 1990 (Hou et al., 2019). Since 1990, Hangzhou has undergone rapid urbanization, resulting in rapid growth in population and economy (Hou et al., 2019). The urbanization in Hangzhou has attracted the attention of some scholars.

First, Lin (2004) pointed out industrialization, agglomeration effect play a key role in urbanization. Hangzhou’s urbanization benefits from the high-technology industry, which encourages the city’s informationization as well as improves economic structure. However, the relatively low comprehensive service level hampers the upgrade of Hangzhou’s spatial agglomeration capacity of elements, such as talent, funds, and information. He attempted to explain the relatively low level of urbanization in Hangzhou in the 2000s theoretically.

Second, the relationships between urbanization and other institutional factors have been considered. Guo (2013) evaluated the motivation of institutions in Zhejiang by using Hangzhou as an instance. He revealed that the adjustment of administrative division in Hangzhou eliminated administrative obstacles, providing conditions for the reconstruction and adjustment of the urban region, and a broader platform for land capital operation in Hangzhou. It was found that implementing the strategy of promoting the city center contributed to urbanization in Hangzhou. Also, Guo(2013) proposed that the abolished restrictions on the migration of household registration (hukou) in Zhejiang Province in 2002 matters. Relaxed household registration (hukou) policies allowed more farmers to move to cities as floating workers (Pannell, 1995), supporting the emergence of “urbanization from below” which enabled cities to urbanized spontaneously (Shen & Lin, 2017). It is an important change because the hukou system is suggested to present as a major obstacle to China's quest to become a modern, first-world nation and global leader (Chan, 2009).

Third, for the dynamic process of urbanization in land-use change and landscape pattern, Deng et al. (2009) integrated remote sensing and spatial metrics to analyze the rapid urbanization process in Hangzhou from 1996 to 2006. Deng et al. (2009) pointed out that most of the converted lands were developed for the real estate, the Economic and Technological Development Zone, and new University or Industry Parks. Also, the land use pattern in Hangzhou experienced a fundamental transition from agricultural-land-use dominant landscape to urban-land-use dominant landscape. Hou et al. (2019) monitored the cropland dynamics of Hangzhou from 1990 to 2015, found that the cropland patches shrank and scattered, decreased 1512.46 km². (Hou et al., 2019) used a spontaneous scenario, modeled that without restrictions, more than 30% of the current cropland would disappear. They both made attempts to prove the land use, land cover changes, and absence of cropland during rapid urbanization.

This paper attempts to re-examine the urbanization process in Hangzhou using the perspective of dual-track urbanization. Previous studies have paid much attention to the ecological effect of urbanization in Hangzhou but little to the causes and systematical motivation system of urbanization. Given Hangzhou’s unique geographical condition, hilly west lake urban region with Qiantang river cutting off,

regional importance eclipsed by the regional growth pole of Shanghai, this paper aims to address the following questions on causes of urbanization through a case study of Hangzhou. How the causes of spontaneous and state-sponsored urbanization contribute to the process of urbanization in Hangzhou? How spontaneous and state-sponsored urbanization contribute to the consequence of spatial pattern and structure of urbanization in Hangzhou?

The remainder of this paper is organized as follows. Section 2 introduces the study area, data, and methodology. Section 3 provides an overview of urbanization in Hangzhou. Section 4 and 5 analyze state-sponsored and spontaneous urbanization respectively. Section 6 presents a discussion about applying dual-track urbanization model to Hangzhou and section 7 concludes this paper.

2. Study area and methodology

Hangzhou is located in the eastern area of China with a total area of 16,850 km² and an urban area of 8,289 km² (Hangzhou Municipal Bureau of Statistics, 2021). Traversing the city is the Qiantang River, widely known for its spectacular tidal waves. It had a population of 11.9 million in 2020 (Zhejiang Provincial Bureau of Statistics, 2021). This paper will analyze the changes in urbanization both at the districts and county levels (Fig.1). In 2021, under the jurisdiction of the City of Hangzhou are 10 urban districts, 1 county-level city, and two counties. For data consideration, this paper analyzes Hangzhou's administrative regions at the 2020 level. Administratively, Hangzhou consists of 10 urban districts in 2020, namely Shangcheng, Xiacheng, Jianggan, Gongshu, Xihu, Binjiang, Xiaoshan, Yuhang, Fuyang, and Lin'an, 1 county-level city of Jiande, and two counties of Tonglu and Chun'an. They are divided into a total of 23 townships, 75 towns, 92 subdistricts.

The study area has experienced rapid urbanization (Zhu et al., 2020). According to the perspective of dual-track urbanization, there are two tracks of urbanization: "state-sponsored urbanization" and "spontaneous urbanization". Here, we define state-sponsored urbanization as policy-led urbanization, includes urbanization influenced by administrative division adjustment, policy and institution reform, infrastructure improvement; Spontaneous urbanization refers to the migration of floating population to urban areas, industrial structure dynamics, which are indicated by population change and its structural features, the proportion of tertiary industry product, especially the mushrooming of the digital economy, and prosperity of micro and small enterprises. All data mentioned above are collected from Hangzhou statistical yearbook and other official statistical bulletins.

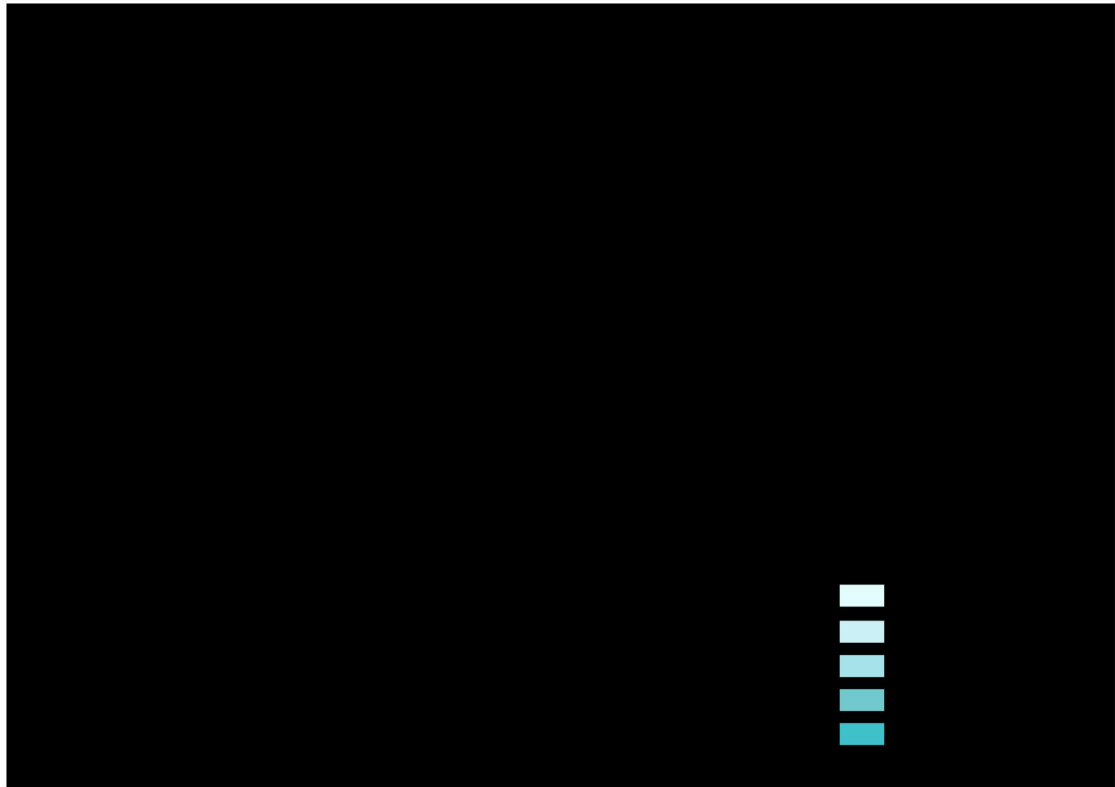


Figure 1 Hangzhou city's location and population density (2019).

