

## A STUDY ON LOCATION OF TOWNSHIP INDUSTRY IN SHANGHAI SUBURBS

Guo Bailin (郭柏林)    Gu Renxu (谷人旭)

(*Department of Geography, East China Normal University, Shanghai 200062, PRC*)

**ABSTRACT:** The township industry in Shanghai suburbs has undergone a rapid development in the past few years. Aimed at studying the spatial law of the township industry in Shanghai suburbs, three kinds of indexes including distribution density, economic benefit, and regional structure are selected and analysed using correlation analysis method. There are 12 indexes in total. It is found that the locational variation of the township industry in Shanghai suburbs conforms to the following distribution equation:

$$y = ae^{-bx} \quad (x > 5)$$

The above equation has been more and more conforming to the real distribution of the township industry. It is obvious that decreasing trend from inner suburban districts to outer suburban districts is an important character of the locational variation of the township industry of Shanghai suburbs. The fact is closely related with the radiation intensity of the urban economy and the locational superiority for the development of township industry. The regional strategies of the township industry of Shanghai suburbs are follows:

- 1) to link the urban and rural areas as a whole and make coordinated development;
- 2) to make use of the locational superiority of inner suburban districts, to speed up technology renovation, and to develop projects and products serving the industry of the central city;
- 3) to improve the investment environment of outer suburban districts and strengthen the attraction for the radiation of the urban economy so as to speed up the development of township industry.

**KEY WORDS:** Shanghai suburbs; township industry, industrial location

Since the 3rd Plenary Session of the 11th Central Committee of the Chinese Commu-

nist Party held in December, 1978, with the implementation of the rural economic policy, the township industry in Shanghai suburbs has been developing rapidly. By 1985, 14,542 enterprises with a total of 1,249,500 workers had been established. Their output value amounted to 9024 million yuan, that is, 7/ 10 of the gross industrial output of Shanghai suburbs, 1/ 10 of the total Shanghai, or 1/ 20 of the township industry output of the whole nation. Thus, the township industry has become the mainstay of industry in Shanghai suburbs and an indispensable sector of Shanghai's industry. The Shanghai suburbs have become the most developed region in China in terms of township industry. Investigation of the patterns and laws of the spatial variation of township industry in the suburbs of this metropolis will not only facilitate the in-depth progress in the study of industrial location theory and the improvement of the theoretical system on rural geography, but also provide scientific criteria for various levels of institutions to work out strategies, tactics and policies about regional development of township industry, thus speeding up the stable and coordinated development of township industry.

## I. SELECTION OF INDEXES FOR LOCATION OF TOWNSHIP INDUSTRY

The locational variation of township industry in the suburbs of a city may be expressed in many respects. Each respect, from its specific viewpoint, reflects the characteristics of spatial variation of township industry. With a view to reflecting the locational variation of township industry in Shanghai suburbs from various respects, after having made appropriate analysis and comparison, 12 indexes have been selected. They are (1) enterprise density, (2) worker density, (3) original fixed asset density, (4) output value density, (5) per capita output value, (6) per capita profit, (7) profit rate, (8) profit from per hundred yuan of capital, (9) percentage of land occupied to total land area, (10) percentage of labour to total rural labour, (11) percentage of output value to total industrial and agricultural output value, and (12) percentage of net income to total industrial and agricultural net income. These indexes may be divided into 3 categories:

Category A—indexes of distribution density (indexes 1–4). The difference in the input (labour, funds, material) on unit land area and the output may reflect the locational variation of township industry in development scale and agglomeration level.

Category B—indexes of economic profit (indexes 5–8). Labour productivity and ratio of input to output in funds may be used to measure the level of economic profit from township industry in different regions.

Category C—indexes of regional structure (indexes 9–12). These indexes are used to compare and show the spatial difference of township industry between different regions in respects of labour structure, land-use structure and status on economic structure.

