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Evolution and Development Mechanism of World's Megalopolises

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Abstract

Rapid development of the global economy accelerated the trend of urbanization and metropolitan areas in China will experience substantial development. Research on evolution and development mechanism of world's classic megalopolises is of great importance for guiding Chinese megalopolises' reasonable, efficient and sustainable urbanization tracks. The development course of the world megalopolises reflects the spectacular evolution of urbanization process. With the rise of the city center and surrounding small towns, megalopolitan regions are formed and display the utilization of natural resources, market mechanisms, and planning visions to shape better living and working environments. In this paper, we intend to figure out the evolution and development mechanism of world's classic megalopolises as policy directions to content with the needs in the fast process of urbanization in China. First, the concept of world's megalopolises is introduced, followed by a description of the evolution of megalopolitan systems. Then the development mechanism of megalopolis is presented including its spatial structure layout, economy and industry layout, transportation development, as well as associated planning and regulations issues. Finally, this paper concludes the geographical and industrial advantages of megalopolis, figured out its new layout and allocation driven by tertiary industry where a new format of industrial chain is developed in compatible and complementary pattern. This paper also pointed out that megalopolises started the counter-urbanization strategy to relieve the crisis of excessive consumption of resources. Most metropolises worked out a coordination mechanism in line with their specific implementation at regional levels. Last, this paper concludes that the development of every megalopolis substantially relied on efficient and multi-dimension transportation systems.

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1. Introduction

In the context of globalization, world cities take an important position in the global economy and trade system. Centered with these cities, their surrounding metropolitan areas' urbanization processes have become classic models because of their strong impetus and mature development mechanism.

Beginning from the twentieth century, the rapid development of the global economy accelerated the trend of urbanization. Due to the internal and external advantages, large cities gathered a large number of populations and played a role in promoting the overall development of the regional economy and forming the basis of metropolitan areas. With the rapid development of urbanization process, the large cities encountered the prevalence of traffic congestion, environment pollution and other phenomena. This, in turn, caused urban residents to migrate to the suburbs, resulting in "counter-urbanization". Therefore, the boundaries of large cities continued expanding and strengthening connections with the surrounding small towns, which led to the further development of the metropolitan areas. As a new type of urban morphology, the metropolitan areas mean that the joint development of the central cities and their surrounding small towns produced an agglomeration effect and contributed to the rational allocation of resources within the regions. In the developed countries, metropolitan areas have gradually become an important driving force of regional and national economic growth.

Under the reform and opening-up policy, the economic and social development in China has experienced rapid growth and China's urbanization level is increased significantly. According to statistics, by 2020, the level of urbanization will reach 56% -58% (China Urban Planning Industry Development Report, 2008). Under such a background, the cities with close geographic and economic relationships are clustering as vast metropolitan areas, and with the continuous increase of the city clusters' scale, several megalopolises have emerged, such as the Jing-Jin-Ji metropolitan area, the Yangtze River Delta, the Pearl River Delta, etc. (Wang and Bai, 2003). The emergence of large metropolitan areas generates huge economic benefits and promotes a spatial layout for regional economy in terms of resource allocations. Chinese government clearly pointed out that urbanization is the critical task of China's modernization construction (Yang and Gu, 2008). As a result, it can be expected that under the trend of further rapid urbanization and internalization in the future, Chinese metropolitan areas will experience substantial development. Thereby, research on evolution and development mechanism of world's classic megalopolises is of great importance for guiding Chinese megalopolises' reasonable, efficient and sustainable urbanization tracks.

2. Concept of World's Megalopolises

The term "World city" was first proposed by Geddes to describe those cities that hold an important position to the operation of the global system of finance and trade in his book "Cities in Evolution" (Geddes, 1949). American sociologist Sassen popularized the term "Global City" from the producer services' point of view. She pointed out that along with the global economy wave, global cities should be those that take their unique economic advantages in the global capital system to create their unique positions in the world, which are the production and consumption centers with advanced services. (Sassen, 1991). Later, British scholar Taylor studied the concept of world cities network from the perspective of network and node through analyzing the connectivity between large multi-country service companies. He proposed several cities that have global or regional service functions and defined as world cities and established the Globalization and World Cities Research Network (Taylor, 2001). A roster of world cities was outlined in the GaWC Research Bulletin 5 and ranked cities based on their connectivity according to four "advanced producer services": accountancy, advertising, banking/ finance, and law. The major cities include: London, New York, Shanghai, Paris, Sydney, Tokyo, Hong Kong and Seoul.

