

COORDINATED DEVELOPMENT OF INFRASTRUCTURE IN A REGIONAL ECONOMY

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ABSTRACT

1994 was an infrastructure year named by the World Bank which suggested that all member countries do their best in the investment of their infrastructure. The paper studied the roll of coordinated development of infrastructure in regional economy of a typical area such as Yangtze River Basin of China.

The paper studied the following issues:(1)principle of rational layout of regional industries ,rational allocation of natural resources and coordinated development of infrastructure; (2) analysis of the status and problems of infrastructure in the region; (3) modelling and policy testing for analyzing the coordinated development of infrastructure; (4) the impact of coordinated development of infrastructure on regional economy.

Based on theories of system dynamics(SD),urban dynamics, input-output and economics, we created a series of models of system dynamics and econometrics. The paper tried to explore the issues and problems above. Based on model simulating and policy testing, we put forward some suggestions in coordinated development of infrastructure to the regional economy and especially to Yangtze River Basin.

Introduction

The "Development and Opening of Pudong(the east part of Shanghai)" announced in 1990's is one of the major policies of China, which will not only promote the economic development of Shanghai, but also excite a great effect on the future co-prosperity of Yangtze Delta or even of the whole Yangtze River Basin.

As one of the most economically-developed regions of China, Yangtze Basin is enjoying many distinctive superiorities: It has an excellent location and a wide economic base; it has a solid industrial basis and a set of advanced manufacturing industries with high efficiency; the early-initiated reform resulted a much developed economy; the advanced traffic system makes convenient the contact with the outside world; the high-quality education and science and technology provide rich intellectual resources.

But at the same time, there are some factors which limit the economic development of this area: shortage of energy supply and raw material; the shrinkage of the capacity of land with the expansion of economy and the backwardness in infrastructures.

Based on theories of system dynamics(SD), urban dynamics, input-output and economics, through creating a series of models of system dynamics and econometrics, we studied the major limiting factors to economic development and the impacts of the lag of basic industries and infrastructures on economy, and tried to find the appropriate strategies to the economic development of Yangtze River Basin.

The Concept of Economic Region and Yangtze River Basin

An economic region generally has the following essentialities:(1)It must have an economic center of a certain scale and of conglomerate economic capability. A territory of a certain size is also a prerequisite because an economic region must have an area large enough including several neighboring districts as a space to grow and

mature. (2) There must exist close relations among its major industries and among its member parts. Some kinds of organic and coordinated divisions and partnership among them, based on their own superiorities, should be developed. (3) Some necessary material elements, including natural resources, labour and technological resources, productive or non-productive infrastructures, and a coordinated system of primary, secondary and tertiary industries are also required.

From a viewpoint of economic region, Yangtze River Basin is made up of nine provinces and a metropolis, Shanghai. They are located in a broad economic zone along Yangtze River with Shanghai as its "dragon head" and spreading to the western China. The idea of the establishment of such an economic region is based on the following features of this area:

First, it has several economic centers with strong economic strength. Yangtze River Basin not only has a metropolis like Shanghai which can serve as an economic center of Yangtze River area or even of the whole country, but also has a group of over 10 other large and middle-sized cities. They usually function as bases or hubs of industry, finance, trade, transportation, science and technology, and have strong centripetal force on their surrounding area.

Second, the region is not only a place that conglomerates great economic strength of the country, but also shares the largest regional markets of China. With a population of 0.44 billion, it produces 40% of the gross domestic products (GDP) of the whole country. Furthermore, the region has an advanced industry system. It has a solid basis of iron and steel, petrol chemist, automobile, machinery, electronic, ship-manufacturing, textile and various other light industries. Education is much developed in this region where many colleges and universities and research institutes are located. So the labour resource is rich and the quality of the labour is relatively high. Three economic circles of the upper, middle and low reaches of Yangtze River meet there and cooperate with each other closely and are having a harmonious partnership. The cross industrial connections in the area are equally close. The present status of industries in the area has the advantages of mutual complement between industries, mutual promotion of technology and prosperous inter-district trade within itself. The region is also enjoying the mutual complement of raw material, energy supply and many mineral resources among the different parts of the area.

Third, Yangtze Basin has a wide continuous territory, abundant supplies of materials and natural resources in the urban as well as in the rural area of the region. Infrastructures of a considerable scale have been set up, which provides the basis for the formation and evolution of the regional economy.