Sources: Data collected from Hangzhou Statistical Bureau (2020)

There were several changes in administrative units during 1978 – 2021. To keep consistency, the administrative divisions in 2015 are used for data analysis in this paper.

3. Urbanization dynamics in Hangzhou

According to the National Bureau of Statistics of the People's Republic of China (2020), the urbanization ratio is defined as the proportion of the urban population to the total population. However, data on urbanization levels are not comparable owing to changes in the population census. Before 2015, Hangzhou Municipal Bureau of Statistics used the ratio of non-agriculture population to household registered population to indicate urbanization level. This paper uses household registered population from 1978 to 2019 to calculate urbanization level (Fig. 2a). While the urbanization level of Hangzhou in 1978 is 22.96%, the number reached 67.38% in 2019, which means a lot of residents and migrants have changed their status from rural to urban in the Hukou system in Hangzhou over the past four decades. However, since 2015, the denotation of the non-agriculture population has been adjusted to the urban population, which means all people who live in urban regions are counted without considering their household registered situation. In this way of regardless of the hukou system, the ratio of urban population to total long-term residents population represent urbanization level, which means the urbanization level of Hangzhou in 2020 has reached 83.29%. Hangzhou's population level has been growing rapidly all the time, especially since the year 2000.

Population dynamics in Hangzhou could also be reflected by a comparison

between long-term residents and housed hold registered population. Fig. 2b shows that the household registered population rise stably during the last forty years, while long-term residents grow quickly. The enlarging gap between long-term residents population and household registered population suggests population influx is accelerating. The soaring migrant population shows Hangzhou's economic vitality attracting a large number of talents entering.

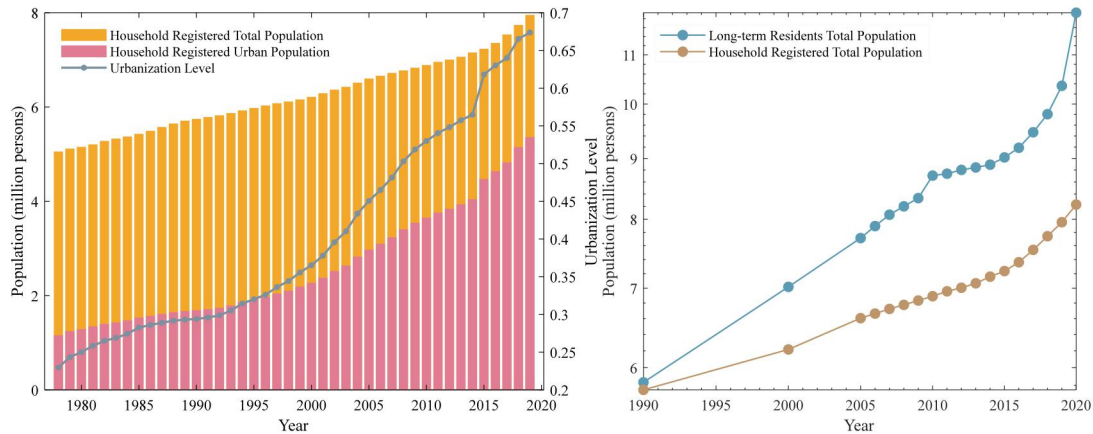


Figure 2 a. Household registered population urbanization level

b. comparison between long-term residents and housed hold registered population

Sources: Data collected from Hangzhou Statistical Bureau (Hangzhou Statistical Bureau, 2020)

4. State-sponsored urbanization in Hangzhou

4.1 Spatial Structure

Hangzhou is the largest city in the Yangtze River Delta urban agglomeration. However, the area of the urban region under Hangzhou municipal's direct jurisdiction has always been small. Only after three times, administrative zoning adjustments did Hangzhou expanded its urban spatial scale, laying a foundation for the spatial development of Hangzhou as a modern metropolis.

In 1978, there were five districts in urban Hangzhou, Shangcheng, Xiacheng, Jianggan, Xihu, Gongshu. Then, Hangzhou experienced its first expansion in 1980, when Banshan district was set and the total number of districts grew to six with the city area reaching 430 km² (Institute for Hangzhou Internationalization, 2020). Hangzhou is surrounded by mountains on three sides and only could build a city on one side. Excluding water area and mountains, the land area that can be used for urban construction was limited to 280 km². As the economy developed rapidly, the conflict between people and land has gradually become prominent. With traffic congestion, housing tension, environmental pollution in the tiny urban area, residents' lives were seriously affected. In the early 1990s, Hangzhou was elevated from a prefecture-level city to a sub-provincial city and only had to borrow land for development. Since 1996, Hangzhou has annexed ambitiously several parts of its large neighboring counties. Binjiang District (High-tech Development Zone), located on the south bank of Qiantang River, was part of the former Xiaoshan County and

was established through annexation. In this way, the area of Hangzhou dramatically increased to 683 km².

The second administrative division adjustment took place in the year 2001. To accelerate urban development, Hangzhou decided to abolish counties and establish districts. Xiaoshan and Yuhang counties were annexed and became urban administrative districts. After this adjustment, the area of Hangzhou city jumped to 3068 km², which means Hangzhou jumped from the last to the fifth place in the ranking of 15 sub-provincial cities in China in terms of an urban area. The city's urban area, total economic volume, and population size became the second-largest city to Shanghai in the Yangtze River Delta.

As major projects such as Qianjiang New City, Olympic Sports Expo Center, Binjiang District, and Zhejiang Block, the main point of Hangzhou's urban development has shifted. Following the urban expansive strategy of 'crossing the Qiantang River and developing southward' (Kuajiang Fazhan) proposed by the Hangzhou Municipal Government in the late 1990s, the rapid development along the Qiantang River drove the eastward and southward expansion of built-up areas (Qian, 2015a). In 2014, Fuyang County was annexed and became Hangzhou's urban district, the urban area of Hangzhou grew to 4899. In 2017, neighboring city Lin'an was set as Hangzhou's district, and Hangzhou became the city with the largest urban area in the Yangtze River Delta with 8002 km².

In 2021, Hangzhou experienced one more time administrative division adjustment with no expansion but division change. There are ten districts, Shangcheng, Gongshu, Xihu, Binjiang, Xiaoshan, Yuhang, Linping, Qiantang, Fuyang, Linan, and three counties, namely Jiande, Tonglu, Chun'an now.

After several adjustments of administrative divisions, Hangzhou has greatly expanded its urban development space. Moving from the traditional West Lake era to the Qiantang River era, Hangzhou's spatial structure has also undergone a great transformation. The urban growth space for a modern metropolis has provided space for the transformation and renewal of old urban regions, the cultivation of urban industries, the expansion of residential space, and the improvement of public facilities.

4.2 Master Plan

A city's master plan designs for urban development in a certain period. Hangzhou's master plan plays an important role in promoting the coordinated development in urban economy and society, guiding the orderly construction of the city and improving the level of urbanization.