French geographer Gottmann proposed the term of "Megalopolis" for the mega-cities as the center of densely populated areas in "Megalopolis: or the Urbanization of the Northeastern Seaboard" (Gottman, 1957). The author mentioned that a series of metropolitan areas were formed because of the agglomeration effects in short term, and each metropolitan area was developed by a strong core city. There are two most important impact factors for promoting the megalopolis formation: one is polynuclear structure and the other is the hub effect reflected in the economy of the American eastern shore cities. Gottmann further indicated that in the megalopolitan areas, the development trend of large cities is that a large number of people moved out of the cities over eighty kilometers away to live in suburban areas, but still commuted to the city center for work. The city boundaries were no longer clearly defined and there were more mixed land uses. This trend made the United States Census Bureau introduce the urbanization terminology to distinguish between urban and rural areas within the megalopolis area.

In a subsequent article of Gottmann's, there are six cases in the world of megalopolitan occurrences including: (1) the American Northeastern Megalopolis- from Boston to New York, Philadelphia, Baltimore and Washington D.C.; (2) The Great Lakes Megalopolis-located along the Great Lakes, from Chicago to Detroit, Cleveland, Pittsburgh, and extended to Toronto and Montreal in Canada; (3) the Tokaido Megalopolis in Japan – from Tokyo, Yokohama, Nagoya to Kyoto, Osaka and Kobe; (4) the megalopolis in England - London to Liverpool as the axis, including Greater London, Birmingham, Sheffield, Liverpool, Manchester and other large cities, as well as many small and medium-sized cities and towns; (5) the megalopolis of northwestern Europe - extending from Amsterdam to the Ruhr and to the French northern industrial conglomeration; (6) the Urban Constellation in China-the Yangtze River Delta megalopolis - centered in Shanghai including Suzhou, Wuxi, Changzhou, Yangzhou, Nanjing, and other cities (Gottmann, 1976).

3. Evolution of Megalopolitan systems

The beginning time of development of megalopolis varies between the areas. Because of the unique historical background of each society, the course of each megalopolis area's development is individual path and pattern. However, if we sort out the historical context of the development of the metropolitan area, it can be found that they display common aspects.

First, in the early development stages of the metropolitan areas, the core area stands out because of its unique internal advantages in combination with powerful external forces. With the agglomeration effect, the core area continuously attracts resources and population from the adjacent cities scattered around the area, and leads to the regional development. For example, from 1500s to 1700s, the population in London had experienced an explosive growth and increased from about 75,000 to 575,000. The population expansion promoted London as the core of the megalopolis in England. Shipping business started in the United Kingdom in 1565, followed by the establishment of the Royal Exchange. Then, London became the main northern harbor and the core economics metropolitan area of Europe. (Great London Authority, 2012). Another example in Asia is Seoul as the symbol after the industrial development. In the 1960s, urbanization in South Korea entered a period of rapid growth by virtue of their unique political and economy advantages. A large amount of population flowed toward Seoul and increased from 2.4 million in 1960s to 5.5 million in 1970s.

Subsequently, the rapid and steady development of the core city led to the simultaneous development of small and medium-sized cities around the metropolitan area as an initial megalopolitan shape. Historically, the first and second industrial revolution and the wave of urbanization promoted the continuous expansion of megalopolitan areas. The radius of daily commuting circle increased to hundreds of kilometers, bringing more population into the megalopolitan coverage scope. Core cities in the megalopolitan areas hold the advantages of economy scale, developed market, and sufficient labor resources, which plays a strong role in promoting the rise of small and medium-sized towns within the areas. The city of Paris as the center of the Paris metropolitan area, attracted capital, labor and other factors to agglomerate to the Ile-de-France region. The total population of the Paris region in 1950s was about 6,377,000. Just during the subsequent 150 years, the Paris region's population grew by 11 times and the proportion of population in the whole country increased to 15.7% (Wu, 2005). Meanwhile, its industries in textiles, electronics, automotive and aerospace had a rapid development. Since the Industrial Revolution, Paris has been remaining as France's most important, complete, and concentrated industrial zone.