## II. LOCATIONAL CHARACTERISTICS OF TOWNSHIP INDUSTRY

Taking the distance from the city center (People's Square) to a suburban county government seat as independent variable and the above-mentioned 12 locational indexes in 1980 and 1985 respectively as dependent variables, correlation analysis were made. It was found that the locational variation of township industry in Shanghai suburbs conformed to the following distribution equation:

$$y = ae^{-bx} \quad (x > 5)$$

After testing, it was shown that within the confidence region of 0.05, an overwhelming majority of township industry indexes had very significant locational correlation; moreover, the correlation level in 1985 was higher than that in 1980. This indicates that this exponential distribution equation is capable of reflecting the pattern of locational variation of township industry in Shanghai suburbs and moreover, it has become increasingly conformable to the real conditions in Shanghai suburbs (Fig.1).

From correlation analysis it can be seen that the locational variation of township industry in Shanghai suburbs has two significant characteristics:

### 1. Declining Trend from near Suburb to Far Suburb in Space

The exponential distribution equation  $y = ae^{-bx}$  which conforms to the real conditions of Shanghai suburbs refers to decreasing equation, where  $y$  decreases with the increase of  $x$ . It shows that the real distribution of development level of township industry in Shanghai suburbs is dependent upon its distance from the central city, exhibiting a regular decreasing trend. The township industry in the near inner suburban districts develops more rapidly, having a higher distribution density and a better economic benefit, thus making fast progress in rural industrialization, while the township industry in the outer suburban districts develops relatively slowly, having a lower distribution density and a relatively poor economic benefit, the rural industrialization lagging behind there. In 1985 the various locational indexes of township industry for the inner suburban districts were higher than those for the outer suburban districts by 10–100% (Table 1).

### 2. The Difference between Near and Far Suburbs Has Become More and More Greater in Time

The value  $b$  in the exponential distribution equation reflects the slope of  $y$  variation. The greater the value  $b$ , the faster is  $y$  variation, and vice versa. By comparing  $b$  values in different periods we can find out the trend of  $y$  varying with time. The value  $b$  in variation of various locational indexes of township industry in Shanghai suburbs in 1985 was