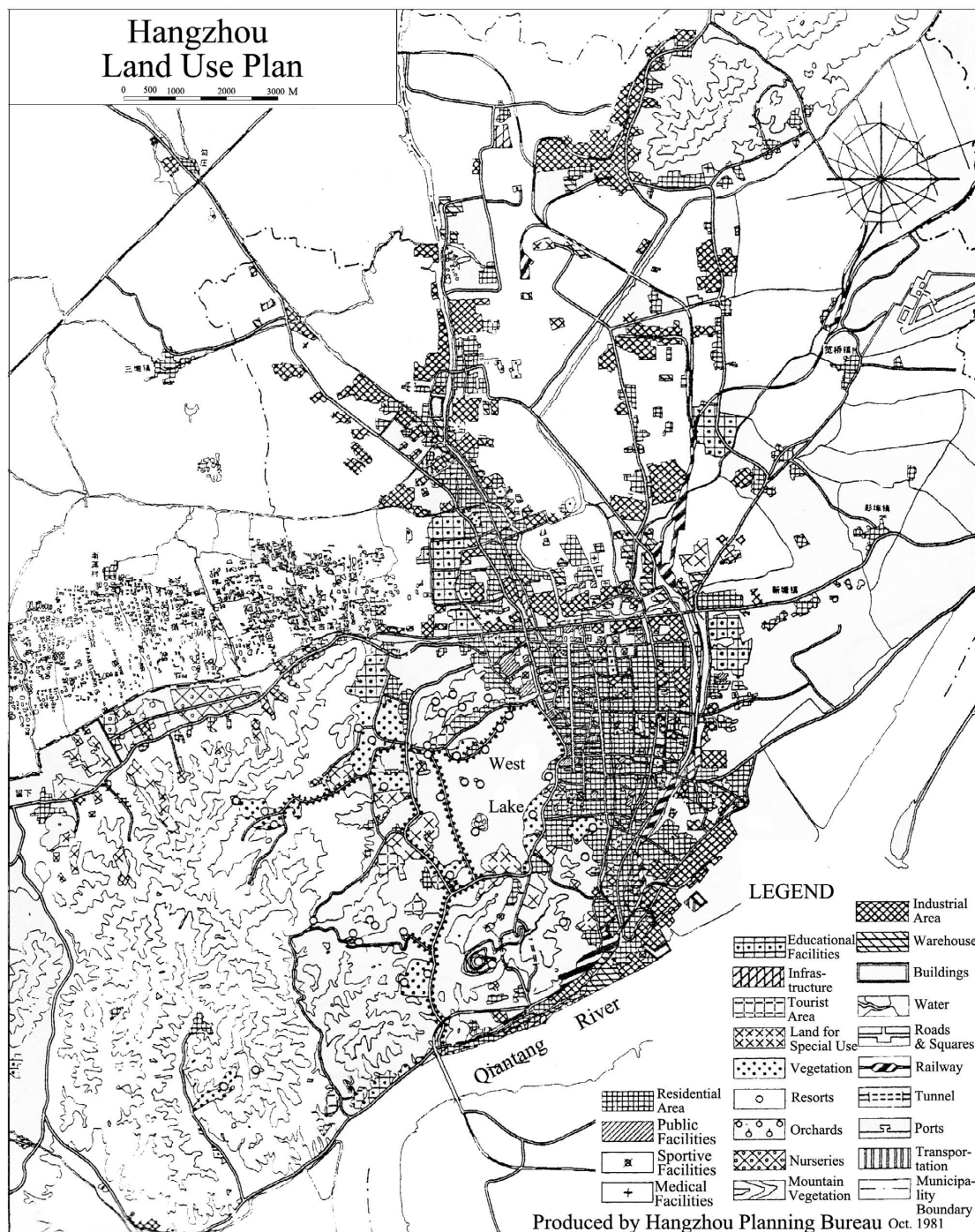


Figure 3. Hangzhou's 1981 Land Use, the city's first post-reform plan (Qian, 2015)

In its first post-reform master plan approved by the State Council in 1981, Hangzhou set its urban growth orientation to be “a provincial administrative seat, a listed Historic, and Cultural Famous City, and a national major tourist city”. The 1981 master plan (Fig. 3) set 1985 as the year for achieving its short-term planning objectives and 2000 as the year for its long-term planning vision. This master plan imposed strict control of population growth in the main city through industrial suburbanization, economic cluster restructuring, satellite or sub-center town development, and strict migration policy. It prioritized the tourism industry and encouraged rural individuals and collectives to build vernacular-style structures that

match their surrounding amenities, contributing to the tourism development. The 1981 master plan followed the tenet of “conserving the West Lake, developing areas along the Qiantang River, redeveloping the old city, improving public service facilities, restructuring urban industries, and erecting satellite towns”. The newly planned areas along the Qiantang River were for tourism, cultural and educational, science and research, and residential uses.

The city’s master plan proposal (1996–2010) (Hangzhou Municipal Bureau of Statistics, 2015) defined Hangzhou as “an international tourist city and national historic and culturally famous city, a central city in the Yangtze River Delta Region, and the political, economic, scientific-educational, and cultural center of Zhejiang Province”. The development direction is adjusted to “base on the main city, develop along and cross the Qiantang River, expand eastward and southward, and strictly control the westward development. The layout form should change from the old city as the core, to the Qiantang River as the axis, develop along and cross the river, and to form a multi-core group layout.”

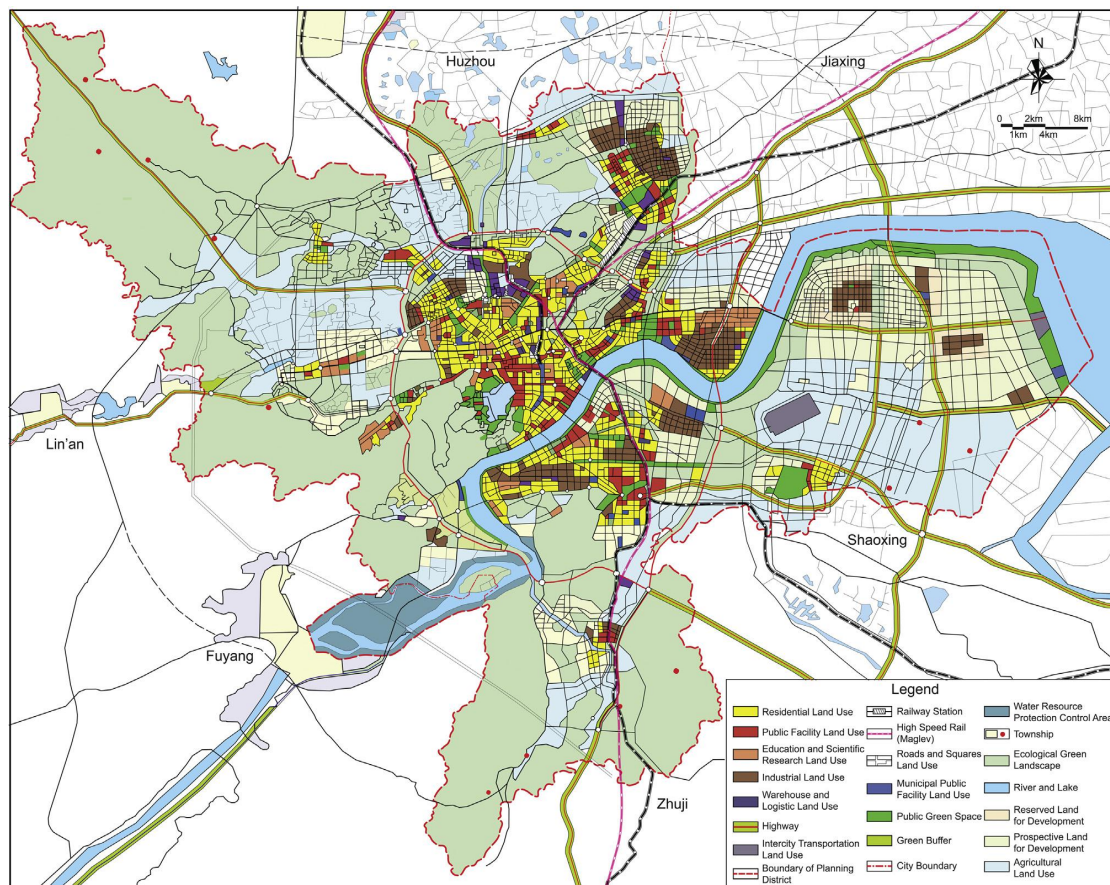


Figure 4 Hangzhou Master Plan (2001–2020).