Stimulations and Obstructions to the Regional Development

As mentioned above, Yangtze River Basin has many favourable conditions for economic development. First, the area is at a favourable geographical location and rich in natural resources. Secondly, the area has a high level of all-around development of industries. A stereoscopic network of transportation and communication of land, water and air has been formed in a certain scale. Third, the area is rich in labour resources, in qualified scientists and technicians especially in high technology. It also has a rather high level of management. For a long time, the region has been a rather prosperous area in China.

But the region also has some disadvantages to the economic growth. Compared with the outside, the area has overpopulation, a rather small amount of arable land, a rather serious shortage of energy and raw material supply, a severe lag of urban infrastructures and relative obsolescence and ageing in equipment and technology. What's more, the development of inter-district transportation and communication in the area can't meet the demand of the economic development at a high speed. Actually the backwardness in basic industries

and infrastructures has become the bottleneck of economic development. For example, from 1978 to 1988 Shanghai invested only 16.5 billion Yuan in infrastructures on electricity, transportation, postal and telecommunication services and public facilities etc. It is only 15% of the national total investment in fixed assets, and 6.7% of the financial revenue of Shanghai. For a long time, because of the low investment in infrastructure, the status of its infrastructures can't match the position of Shanghai as the "dragon head" of Yangtze River Basin. To some extent, this has weakened the radiation and strength of Shanghai as the biggest regional economic center of China. For example, the annual turnover reported by Shanghai Railway Bureau in 1987 was 6.75 times that of 1958, but the mileage only increased 1.8 times at the same time, and the mileage of Shanghai Railway Bureau was only 10% of that of the nation. It can be seen that the great gap between the demand and capability of transportation has limited the economic growth of Shanghai.

The Model

In order to analyze the influence of the limiting factors and the lag of infrastructure on the development of economy, we built a dynamic quantitative model of regional economy which simulates the interaction between the economic variables and the development of basis industries and infrastructures. In the model, it is assumed that the development of economy depends on the status of basic industries and infrastructure, which in turn affects the development of economy. By altering the investment structure, the construction of basic industries and infrastructures can be adjusted. To be convenient, we divided the Yangtze River Basin into two parts: Shanghai and the rest, and studied the mutual influences, mutual promotion and mutual limiting. The simplified cause-effect relations mentioned above and the more detailed flows of material and information are shown in Figure 1 and 2 respectively.

In Figure 2, we can see that the outputs of the various industries are the functions of fixed capital stock, labour, technological factors, and the influence of limiting factors. The outputs (and the stock of capital in the case of energy for example) determine the demands on basic industries (energy, raw material etc.) and the demands on infrastructures. On the other hand, the investment in the basic industries and infrastructures convert to the stocks which decide the capacities. The discrepancy between capacity and demand in turn will influence the production as a limiting factor. Besides that loop, the outputs add up to GDP, minus some outflow of funds, equals the income, which together with some policy, determines the total investment and the investment to each sector: ordinary industries, basic industries and infrastructures.