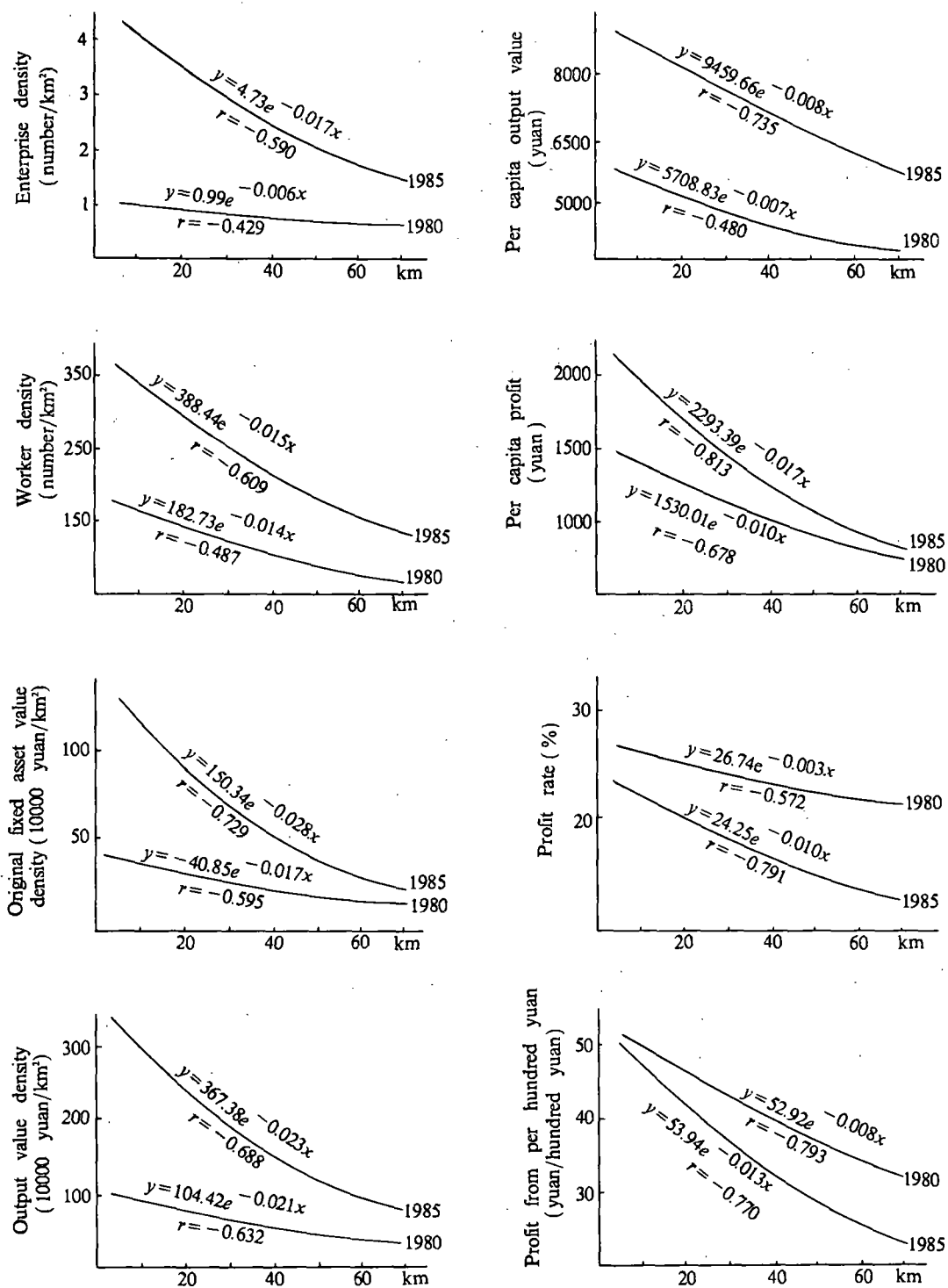


Fig. 1 (a)

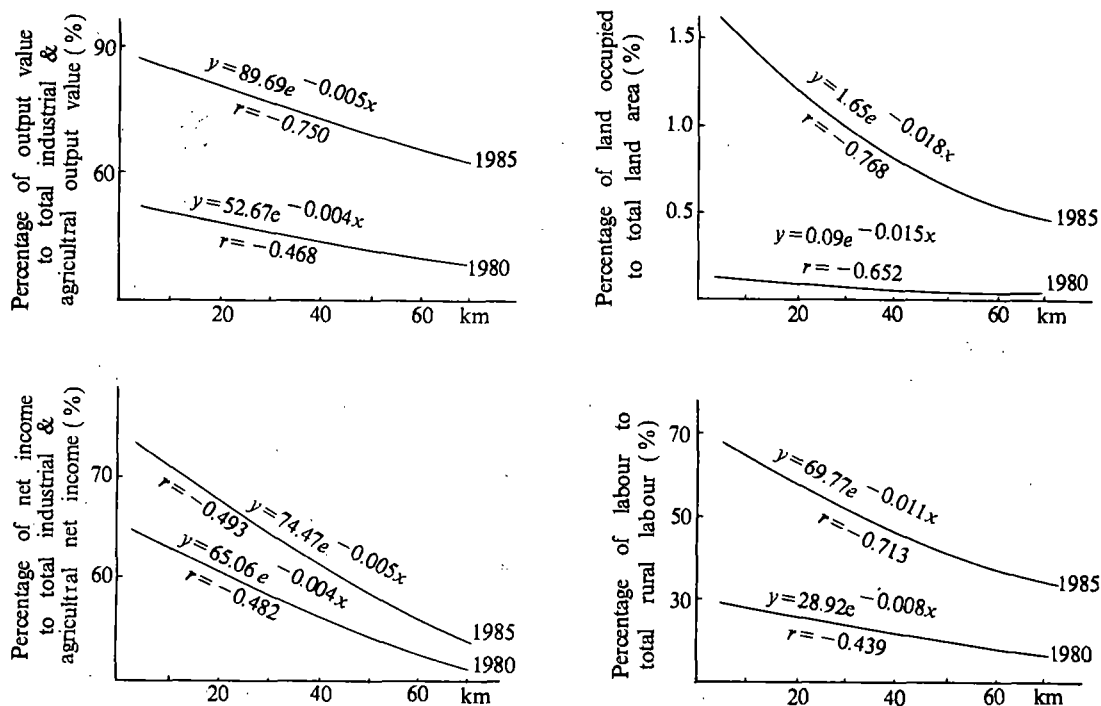


Fig. 1 (b)

