

# AGGLOMERATION AND RADIATION EFFECT OF THE PULL OF URBANIZATION

QI Jin-li

(*School of Economics, Huazhong University of Science and Technology, Wuhan 430074, P. R. China*)

**ABSTRACT:** In order to explore the train of thought for China's urbanizing development and coordinated rural economic development, and to find good ways of solving rural problems through urbanization, this paper absorbs the push-and-pull forces theory and the systematic dynamic theory in the traditional population migration theories, views urbanization as a dynamic system, makes research on the push-and-pull mechanism of urbanization. The pulling power of urbanization is analyzed according to two aspects, the agglomeration effect and the radiation effect of cities. The agglomeration effect provides continuous propelling force for urbanization, and the radiation effect further accelerates the urbanization process by pushing forward the development of rural economy. Of course, the slow development of urbanization can result in the hindrance to rural economic development.

**KEY WORDS:** agglomeration effect; radiation effect; pull of urbanization

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## 1 INTRODUCTION

Urbanization is an important indicator to the social and economic development and the level of civilization in a country or region. It is also a process of spatial redistribution of population and economy along with the industrialization, in this process, the number and scale of cities are increasing and cities become more and more important to society and economy.

As the center of a region, city usually has more working opportunity, higher income per capita, better social environment and colorful physical and cultural life, so it is very attractive to the resources and population in rural area. Urbanization process can be viewed as a tendency towards the social progress, which can make great contribution to China's economy. According to statistical data (National Bureau of Statistics of China, 1980–2002), the urbanization level rose by 1%, urban infrastructure investment rose  $140 \times 10^9$  yuan (RMB), and the final rise in GDP may reach  $336 \times 10^9$  yuan. Urbanization now plays a key role in pushing on the economic development and appeasing the social conflicts in China.

## 2 AGGLOMERATION EFFECT OF CITY

### 2.1 Agglomeration Effects

Urban economy is an intensive economy linked to densely distributed population and industry, its main characteristics are geographical coherence, specialized production and concentration of assets and technology. Agglomeration is the base of urban economy, it is a systemic factor to increase efficiency and reduce cost by way of scale and space economy.

Agglomeration indicates the spatial concentration of economic activities, according to economic principles, every single economic activity is interrelated with other activities, spatial concentration of economic organizations can produce three results: a powerful collective effect, the concentration of dispersed economic activities and the construction of basic social and economical structure. Basically, urban agglomeration effects include following 5 aspects:

(1) Scale effect: the benefits resulted from the concentration of economic factors and resources, being the main source of urban agglomeration economy. It

reflects not only the economic benefits but also the organic combination of the concentration of productive forces and the intensive use of resources.

(2) Neighboring effect: the economy caused by the concentration of economic activities in urban area. It can be divided into sharing economic benefits, labor market economic benefits and information economic benefits.

(3) Labor-division effect: almost every region or organization can enjoy the benefits from division of labor by spatial concentration, such as socialized service and the cooperation of different production processes. The rise in division of labor and the specialization may result in the transfer of labor forces and other production factors from an industry with lower level of division of labor to an industry with higher one.

(4) Structure effect: the effect on the urban agglomeration by the mode of agglomeration and assembling level of the productive factors, including interrelation effect (effect on the quality of urban agglomeration by the interrelationship among the urban industries); growth effect (redistribution effect which leads the resources towards the department with higher productivity); open effect (the exchange of material, energy and information between city and outside).

(5) Urban field effect: "depression effect" caused by the interdependence among different urban regions. The urban area has densely concentrated energy, advanced infrastructure and higher efficiency, thus the distance-decay regularity emerges in urban acting force on outside.

## 2.2 Contents of Urban Agglomeration Scale

(1) Population scale: Labor is the prime factor of productive factors. Historically, as the development of social division of labor and the expansion of production in a settlement, there was an emigration from outside. When the most of the production of the settlement were non-agricultural production and the whole settlement relied on the imported farm products, the settlement evolved from rural area to urban area. Since the metropolis has the advantages of higher economic efficiency, more job opportunities, varied industries and services, fast increasing income and consumption, the attraction of urban area is great to the population in rural area. With the fast growing immigration, the city becomes bigger and more prosperity (Fig. 1). For example, although the urbanization level is low, in 2002, the deposit of urban inhabitant in China reaches  $8.7 \times 10^{12}$  yuan at the same time, the total

deposit of all the financial institutions amounts about  $18.7 \times 10^{12}$  yuan. Under such a mechanism of urbanization pulling, the settlement grows to a city, and a city becomes a metropolis; the city developed from single functional to multi-functional one, from regional economic center to international economic center (FAN, 1999). On the other hand, the city can also die out because of lose of inhabitants caused by various negative factors such as environment deterioration, climate change, resources exhaustion, war, famine, economic crisis and political turmoil. So the population scale has a close correlation with the rise and fall of a city, without the agglomeration of population, no development of the city can be expected (ATKINSON, 1997).