Source: (Qian, 2015)

After the annexation of Xiaoshan and Yuhang counties, this proposal was revised upon the request of the State Council. Hangzhou’s master plan (2001–2020) (Fig. 4) added to its 1996 proposal for its future development orientation to be a modern city that would, “further contribute to the Yangtze River Delta Region as one of the core cities led by Shanghai; continue to be the provincial political, economic, cultural, and

educational center; and enhance the city's scientific innovation and regional comprehensive services (Hangzhou Municipal Government, 2007). This master plan sets 2050 for its long-term vision with detailed configurations specified for 2020. It aims to control central urban land uses within 370 km² and long-term residents within 4.05 million by 2020. Urban expansion along the Qiantang River is emphasized again. Six suburban centers for polycentric growth and six ecological belts connecting suburban or exurban ecological, green, and agricultural areas are articulated in the master plan. Ten historic and cultural districts and sixteen historic street blocks are designated for conservation.

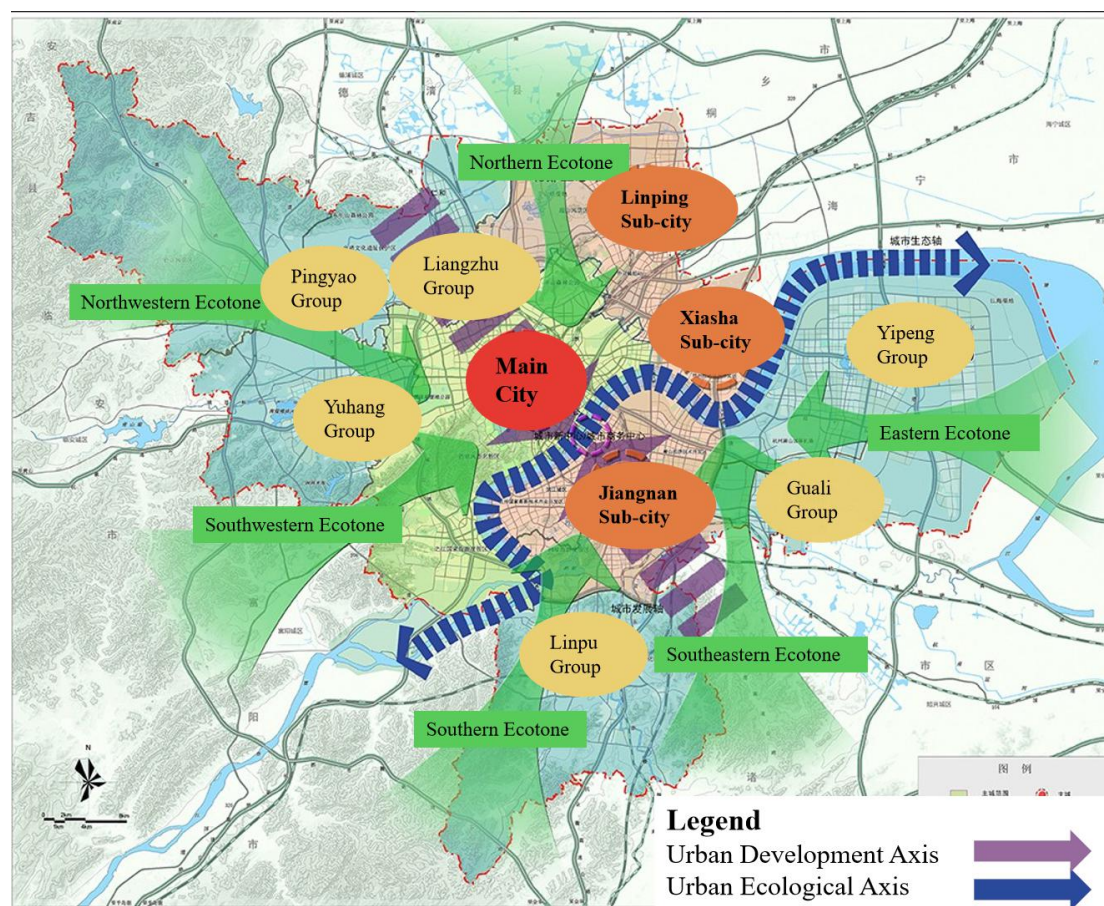


Figure 5 Hangzhou's master plan (2001-2020) Revised in 2016.

Sources: Hangzhou Bureau of Planning and Natural Resources (2019), digitized and revised by the author.

In 2016, Hangzhou's master plan (2001-2020) was revised again. Hangzhou claimed that it was in a critical period of "innovation-driven, transformational development". The city improved its development goal to give full play to the advantages of historical and cultural, mountain and water tourism resources, to develop science and education industry. To build a high-tech industrial base and an internationally important tourism and leisure center. In this version of a master plan, Hangzhou will be a center of high-tech industries, international tourism, international electronic business, national culture and creativity, and regional financial service. It forecasts the area of urban built-up area to be 729 km² and total long-term residents in

the planning area (all districts except Fuyang) to be 7.45 million. Also, the city function was added. Hangzhou aimed to play a role as a “regional financial service center, modern logistics center, and transportation hub in Yangtze River Delta; national high-tech industrial base, information economy center and innovation center; international e-commerce center and important tourism and leisure center”. In this version of the master plan, it was obvious that enhancing Hangzhou's radiation-driven capacity and promoting industrial transformation and upgrading were stressed, and residents would share benefits brought by urban development.

It was said that Hangzhou would adhere to the spatial strategy of "city expansion to the East, tourism expansion to the west, industry expansion along the river, and development across the river ". There would be one main city and three sib-cities: the main city and Jiangnan Sub-city, Linping Sub-city and Xiasha Sub-city. Six groups could be seen in the master plan: Yuhang group (future science and technology city), Liangzhu group, Pingyao group, Yipeng group (Dajiangdong new city), Guali group, and Linpu group. Six ecotones would be built: Northern Ecotone, Southern Ecotone, Eastern Ecotone, Northwestern Ecotone, Southwestern Ecotone, and Southeastern Ecotone. As time passed by, Hangzhou enhanced the functions of the main city's innovation and high-end services, improved the production function of sub-cities and groups, trying to optimize the layout of industrial, residential, and other places combined with innovation and development and industrial transformation.