Fig.1 Curves showing locational variation of township industry in Shanghai suburbs

0.001–0.011 higher than in 1980. This demonstrates that after the development in the period of the Sixth Five-Year Plan the difference of township industry between near and outer suburban districts has become increasingly greater not only in terms of development scale, agglomeration level and economic benefit, but also in status on regional economic structure. The difference in various locational indexes of township industry between near and outer suburban districts in 1985 was 100–300% greater than in 1980 (Table 2).

### III. FACTORS INFLUENCING LOCATIONAL VARIATION OF TOWNSHIP INDUSTRY

The locational variation of township industry in the suburbs of a city is closely related to the intensity of urban economic radiation and the difference in locational superiority for developing township industry in the suburban areas. The economic growth of a city as regional economic centre must radiate toward the surrounding area, especially the suburban area. The greater the scale of a city, the more intense the economic radiation and the greater the influence on the suburban area. The intensity of economic radiation from a city has a gradient variation in space. It gradually decreases from inner suburban districts toward outer suburban districts with the increasing distance from the city. Moreover, there is ap-

parent areal difference in socioeconomic conditions for developing township industry in suburban area—inner suburban districts better than outer suburban districts. The former is more capable of absorbing urban economic radiation for developing production. This is the basic reason why the township industry in inner suburban districts grows earlier and faster with a better economic benefit and a higher regional status as compared with outer suburban districts.

**Table 1 Regional difference in development of township industry  
in Shanghai suburbs (1985)**

Indexes	4 counties in inner suburban districts	6 counties in outer suburban districts	Inner suburban districts higher than outer suburban districts (%)
Enter prise density (number/ km <sup>2</sup> )	3.63	2.04	77.94
Worker density (number/ km <sup>2</sup> )	303	179	69.27
Original fixed asset value density (10,000 yuan/ km <sup>2</sup> )	90.82	45.60	99.17
Output value density (1,000 yuan/ km <sup>2</sup> )	244.21	118.11	106.76
Per capita output value (yuan)	8056	6585	22.32
Per capita profit (yuan)	1595	1010	57.92
Profit rate (%)	19.80	15.33	29.16
Profit from per hundred yuan (yuan/ hundred yuan)	41.45	29.74	39.37
Percentage of land occupied to total land area (%)	1.17	0.66	77.27
Percentage of labour to total rural labour (%)	56.32	41.07	37.13
Percentage of output value to total industrial & agricultural output value (%)	80.70	71.55	12.79
Percentage of net income to total industrial & agricultural net income (%)	69.39	60.45	14.79

**Table 2 Temporal variation in regional difference of township industry in Shanghai suburbs**

Indexes	1980	1985	1985 greater than 1980 (%)
Enter prise density (number / km <sup>2</sup> )	0.24	1.59	562.50
Worker density (number / km <sup>2</sup> )	62	124	100.00
Original fixed asset value density (10,000 yuan / km <sup>2</sup> )	15.05	45.22	200.47
Output value density (1,000 yuan / km <sup>2</sup> )	36.59	126.10	244.63
Per capita output value (yuan)	742	1470	98.11
Per capita profit (yuan)	225	585	160.00
Profit rate (%)	1.1	4.47	306.36
Profit from per hundred yuan (yuan / hundred yuan)	5.36	16.18	201.87
Percentage of land occupied to total land area (%)	0.03	0.51	1600.00
Percentage of labour to total rural labour (%)	5.46	15.25	179.30
Percentage of output value to total industrial & agricultural output value (%)	4.24	9.21	117.22
Percentage of net income to total industrial & agricultural net income (%)	2.80	8.94	208.27