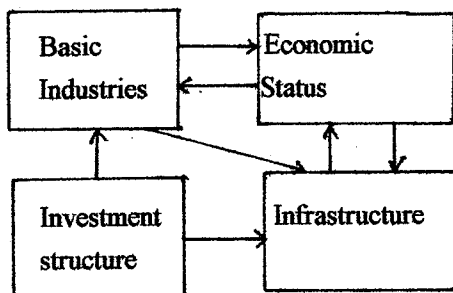


Figure 1. Simplified Feedback Relations of the Regional Economy

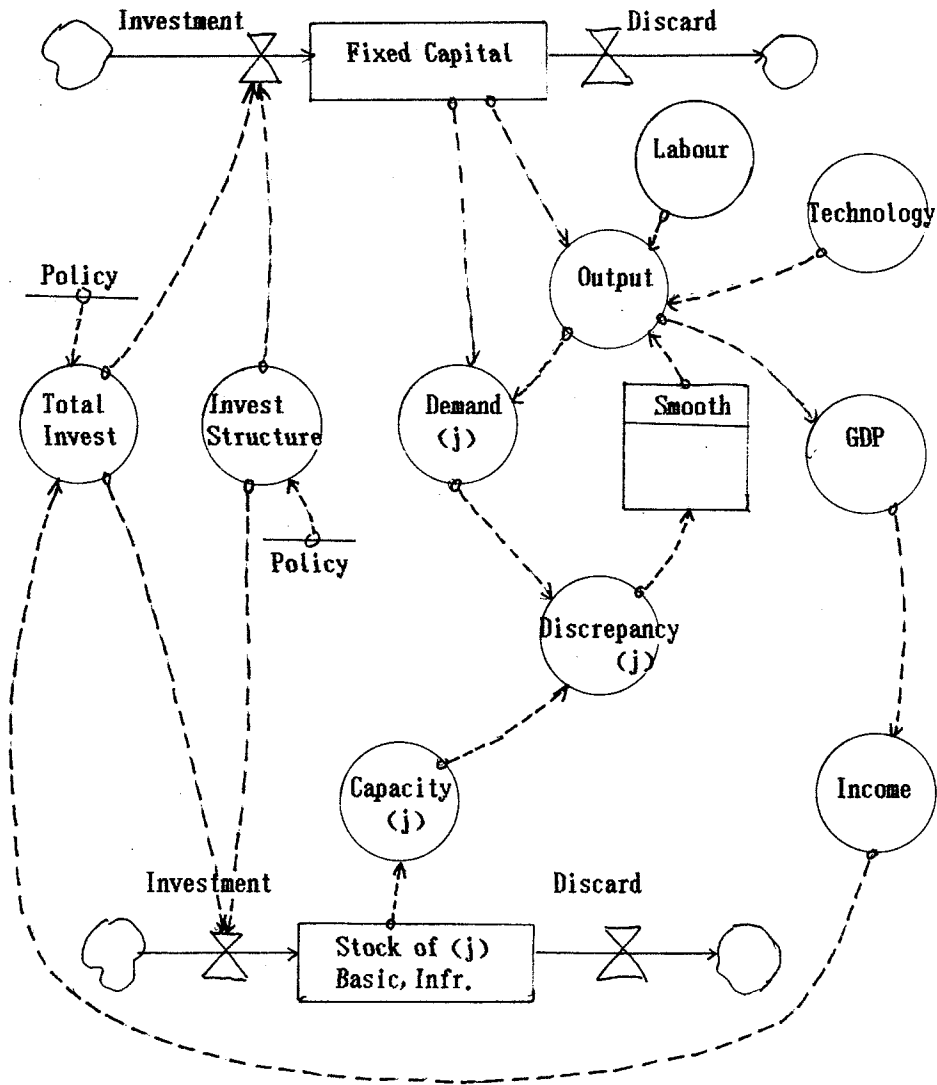


Figure 2. Main Feedback Loops of The Model

Parallel Program

The Policies of the Economic Development in Yangtze River Basin

The regionization of the economy of Yangtze Basin and the coordination of regional development require the formulation of a set of practical economic policies concerning the construction of basic industries, infrastructures, the adjustment of industrial structure etc. The model is under refining, and based on simulating the model, we have some preliminary suggestions on the inaction of such policies, which are outlined as follows:

1. The regional industrial structure is subjected to future adjustment

Regarding the current status of the industrial structure in Yangtze River Basin, we suggest that the structure adjustment follow the following principles: (1) Coordinated development. By enhancing the investment in agriculture, water facilities, traffic, communication, energy, raw material and so on, agriculture should be appropriately positioned, the lag of traffic, communication and the shortage of energy and raw materials and other bottlenecks be removed or eased; (2) Relative superiority. The relative superiority of each of the inner districts should be emphasised on and the dominant industries of each of them should be identified so that rational regional division and the cross cooperation can be established and the best allocation of production factors can be realized.

The model gives a prospect of the variations of the industrial structure of Shanghai and Yangtze Basin. Based on that dynamic analysis, we set up an overall target of the dynamic industrial structure adjustment as shown in Table 1.