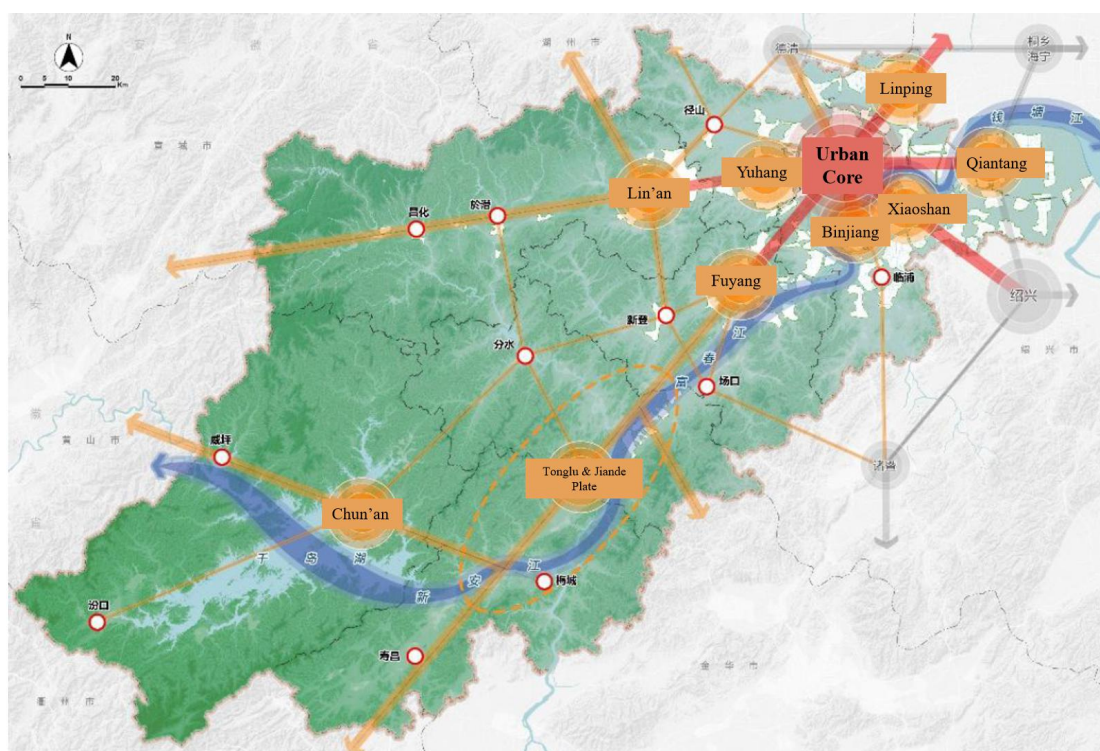


Figure 6 Hangzhou Territorial Spatial Master Plan (draft)

Sources: Hangzhou Bureau of Planning and Natural Resources (2021), digitized and revised by the author.

In 2021, the draft of the Hangzhou Territorial Spatial Master Plan (Hangzhou Bureau of Planning and Natural Resources, 2021) was publicized by the Hangzhou

Bureau of Planning and Natural Resources. Hangzhou's ambition is easily recognized when sight falls on the city nature it claims. Hangzhou aims to be not only a capital of Zhejiang Province, the center city of the Yangtze River Delta region, the national historical and cultural city, but also the national central city and the national comprehensive scientific center, the first city of the national digital economy, the international cultural tourism and leisure center, and the world-class socialist modern international metropolis.

In the following 15 years, Hangzhou will improve the spatial pattern of "one core, nine stars, dual network integration, three rivers green wedge". Multi centers, networks, city groups, and ecological patterns will be pursued and the city will open up new space, and speed up the construction of new spatial patterns of Megacities.

4.3 Institution improvement and reform in the digital economy

The government of Hangzhou has paid much attention to building an international city. In the digital economy, one belt and one road initiative, Asia Pacific Gateway Hub, smart city, and regional integration building, Hangzhou showed great emphasis in all the above regions. In the latest draft of Hangzhou's master plan, "the first city of the national digital economy" is taken as a credo. This paper will sort out the history of Hangzhou's digital economy development, and analyze the booming of the digital economy in Hangzhou from a government perspective.

Don Tapscott (Tapscott, 1997) revealed how the digital economy is transforming not only business processes but also the way products and services are created and marketed, the structure and goals of the enterprise, the dynamics of competition, and all the rules for business success. Since the 1990s, the digital economy has been leading the world to a new era when big data is used to greatly reduce transaction costs and improve the efficiency of optimal resource allocation.

The digital economy in China first started in the 1990s, characterized by e-commerce. The gradually digital economy is dominated by mobile Internet applications, manifested as "Internet+" after 2013. The digital economy then enters the post-mobile Internet era, when various industries begin a comprehensive digital transformation, such as artificial intelligence, intelligent manufacturing.

Hangzhou's exploration of fostering a digital economy could date back as far as the 2000s. The city has developed a digital economy around a blueprint of "Internet and digitalization" over the past two decades. In 2000, Hangzhou municipal committee and government issued a document, stating that Hangzhou should further strengthen technological innovation and build "two ports and three districts" focusing on "information port, new drug port, national high-tech industrial development zone, national economic and technological development zone, and Hangzhou Higher Education Park". Among them, promote the "information port" construction for the first time became the main point. Many famous IT enterprises have emerged in Hangzhou, such as Sunyard, Hundsun Technologies Inc., and Wasu, etc. By 2005, all information industry added value accounted for about 15% of GDP. Hangzhou initially becomes a domestic first-class information industry base and the national information construction of advanced cities.

In 2010, the work report of Hangzhou Municipal Government proposed to “enhance the functions of national and provincial high-tech zones and development zones, and build a ‘Silicon Valley in Paradise’”. Around this goal, Hangzhou has introduced a series of heavyweight policies and measures, such as “Article 30 of Science and Technology Innovation” for developing an innovative economy and “Article 30 of Hangzhou Reform” for deepening reform. The policy guided the agglomeration of science and innovation resources, encouraging digital economy enterprise development. Alibaba, Hikvision, Dahua, Netease, and other new-generation digital economy enterprises are thriving. In 2014, Alibaba Group was officially listed on the New York Stock Exchange, marking a new milestone for Hangzhou's digital economy.

In 2014, the Hangzhou government seized the golden opportunity of cloud computing, big data, mobile Internet, Internet of Things, and other new generation of information technology, initialed in China to implement the encouraging policy of the information economy. Hangzhou conducted a “No. 1 project”, centering at “Intelligent industry, intelligent industrialization”. The core of the project is to build a trillion-dollar information economy cluster. In addition, Hangzhou has formulated and promulgated the country's first "Regulations on promoting smart economy". Hangzhou set up an information economy industry investment fund and formed a mature information economy promotion system. Since then, the added value of Hangzhou's digital economy industry has continued to grow (Fig.7). In 2015, the added value of Hangzhou's digital economy core industry was 231.4 billion yuan.