So far as Shanghai suburbs are concerned, the township industry is lacking in both raw material and energy. Although the local agricultural production has well developed, providing relatively abundant products, a considerable part of them (vegetable, meat, fowl, egg,

fish) is directly sold on market without processing, while the rest (grain, cotton, rape seed) amounting to 94% are processed by 200 odd state-run mills. Therefore, the township industry in Shanghai suburbs has to depend upon the central city; it serves the central city and receives the economic radiation from the latter, thus developing along the road of "suburban-industry type".

Shanghai is China's largest comprehensive industrial base and port for external trade. Its industrial output value accounts for 1 / 10 of the country's total; its export equals 1 / 6 of the country's total export. Since the founding of the People's Republic of China, with a view to dispersing industry of the central city, reallocation of industry has been attempted several times. New industrial districts and industrial satellite towns have been successively set up in suburbs, a number of factories moved there. However, due to rapid development of production, most enterprises remain in the built-up area, making use of every bit of spare space and undergoing reconstruction on the spot. Thus the phenomenon of excessive concentration in industrial allocation left over from the past has not been basically solved. In an area of 141 square kilometers belonging to the original city, the industrial density reaches 34 enterprises, 14,000 workers and 360 million yuan output value per square kilometre. Such extra-intensive spatial structure leaves little leeway for developing production, seriously hindering technical reconstruction and restricting the development of new products. The further development of urban industry has been hampered, while the disposal of industrial wastes restricted accordingly. Pollution of environment has become more and more serious. Hence, in order to solve the contradiction between the rapid growth of industry and the limited spatial capacity of urban industry, and overcome the various demerits caused by extra-high density of urban industry, since the 1970s, especially from the early 1980s in the process of urban reconstruction and industrial reorganization, the Shanghai Municipality has adopted various measures, such as moving factories to other places, committing other factories to handle processing, technological cooperation, devolving work on subordinate factories and technique transfer, thus dispersing industrial projects and products to suburban rural areas while providing them with equipment, technical personnel, material supply, sale and marketing intelligence, credit, taxation and other supports. For the present more than 70 corporations belonging to various industrial bureaux have established long-term production relationship with enterprises of suburban township industry. The external trade institutions have appointed 300 odd suburban industrial enterprises as their direct processing agents. In an effort to intensify economic exchange between urban and rural areas, the industrial, external trade and commercial institutions in the urban area have abolished their demarcation in terms of ownership, sector and regional jurisdiction and set up 1000 odd joint-run enterprises with various levels of suburban rural institutions, thus further strengthening the relationship between the urban and rural areas.



Due to the impact of intense radiation from the urban economic growth, the stigma of urban economic radiation firmly attaches on the township industry whose departmental structure is quite akin to the urban one. Machinery, chemicals, textile and sewing are the four major departments. Out of the total output value of 9,024 million yuan, 33% belong to the service for the urban large industry and 14% service for external trade or export. A considerable percentage belongs to domestic products to meet the needs of urban inhabitants. From this we can see that the urban economic radiation serves as the lifeblood of suburban township industry, providing the latter with a sound material foundation for its existence, growth and expansion.

However, the radiation of urban economy towards suburbs is still constrained by the difference in locational superiority between near and outer suburban districts. The inner suburban districts have the following locational superiority:

1) Shorter distance from the central city. Some inner suburban districts are adjacent to the city proper; others are only two hour's drive distant. Their superior geographical location is very favorable to cooperation with urban industrial enterprises, provision of complementary service for them, saving mileage for transportation of material, parts for processing and products, easy communication with the urban industrial, external-trade and commercial departments, on the spot instruction and guidance by scientific and technical personnel and transmission of market information.