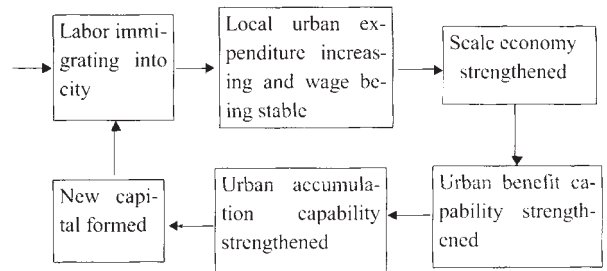


Fig. 1 Conception model of urban labor development

(2) Economy scale: The production and distribution of material goods is the physical pre-condition of the existence of all the society. As the development of production capacity in urban area, more expansive and intensive division of labor and cooperation are needed for the benefits of reducing cost and resulting in economy of agglomeration. With the expansion of industrial production and commodity exchange, new division of labor and economy of agglomeration is formed, and the city scale grows rapidly, from the small town to a metropolis. With the elaborate division of labor and the increase of the department of industries, the industrial type of the city evolves from single one to synthetic one, at the same time, with the service sector growth, the city becomes multi-functional.

(3) Science and technology scale: The development of science and technology has a tight relationship with the social progress, since the population, production and circulation concentrate in city; the urban area thus becomes the center of application and dissemination of science and technology.

(4) Culture and art scale: Urban area is also the center of social superstructure, the new sense and idea usually emerges from the city. With their dissemination, the behavior and thinking of urban residents can be changed and enriched, and the alteration can also

reach rural area by radiation effect, thus causing the development of rural area and the region as a whole.

Like the agglomeration of industries and commodity circulation, the agglomeration of population in urban area is the other side of the problem; their development decides the agglomeration of social activities and the development of urban area.

### 2.3 Key Role of Metropolis in National Economy

The economic benefit has a positive correlation with city scale; the bigger the city scale, the better the economic benefit. In Germany, the output value per capita in the city with a population of  $500 \times 10^3$  is 40% higher than that of the town with a population less than  $50 \times 10^3$ . In China, large cities play a key role in the social and economic development of the country, for example, the top 50 cities had 9.1% of total population, covered 0.9% of total territory (National Bureau of Statistics of China, 1980–2002), but produced 27.1% of GDP, 41% of national revenue and 32.8% of social consumption. In 2002, Shanghai attracted the investment of  $70 \times 10^9$  yuan in real estate (National Bureau of Statistics of China, 2002). According to statistical data of Henan Province, urban agglomeration evolves along with the scale expansion, metropolis with the population more than  $1 \times 10^6$  is the core of regional development, the larger the city is, the more economic benefits it can produce (Table 1). In 2002, there were 1023 high-tech enterprises, with the total output of  $110 \times 10^9$  yuan and the value of export of  $3.5 \times 10^9$  yuan, the high-tech industry now becomes the new power source of urban development. According to the industrial output per square kilometer, the core city is 6.4 times higher than the large city, the large city is 1.6 times higher than the medium one, and the medium city is 7 times higher than the small towns. The space per capita is 90% higher in small towns than in big cities with population more than  $2 \times 10^6$ .

## 3 RADIATION EFFECT OF CITY

There are three aspects of the fast growing of large cities: first of all, in the early-mid period of urbanization, large cities have a tendency of expansion; second, the speed of expansion is higher in the large city than that in the small one; third, the increase index of population proportion is higher in large cities than that in the small ones. All these three aspects are interrelated; they are inevitable tendency of the urbanization. The fundamental reason for the faster growing of the large city is that the large city has stronger economic strength and advantage of agglomeration; it has a powerful radiation effect on the development of periphery and attracts the resources to concentrate in itself. Thus, the large city plays a key role in organizing and leading the regional even national industry allocation and the structure adjustment, to promote the development process of the country (DAI, 2001).