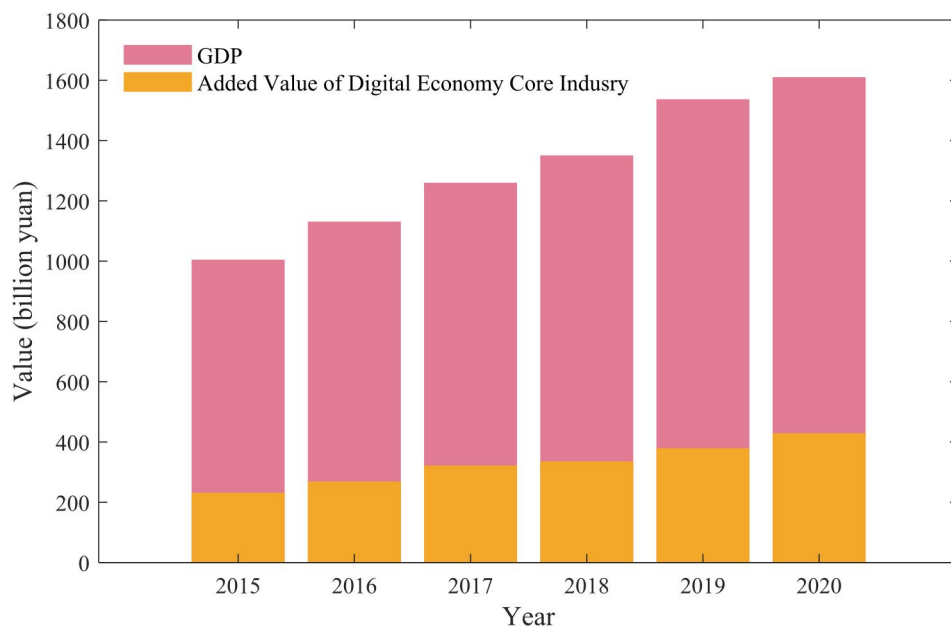


Figure 7 The added value of Hangzhou's digital economy industry and Hangzhou's GDP

Souces: Hangzhou Statistical Bureau (2016) (2017) Hangzhou Statistical Bureau (2018) (2020) (2021)

Note: Since 2018, the statistical caliber was Zhejiang Digital Economy, it was Hangzhou Information Economy before.

In 2018, the Hangzhou government proposed a strategic plan to promote the synergistic integration of “digital industrialization, industrial digitization, and urban digitization” to build the “first city” of the digital economy in China. Hangzhou was vigorously promoting the deep integration of Internet, big data, artificial intelligence, new-generation information technology, and the real economy, promoting the deep integration of data, industry, city, and people, creating an upgraded version of “Project No. 1”, marking the development of Hangzhou's digital economy step into a higher level.

With the increasing sponsor of the Hangzhou government for the digital economy industry, the value increased to 379.5 billion yuan in 2019, accounting for 60.92% of Zhejiang's digital economy industry. This shows that Hangzhou's digital economy construction has achieved remarkable results in the past five years. Also, the proportion of the digital economy added value to Hangzhou's GDP upsurge greatly, contributed to Hangzhou's economic structural adjustment.

In 2020, Hangzhou's digital sector maintains its leading role in the economy. Core digital industries reap an added value of 429.0 billion yuan, up 13.3%, and contribute 26.6% to local GDP. Growth in related sectors like E-commerce (193.3 billion), cloud computing and big data (138.9 billion), digital content (311.3 billion), software and information service (344.1 billion), E-information products manufacturing (109.9 billion) exceeds 100 billion in added values. AliCloud has become the third-largest cloud computing service provider in the world, and Hikvision's “video perception” is chosen as the nation's open innovation platform for the new generation of AI. The first national (Hangzhou) New Internet Exchange Center has open innovation platform for the new generation of AI. The first national (Hangzhou) New Internet Exchange Center has opened. The UN Global Platform for Big Data China Hub comes to locate in Hangzhou. The Digital Economy industry is playing an important role in Hangzhou's economic development.

5. Spontaneous urbanization in Hangzhou

Spontaneous urbanization refers to the migration of floating population to urban areas, industrial structure dynamics, especially the mushrooming of the digital economy, and the prosperity of private sectors like micro and small enterprises. In this part, we will discuss the digital economy specifically, focusing on the migration it caused, as well as private sectors in the economy.

5.1 Industrial structure dynamics

Urbanization and industrial structure are two economic development systems that affect and promote each other. The former's rapid development will contribute to the continuous adjustment of the latter and the latter's upgrading and optimization will stimulate the former uninterruptedly (Wong et al., 2003).

Petty-Clark's law suggests that as the economy of a country develops, its proportion of primary industries declines while those of its secondary and tertiary industries increase. Hangzhou has witnessed dramatic growth in the tertiary industry.

Since 1979, the tertiary industry has kept rising, reaching 66.2% in 2019 (Fig. 10). Though the primary industry has experienced several ascending, the ascending was subtle and happened only at beginning of reform times, namely from 1978 to 1979,

and from 1987 to 1989. The latest report (Hangzhou Municipal Bureau of Statistics, 2021) has shown that in 2020, Hangzhou's industrial structure features a pattern of "tertiary, secondary, primary". Its primary industry contributes an added value of 32.6 billion, down 1.1% than 2019. Its secondary and tertiary industries reach an added value of 482.1 billion and 1.0959 trillion yuan, up 2.3% and 5.0% respectively. The ratio of the three industries is at 2.0: 29.9: 68.1, with the proportion of tertiary industry grew by 1.6% over the previous year.

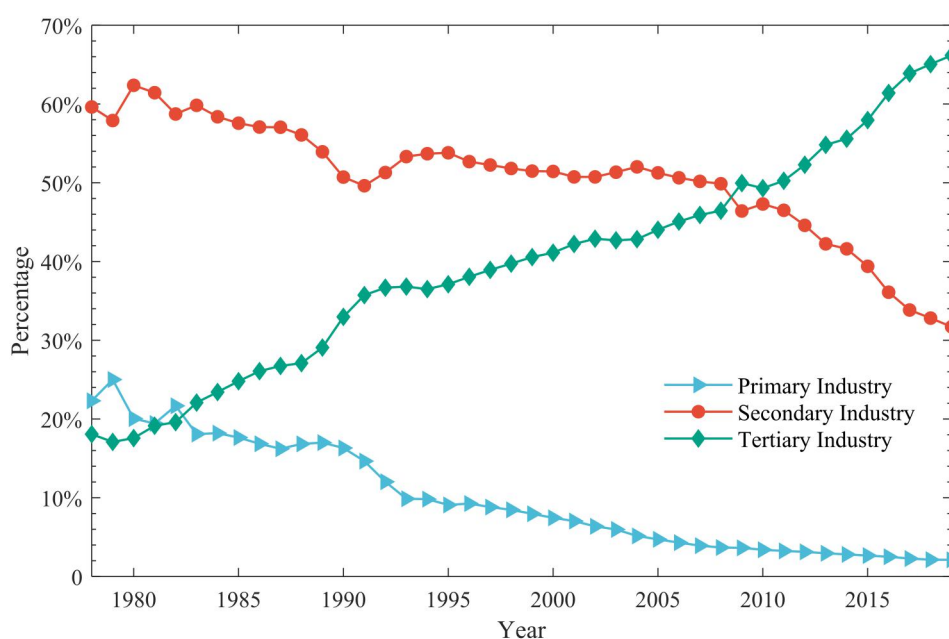


Figure 8 Industrial structure dynamic (1978 - 2019)

Sources: Hangzhou Statistical Bureau (2020)

In 2020, Hangzhou's modern farming, in a process of accelerated integration, gains an added value of 33.4 billion yuan, down 0.9%, from its agriculture, forestry, animal husbandry, and fishery sectors (Hangzhou Municipal Bureau of Statistics, 2021). Also, remarkable growth in rural income was realized.

Though secondary industry's proportion kept decreasing, a new type of industry boomed in Hangzhou. The year 2020 sees further implementation in Hangzhou's plan to boost new manufacturing. The city achieves an added value of 422.1 billion yuan, of which 363.4 billion comes from its above-scale industries, up 2.6% and 3.8% respectively. Growth in high-tech industries, up 2.6% and 3.8% respectively. Growth in high-tech industries is respectively at 8.6%, 8.1%, and 11.8%, higher than the rate of above-scale industries for seven consecutive years (Hangzhou Municipal Bureau of Statistics, 2021).