2) Much more industrial districts. Since the founding of the People's Republic of China, 10 odd industrial districts and industrial towns have been constructed in Shanghai suburbs. Except industrial districts of Beixinjing, Pengpu, Wujiaochang and Changqiao which have already been incorporated into the city proper, most of the others are located in inner suburban districts (e.g. the Taopu Industrial District). The development of these industrial districts and industrial satellite towns makes the nearby subcounties (townships) and villages be subjected to double radiation of economic growth from the central city and industrial districts, or satellite towns. Thus the township industry is developing more rapidly there.

3) Convenient traffic. Shanghai suburbs have a dense system of highways, especially in inner suburban districts, the density of roads open to automobile traffic reaches 3.05 km / km<sup>2</sup>, much higher than 1.98 km / km<sup>2</sup> of outer suburban districts. Major transport lines including Yunchuan, Hutai, Huiyi, Caoan Xumin and Longwu lines, exhibit a radiating pattern, extending from the city proper to Zhejiang and Jiangsu provinces through near and outer suburban districts. These transport lines are in favour of the near-suburban township industry along them. Moreover, in the inner suburban districts there are major railway marshalling yards (Zhenru, Nanxiang, Anting, Pengpu and Hejiawan marshalling yards), ports for external trade (No.9 and No.10 cargo-handling districts) and Hongqiao International Airport, all of them facilitating the import of raw material of industry and the export of products.

4) Abundant labour resources and numerous craftsmen. In inner suburban districts the population density is higher; one worker has only 0.064 ha of land on an average, or 0.024 ha less than a worker has in outer suburban districts. The abundant labour supply not only meets the needs of production of vegetable and non-staple foodstuff in inner suburban districts, but also provides a better labour conditions for township industry both in quantity and quality as compared with outer suburban districts. The rural workers in inner suburban districts are more qualified; many of them are enterprising and anxious to learn whatever is novel. Moreover, in the past these places were well developed in a variety of handicraft industry. Today many retired workers live there. All these are considered inherent superiority for township industry to introduce new projects and renovate products, technology and equipment for developing production.

5) Relatively strong economic capacity. In 1985 the mean profit (accumulation of capital) of a subcounty in the inner suburban districts from its agricultural, sideline and industrial production was estimated at 7.58 million yuan, or 74% higher than that in outer suburban districts. This provides a better financial support for accepting large projects and jobs dispersed from the urban industry as compared with the outer suburban districts.

Due to the above-mentioned locational superiority the inner suburban districts is stronger than outer suburban districts in terms of absorption of the urban economic radiation. The township industry emerged earlier and developed faster in the inner suburban districts. As early as in the early 1970s, taking advantage of their locational superiority and seizing the opportunities that turned up, the township industry in the inner suburban districts with the support of the related departments of the Municipality accepted processing jobs and other orders from large factories and corporations of external trade. In 1975 the per capita industrial output value by rural population in the inner suburban districts was given at 314 yuan, or 46.05% higher than that in the outer suburban districts. The mighty advance of the township industry in the inner suburban districts called for training personnel, raising technical level, accumulating funds and supplementing equipment, thus improving the investment environment and strengthening the absorbing capacity for urban economic radiation. A broader horizon for production has been presented before the near-suburban township industry so that it is gradually changing its old attitude "like a hungry person who is not choosy about his food" and seeking for an optimum allocation. It is capable of readjusting sectoral structure, screening projects and production items, and renewing products according to economic benefit, stability in conditions of production, supply and sale and the impact on environment, while improving its capacity of sustaining any change in price of material and the demand of market and speeding up the progress of industrialization.

Outer suburban districts are more distant from the city proper; the feedback of market information lags behind. The transport of material and products takes a longer distance. The environment for investment is less favorable. The attraction for large urban industry is

comparatively weak. The urban industrial and commercial institutions are usually reluctant to appoint processing agents or set up joint ventures in outer suburban districts. The locational conditions are relatively poor and the development of township industry is slow. Most of the production projects and items decentralized to outer suburban districts are those unsuitable for inner suburban districts or refused by them in accordance with the principle of opportunity cost. Some projects and items are of "self-production and self-sale" in character. A considerable part of production is unstable without fixed supply of material and market; its cost of production is relatively high and the level of economic benefit rather low. Here lies the main reason why outer suburban districts lag behind inner suburban districts in the progress of industrialization.