### 3.1 Radiation Effect

Radiation effect indicates that the city, with its advantages in economy, culture, technology, education, human resource etc., drives the development in surrounding rural area. It is a part of growth pole theory. According to the theory, central city is the power source of the development of periphery, it drives the economic development of periphery by the diffusion of innovation, dissemination of information, and the interrelation of industries, so the central city is an important influential factor to the form and development of sub-class cities. The urbanization process not only cause the agglomeration of all the resources into cities, but also bring the urban civilization into rural area, rise the living standard of farmers and change their life and production style into a modern one. Shiyan City, Hubei Province set good example, the Dongfeng Motor Company (its sales reached  $70.48 \times 10^9$  yuan, the total profit reached  $6 \times 10^9$  yuan) plays a

Table 1 The agglomeration benefits of cities in Henan in 2002

	Large city	Medium city	Small town	Total(average)
City number	7	8	23	38
GDP per capita(yuan)	11167	6776	6618	9798
Industrial output per capita(yuan)	14099	9203	6237	8819
Income per capita(yuan)	5179	4492	4375	4682
Consumption per capita(yuan)	6027	3112	2125	3298
Post & telecommunication service per capita(yuan)	627	313	119	286
Savings per capita(yuan)	12419	6493	3312	6180

Source: Henan Provincial Bureau of Statistics, 2002

key role in the economy of the city. Shiyan City now becomes a famous automobile producing base and the

economic center of the region (National Bureau of Statistics of China, 2002).

### 3.2 Radiation Effect of Central City

The extent of the effects of city attraction and radiation to rural area has a positive correlation with the level of agglomeration, the higher the level of agglomeration, the stronger the effects of attraction and radiation, and the more benefits the surrounding rural area gets from the process (Fig. 2). Under the condition of market-economy, the central city is a resources allocation center that covers a vast area. It owns the market of capital, land, techniques, labor and other production factors, with a high-efficiency service sector including transportation, warehouse, finance, education, science & technology, information and so on. The center needs a higher concentration of qualified personnel and investment, and with the concentration, the city function is greatly optimized. The central city drives the development of surrounding cities and whole region by means of technique transfer, industry restructuring, capital export, information dissemination, thus forms the city cluster with the central city as the core. International cities such as New York, London, Tokyo and Shanghai are good examples, and serve not only the city cluster, but also the nation as a whole (FRIEDMANN, 1973). According to statistical data, in view of the percentage of GDP a city contributes to, Seoul is 26%, Tokyo 18.6%, London 17% (GUERIN-PACE, 1995). Since the resources may be wasted if the function of central city is declined, we should make use of central city as the growth pole to drive the regional development and accelerate the urbanization of natural resources.

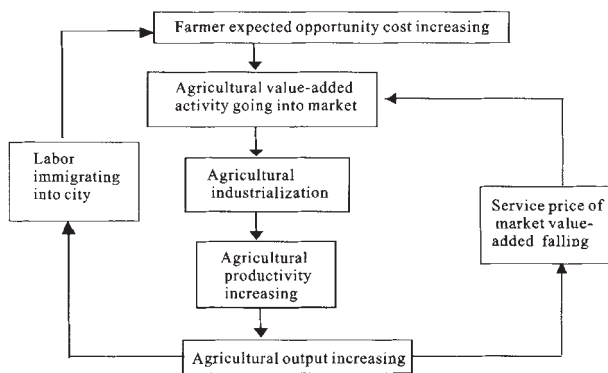


Fig. 2 Conception Model of labor immigrating into city to push the development of rural public department

### 3.3 Urbanization and Radiation of Urban Civilization

Large city has advantages in the fields of geographical location, culture, labor quality and institutions. "Ac-

celeration principle of the popularization of urban civilization" describes the situation that, when certain urbanization level is reached (e.g. 20%–30%), the speed of urban civilization popularization gets higher along with the increase of urbanization level. The radiation of urban civilization increases faster than the speed of urban development, and the area covered by urban civilization is larger than the urban area itself. Study shows that the urban radiation is slim when the urbanization level is lower than 10%; when the level reaches 20%–30%, the radiation increases, and the popularization of urban civilization accelerates, the popularizing rate may reach 25%–35%; when the level is 30%–40%, the civilization popularizing rate will be 40%–50%; when the level is 50%, the civilization popularizing rate 70%; finally, when the urbanization level reaches more than 70%, the civilization popularizing rate may be as high as 90%, and the merge of urban and rural area will be met.

China now has a urbanization level of 36.2%, 8.7% lower than the industrialization level, according to international standard, the gap is great, on the other hand, it indicates that the urbanization in China has great potential. With the process of the economic globalization and China's entry into WTO, the urbanization in China will be accelerated, and it is anticipated that the urban population will increase  $20 \times 10^6 - 40 \times 10^6$  annually, at the end of 2010, the total number of urban population in China will achieve to  $0.45 \times 10^9$ , and the number of cities will rise to more than 1000, the urbanization level will be above 45% (National Bureau of Statistics of China, 2000).

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