Since 2009, the third industry has taken first place. In 2020, Hangzhou's service sector gains fairly rapid expansion, and realizes an added value of 1.0959 trillion yuan, contributing 79.4% of local economic growth (Hangzhou Municipal Bureau of Statistics, 2021). Hangzhou boasts over 20 national service industry pilot programs and bases, including National Service Comprehensive Reform Pilot Program, National Service Trade Innovative Development Pilot Program, National Modern

Service Industrialization Base, and National High-Tech Service Industry Base.

With such sustained and rapid development of urban national economy, urban industrial structure has been constantly adjusted and improved.

5.2 Digital economy and migration

Apart from representing in profits, the digital economy also attracts high-tech talents to move in. We collect mechanical changes data of household registered population by regions from Hangzhou Statistical Bureau (2020), as well as enterprises in digital economy industry in Hangzhou by regions, which was collected by Qiyandata (<https://www.qiyandata.com/>) and derived from National Enterprise Credit Information Disclosure System.

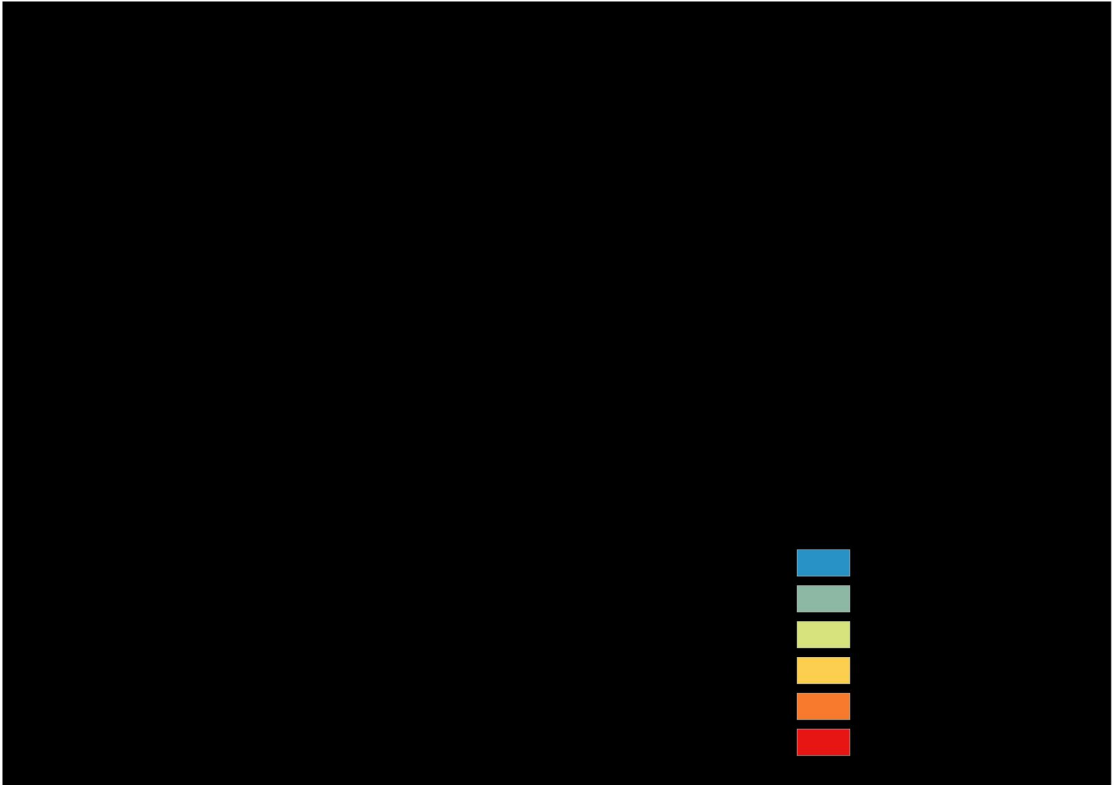


Figure 9 Net Persons Moved in Hangzhou by regions (2019) (Household Registration)
Sources: Data collected from Hangzhou Statistical Bureau (2020)

By comparing Fig. 8 and Fig. 9, similarity in high values could be easily recognized. For net persons moved to Hangzhou in the year of 2019, Yuhang, Jianggan, and Xihu districts have the most migrations. Also, for these places, the number of enterprises in the digital economy industry is highest up to March 2020. For counties like Chun'an and Tonglu, which possess the fewest enterprises in the digital economy industry, people are migrating out. It is worth noting that although there are a relatively small number of digital economy enterprises in Jiande, people still move out there, namely, Jiande lost 2002 original residents.

We calculated the above two factor's correlation coefficients in 2019 and found the coefficient of 0.83, showing a strong correlation between them. Hangzhou's Internet economy is well-developed, and there is a strong atmosphere for innovation and entrepreneurship in the digital economy. In Binjiang District, there are

well-known Internet companies such as Alibaba and Netease, surrounded by several science and technology parks such as Zhejiang University Science and Technology Park, Xike Science and Technology Park, as well as the production base of entrepreneurial smart medical software and Hangzhou Research Institute of Huawei Technology Co., Ltd. In Yuhang District, there are dream town maker center, Hangzhou future science, and Technology City, etc. Alibaba's headquarters are also located in this district.

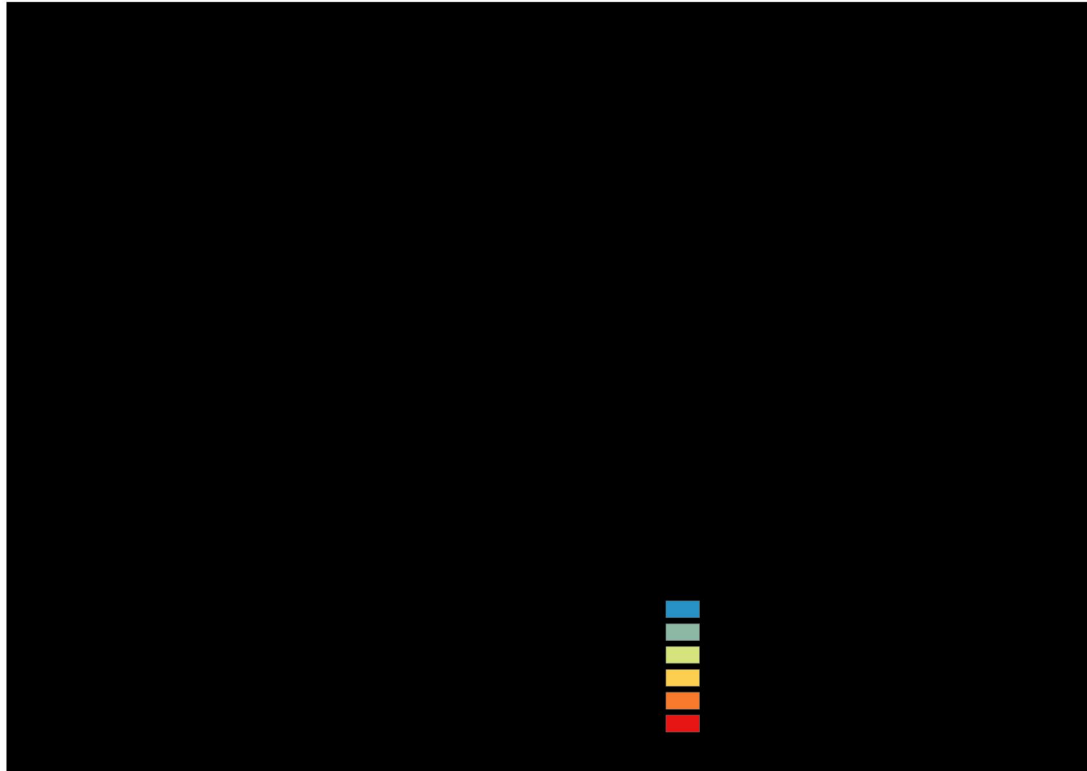


Figure 10 Number of enterprises in the digital economy industry

Sources: Qiyang Data (<https://www.qiyangdata.com/>)

In these areas where well-known Internet enterprises, science and technology parks, and entrepreneurship and innovation located, Hangzhou's long-term residents' population is growing. Regions that enjoy a new economy and new industries are becoming a “sharp weapon” to attract the population.