#### IV. REGIONAL STRATEGIES FOR DEVELOPING TOWNSHIP INDUSTRY

1. To link the urban and rural areas as a whole and make coordinated Development. In the last several years due to the intense radiation of urban economy, the township industry in Shanghai suburbs has been developing very rapidly. Compared with 1984, the value of output from township industry increased by 48.39% in 1985, far exceeding the growth rate of industry for the whole city. The part of increase in output value accounted for 34.52% for the city. Thus the township industry has been an indispensable component part of the city's industry. Interdependency, mutual encouragement and coordinated development between urban and rural industries have become the necessary trend in development of Shanghai's industry. In order to give full scope to the respective superiority of urban and rural areas, link the urban and rural industries as a whole and develop township industry in suburban areas, we should break the separation of urban areas from rural areas and overcome the contradiction between the division by departments and the division by regions; work out development plans of various professions to integrate urban industry with rural industry; and intensify the radiation of economy, science and technology, technical personnel, material resources and information from the urban areas to the suburban areas. Various types of industrial groups should be formed to carry out specialized and combined production, with urban industry acting as "locomotive" and township industry as "wagons" for manufacturing local products of famous brands and other high-quality products. The dispersion of industry from the urban areas to the suburban areas should be implemented step by step in a planned way. While each keeps its respective specialties, the urban industry and township industry should properly share out jobs and cooperate with each other in a closely-integrated regional industrial structure in which the industrial productive force will be better allocated. Moreover, Shanghai suburbs should fully utilize the advantage of being adjacent to the nation's largest port of external trade and actively develop export-oriented township industry.

2. To make use of the locational superiority of inner suburban districts to speed up

technology renovation, and to develop projects and products serving the industry of the central city. The township industry in the inner suburban districts has been built on a relatively sound foundation. In the future full scope should be given to its locational superiority while readjustment in trade structure should be proceeded with in order to develop complementary projects and product for serving the industry of the central city. The distance between the master factories in the city proper and the subordinate complementary factories in suburbs should be minimized in order that the enterprise allocation specialized cooperation between them will be more compact and a lot of mileage for transporting material, parts for processing and products will be saved in favour of reducing transport cost and raising overall economic benefit. The present pattern of randomly-scattered factories in suburbs should be changed. With the renovation of equipment and upgrading or replacement of products in the industry of the central city, the requirements for the suburban factories serving it have been raised accordingly. In recent years the township industry in the inner suburban districts developed mainly by means of setting up new factories, expanding the scale of production and raising labour intensity for increasing the value of output. As compared with 1980, the numbers of enterprises and workers increased by 229% and 100% respectively, while the original fixed assets value per capita only increased by 38.54% in 1985. Thus the conditions of obsolete equipment, backward technology and low-quality products have not been basically improved.

3. To improve the investment environment of outer suburban districts and strengthen attraction for urban economic radiation so as to speed up the development of township industry.

The locational conditions in outer suburban districts are relatively poor and the intensity of urban economic radiation to them is also weak. So the township industry is comparatively backward. Most of subcounties and villages have surplus labour. Under such circumstances the development strategy of township industry should be focussed on improvement of investment environment and construction of infrastructure including roads, water and power supply. Besides, preferential policies should be given them in terms of taxation, credit, material supply, projects arrangement and personnel. By active assistance and support to township industry in outer suburban districts it can reduce its distance from the locational superiority shared by inner suburban districts and strengthen its attraction for urban economic radiation. Thus more enterprises in the central city would like to cooperate with their counterparts in outer suburban districts, appoint processing agents or set up joint enterprises there. Making use of their advantageous conditions, including relatively low labour prices and abundant land resources, enterprises in outer suburban districts may develop labour-intensive projects and products as well as non-staple foodstuff processing so as to absorb surplus labour and gain additional value for their non-staple foodstuff. Thus the imbalance in development of township industry in Shanghai suburbs will be improved. An overall growth of rural economy in the suburbs will be implemented.