Table 1

Industry	Primary	Secondly	Tertiary
1990 (S)	3%	67%	30%
(Y)	29%	46%	25%
1995 (S)	3%	56%	41%
(Y)	26%	44%	30%
2000 (S)	3%	46%	51%
(Y)	23%	41%	36%
2005 (S)	3%	39%	58%
(Y)	20%	39%	41%

note: S refers to Shanghai
Y refers to Yangtze Basin

In order to realize that desired structure, in the near future, much attention should be paid to the mitigation of structure imbalance. The weak links in agriculture, water facilities, transportation, and energy should be strengthened. In the middle and long run, the evolution of the industrial structure must be placed in the most important position so as to establish the coordination on a higher stage. In short, the basic principle of the structure adjustment of Yangtze Basin is to enhance basic industries, to improve the level of infrastructures and to speed up the evolution of industries.

2. Reinforcing the construction of transportation and telecommunication facilities

Transportation and telecommunication are the very frail links of the regional economy in Yangtze Basin. At present, they are far behind the demand of economic and social development. Reinforcing the construction of transportation and telecommunication is an essential step to adjust the industrial structure, to improve the environment of investment and to promote the economy to take off. So we should develop an advanced network of transportation which has more efficiency and fewer roundabout ways.

(1) Construction of water transportation

A new network of water transportation should be developed which links Yangtze River and East China Sea. Taking the river and coastal as the main axis, the ports as the hubs, and the river shipping as the arteries and veins, the shipping condition will be improved and capacity of the river will be raised. According to statistics, the turnover of goods in 1990 was 97.57 billion ton-kilometre and will reach about 650 billion by 2000. To take advantage of this potential is one of our suggestions.

(2) Construction of highway and railroad

A system of highway and first class freeway which links the provinces in the area should be constructed. In the next decade, railroad will still be the main tool for the passenger and freight transportation in a middle and long distance; and highway and waterway will be the main way for freight transportation in a short distance. The key point of the development of such a network is the regional cooperation in funds as well as in projecting.

(3) Construction of aviation harbour

A modern network of aviation transportation including large aviation harbours, international airports should be constructed. The efficiency of airports utilization should be improved by reforming the present airports, and the number of flights should be increased progressively. By the year 2000, the number of airports will be over forty.

(4) Construction of postal and telecommunication facilities

A system of an information freeway from east to west which links northern China to northwestern China, southern China to southwestern China should be constructed to improve capability of communication. At present, Yangtze River Basin shares 28% of the total Exchanges of China, and the percentage will reach 40% by 2000.

3. Reinforcing the energy and raw material industries

The manufacturing industries of Yangtze River Basin are well developed, but the energy and raw material industries are relatively weak. The following way may release this bottleneck:

(1) The principle of shared benefit. By reinforcing the coordination between the industrial base and resource base in the forms of commodity exchanges, the supply of energy and raw material can be ensured.

(2) Seizing opportunity and being active in the development of raw material industries, the shortage of raw material can be made up to support the economic development of the region, and the regional markets can be developed at the same time. The problem of competing raw material and markets with the inferior of the region can also be solved in this way.

In order to relieve the shortage of energy and raw material in the long run, Shanghai and other coastal developed areas should transfer high energy consuming and raw material consuming products and industries to the inferior of the region, and develop the products and industries with high intensity of technology, high intensity of capital, high added value and low consumption of raw material and energy. Thus the division of labour among different areas can be formed and improved progressively.

For decades, Shanghai has had the advantages in its concentrated industries, high economic benefit and high technology level, but because of the low level of energy supply, transportation, and basic industries, these advantages disappeared gradually. In that case, according to the municipal program and arrangement, the tertiary

industries including domestic trade ,finance,science and technology,real estate,information,consultation and tourism will become the dominant industries.The acceleration of tertiary will inevitably force the secondly industries which are highly dependent on energy,raw material and transportation to be transferred to the near area progressively.

New industrial layout will surely pour new vigour into Shanghai and Yangtze River Basin. When Pudong becomes a "dragon head",it will drive the whole economy's development,and promote division of labour and coordination of the area further.The economy of Yangtze River Basin will be taking off in the near future.

Conclusions

Based on the dynamic quantitative analysis of the main limiting factors to the economic development of Yangtze River Basin,we put forward some policies for the development of regional economy.We suppose that Shanghai with Yangtze River Basin will become the engine of Chinese economy in the upper of the twenty-first century.But because of the backwardness in infrastructure and basic industries,the economy growth might be limited.In order to promote the economical development,we must give the investment priority to the basic industries and infrastructure.Through structural adjusting and industrial policies,the shortage of energy,raw material,transportation and postal and telecommunication will be alleviated and the further development of the region will be bright.

References

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