After the simultaneous development with the core cities, their medium and small size towns in the megalopolitan areas might not always benefit from the core cities. On the one hand, some medium cities may gradually grow into "sub-centers"; on the other hand, the small towns may experience delay in further development due to lack of Metropolitan Development Plan, lack of liberty in development policy and the fact that the core cities occupy too much resources. Meanwhile, excessive centralization and agglomeration in the core cities can cause have some unexpected side effects, such as congestion, inefficiency and pollution. Thus, governments began to intervene in the megalopolitan development. Because of the different national political systems, various approaches had been adopted to solve the problems and led to different results. In 1937, the British government set up the Barlow Commission and proposed to evacuate the population and industries from central London area (Barlow Report, 1940). In the 1960s, the Paris region began to have a strategic shift from a single central structure with the intensive development mode to a multi-center structure for the Paris region (Zhu and Wang, 2004). Japan emphasized on the establishment of regional multi-center city with decentralized network structure mode (Zhang and Lv, 2009). The Sydney metropolitan development prospects planned 27 strategic centers that provide jobs, services and new

housing and 1,000 towns and smaller regional centers in order that the residents can enjoy leisure and services in their local residential areas (Metropolitan Plan for Sydney 2036, 2010).

4. Development Mechanism of Megalopolis

4.1. Spatial structure layout

The development of internal structures of megalopolis mostly follows a similar process. Spatially, they experienced the process from the initial single center structure, to a center surrounded by sub-centers, and then to the integrated multi-center network structure. For example, the Paris city was dominated by a single center during the early development. With the continuous expansion of the region, the spatial structure of the city could not afford its rapid economy and population growth. Then, sub-centers were gradually planned for balancing the regional development. Another example is New York Megalopolis. Before 1870, the cities within the megalopolitan area were developed independently and presented a scattered form. With the megalopolis's suburbanization, some small cities, such as Long Island and Newark, became new sub-centers of population and industry, providing comfortable living environment and more convenient transportation.

4.2. Development and layout of economy and industry

Usually core cities of megalopolises have geographic advantages on economy. New York is one of the important ports serving Atlantic coast to trade with European countries; Tokyo is located in the center of Japan and close to the Gulf of Tonkin; Sydney has the world's largest natural harbor, Port Jackson. The superb locations of these cosmopolitan cities have laid an important foundation for the rise of international trade and serving as international transport hubs. With the industrial revolution, the megalopolitan cities had effectively improved allocation of resources and productivity. London, New York, Paris and other cities became the major megalopolitan development centers. Owing to the popularization of computers, the development of communications industry and the impact of government regulation, the center cities and adjacent small towns in the megalopolitan regions restructured the economic and industrial layout which formed a clear circle structure. Service, finance and high-tech industries dominated the inner circle while the heavy industry and agricultural development dominated the external circle. Meanwhile, the Government's encouragement on decentralization guided the institutions with public functions and research & deployment functions moving to the suburbs.

4.3. Transportation Development

The internal transportation development in megalopolises is influenced by both the urban planning strategy on transportation mode choice and the impact from science and technology development in transportation. Before the Industrial Revolution, the cities of Paris, New York and London all experienced a carriage-driven era. With the application of trains, railway lines linked up the cities effectively. Also, affected by the popularity of cars in the United States, many typical metropolitan areas formed their unique car culture and the scope of metropolitan area was heavily dependent on the distance that commuters can reach by car. The intensified connection between the central cities and adjacent towns resulted in many commuters living in the surrounding towns and driving to work in the central cities. Later, as traffic congestion was exacerbated, governments started discouraging private cars and building multi-dimensional transportation networks. Instead of relying on any single mode of transportation, rail, bus, car, and subway were provided together to meet the diverse metropolitan transportation demands. The travel range and service improved significantly and the central cities and adjacent towns achieved better communications and collaborations.