Table 1 Correlation between Num_Ent_Dig and Net Persons Moved in

Correlation	Num_Ent_Dig	Net Persons Moved in (2019)
Num_Ent_Dig		1
Net Persons Moved in	0.832479337	1

Notes: Num_Ent_Dig - Number of Enterprises in Digital Economy Industry

5.3 Private Sectors

Hangzhou sticks to the credo of developing economy and keeps innovating after the economic reform in 1978. In early 1990, Hangzhou established the first high-tech development zone, followed by Hangzhou Economic and Technological Development Zone, Xiaoshan Economic and Technological Development Zone, Binjiang High-tech

Development Zone, Yuhang Economic and Technological Development Zone, Future Science, and Technology City, and Dajiangdong Development Zone. In the continuous construction, Hangzhou has gradually improved its economic development system and innovation and entrepreneurship system. Hangzhou has pioneered the “production + life + ecology” model of special towns, and high-level innovation platforms such as Yuhuang Shanan Fund Town, Dream Village, Binjiang Internet Town, Internet of Things Town, and Yunqi Town have been established to promote the construction of Hangzhou's domestic first-class science and technology innovation center.



Figure 11 IOT Town, from Hangzhou Daily Press Group

In such a government-sponsored environment, Hangzhou's private economy is developing with high quality. By the end of 2019, Dream Village has introduced a total of 57 incubation platforms, registered a total of 4,037 enterprises, gathered 1,652 entrepreneurial projects and nearly 15,200 entrepreneurial talents. Yunqi Town has introduced a total of more than 750 enterprises, including 475 cloud-related enterprises.

In 2020, Hangzhou's private sector shows strong vitality and reaps an added value of 985.5 billion-yuan, accounting for 61.2% of the city's GDP, up 0.2%; thirty-nine privately owned firms join the rank of China's Top 500 Private Enterprises, three more than last year, and enabling Hangzhou to keep its first place among the country's large and medium-sized cities for 18 consecutive years.

The private sector in the economy encourages the atmosphere of innovation in Hangzhou, attracting high-quality talents migrating in. Such policies and foundation of entrepreneurship promote economic vitality, facilitating population and economic

urbanization, thus shaping Hangzhou's characteristics of urbanization.

Table 2 Hangzhou's Enterprises Listed in "The Year 2020 China's Top 500 Private Enterprises"

Sources: Hangzhou Municipal Bureau of Statistics (2021)

Ran-king	Name	Ran-king	Name	Ran-king	Name
10	Zhejiang Geely Holding Group	215	Zhejiang Mingri Holding Group	383	Hangzhou Binjiang Real Estate Group
17	Zhejiang Hengyi Petrochemical Group	236	Zhejiang Xinhua Group	386	Xinghui Chemical Fiber Group
19	Zhejiang Rongsheng Holding Group	259	Huadong Medicine	380	Nongfu Spring
35	Wanxiang Group	262	Best Inc.	412	Zhejiang Concorde Group Co Ltd
52	Zhongtian Holding Group	267	Shanghai Yunda Freight	439	STO Express
66	Transfer Group	294	Haiwaihai Group	441	Shengda Group
79	Hangzhou Jinjiang Group	438	Hangzhou Dongheng Petroleum Co, Ltd.	458	Zhejiang Guotai Construction Group
90	Guangsha Holding Group	337	Xizi UHC	459	Zhejiang Zhongnan Construction Group
138	NetEase (Hangzhou)	341	Holley Group	460	Zhejiang Xingrigang Holdings
146	GreatStar Holding Group	358	Zhejiang Dauhua Technology	461	Wanshili Group
159	Zhejiang Fuye Group	369	Zhejiang Southeast Space Frame Group	466	New Century Tourism
174	Hangzhou Wahaha Group	372	Tadee Holding Group	468	Zhejiang Jiahua Group
186	Futong Group	381	Zhejiang FCJ Group	470	Zhejiang Bleader

6. Discussion: rethinking the dual-track urbanization in Hangzhou

In this paper, we ascertained that Hangzhou's urbanization is driven by two tracks. The first track is state-sponsored focusing on the spatial expansion of cities and the construction of urban economy transformation through policies and master plans. The second track is informal and spontaneous urbanization. It can be reflected in industrial structure dynamics, initiated by local enterprisers, who operate private sectors, and by local and migrant residents who are devoted to new types of economy, namely digital economy. The model of dual-track urbanization features a considerable degree of credibility in that it has contributed to Hangzhou's significant economic growth, the construction of urban economy transformation, and economic booms. It has engendered rapid urbanization with Hangzhou's characteristics. However, the model of dual-track urbanization also faces major problems of sustainability and complexity. The heavy blending and interaction between state policies and local people's

subjectivity increase the difficulty of distinguishing which party essentially brings the most contribution to the urban economy and the city's urbanization. Meanwhile, rapid urbanization takes place by undermining the balanced development in all regions, thus an unbalanced digital economy-level could be seen among regions, increasing spatial urbanization inequality.

Rooted in Hangzhou's particular government-sponsored policies and plans, and the spontaneous floating and innovation of Hangzhou's people and migrants, especially businessmen, the dual-track urbanization illuminates the importance of distinguishing form from function to better understand the operation and impacts of agents, namely government and residents. As a spatial result of the dual-track urbanization, Hangzhou has emerged as a form of a metropolis. Apparently, Hangzhou's current model of urbanization rallies sufficient credibility as it has generated rapid economic growth and met the demand of various actors – from residents to businessmen, to migrants. However, the credibility might be limited to a degree of complexity and appears to be evidence of an increased merging between the two tracks which is now presenting challenges to the credibility of the strictly two-track divergence model.

7. Conclusion

Based on the above analysis, the study offers the following major causes and consequences of urbanization in Hangzhou. The government and state play the leading role in urbanization, implementing policies on spatial structure, master plan, economy, and so on. Spontaneous urbanization also plays an important role in the process of urbanization, engendering population migration, tertiary industry change, and economic innovation especially in the digital economy and private sectors. Both tracks together guide Hangzhou's urbanization into a pattern of its characteristics. The level of population urbanization is constantly improving; The development of urban and rural areas (spatial structure) is more coordinated; Remarkable achievements have been made in the construction of the digital economy, forming many strong private enterprises, characteristic towns, and development zones.

Hangzhou's urbanization has entered a new stage. Thus, the study offers the following major policy implications for its urbanization. On the one hand, as Hangzhou's economy is now evidently towards in “digital and intelligence”, the over-reliance on the tertiary industry increases the difficulties in boosting advanced manufacturing and urban modern agriculture. On the other hand, more migrant workers have chosen to stay in cities instead of going back to their hometowns. Under such circumstances, urban policies must be able to address the new challenges and promote a more sustainable pattern of urbanization, providing migrants with better-quality living conditions and institution safeguards.

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Notes:

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