Back in 1939, Paris had proposed the combined construction of both radiation and loop structure layout for the road network. Later, the rapid economic development brought increased car ownership and resulted in congestions. The government then restricted the growth of private cars and put public transit development as a key strategy. Tokyo metropolitan rail network is another example for public transit development. With the advantages of safety, high efficiency, large volume, high density, and less pollution, the rail transportation network constituted the skeleton of Tokyo's urban transit network.

4.4. Planning and Regulations

In the beginning period of the formation of megalopolises, there was no in-depth and far vision for the Metropolitan Area's planning and development plan. Due to the emerging issues of excessive saturated development, disorganized urban construction, reduced quality of life, insufficient employment of the surrounding towns and unreasonable industrial structure layout, governments would finally introduce remediation development plans for megalopolises, such as the cities of Seoul and Tokyo.

As the metropolitan areas continued expanding, the policy implementation and coordination were more complicated, especially in the formation process of polynuclear urbanized system. Therefore, how to ensure the administrative efficiency, effective sharing of resources, and encouraging interactive mechanisms between center cities and adjacent towns became the most important issues. Most of the world megalopolises formed unified regional executive coordination organizations for the purpose of megalopolitan planning. Typically, New York and New Jersey jointly established Port Authority in 1921, responsible for the entire New York metropolitan area. In 1963, London established the Greater London Council (GLC) in charge of the metropolitan development strategic planning for the London Megalopolis.

5. Conclusions

The development course of the world megalopolises reflects the spectacular evolution of urbanization process. With the rise of the city center and surrounding small towns, megalopolitan regions are formed and display the utilization of natural resources, market mechanisms, and planning visions to shape better living and working environments. In this discussion, we try to figure out evolution and development mechanism of world's classic megalopolises and conclude as follows:

5.1. Geographical and industrial advantages

The center cities of megalopolises in the developed countries mostly became the national economy and trade development center based on their inherent geographic advantages. With the innovation in technologies, these cities completed the industrialization process and accumulated a large amount of wealth and population, providing the foundation for the megalopolitan development.

5.2. New layout and allocation driven by tertiary industry

In the late half of the twentieth century, on the one hand, the labor demand for traditional industries declined under the conditions of specialized and automated industrial production. Meanwhile, the improvement of people's life quality increased the demand for services. Therefore, services and other tertiary industries became a new driving force. On the other hand, with the development of the tertiary industries, the original intensive manufactory industries began to relocate, and in accordance with planning and market mechanisms, industrial enterprises moved out off the urban centers to the surrounding towns for cheaper labor and abundant resources. In this way, a new format of industrial chain is developed in compatible and complementary pattern.

5.3. Multipath counter-urbanization

Megalopolitan market mechanism created a "Matthew Effect", which to some extent expanded inter-regional disparities. With the rapid development of tertiary industries and the issues of explosive population increase and excessive consumption of resources, megalopolises started the counter-urbanization strategy to relieve the crisis. For example, the New York metropolitan area once experienced apparent disorder and endless spread of urban areas. Different country governments conducted their specific development paths. In Tokyo, the Japanese government strictly followed the government-led development pattern to regulate and promote multi-core multi-center development. London was against the freedom policy of land use. British government made efforts in promoting counter-urbanization to help the development of megalopolitan small towns.

5.4. Coordination mechanism of cross-regions administration

In order to solve the cross-regions administration issues in megalopolises and form a clear, unified planning vision, most of metropolises worked out a coordination mechanism in line with their specific implementation at regional levels. The metropolitan commission was established to coordinate individual administration for each member of megalopolises. Meanwhile, the participation of non-governmental organizations and the public involvement in the development of public policy promoted communication and collaboration for the inclusive growth of the metropolitan areas.

5.5. Efficient and multi-dimension transportation systems

The development of every megalopolis substantially relied on efficient and multi-dimension transportation systems. The integration between core cities and adjacent towns inside megalopolis was ensured by the well-developed mass transit systems, which reduced the temporal distances for commuters. The enlarged daily commuting circle promoted the communications of both labor and resources. The spatial development of each megalopolis clearly demonstrated a transportation network oriented pattern, spreading from center to the sub-centers in the network.

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