

INDUSTRIAL TRANSFORMATION OF SHENYANG CITY

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ABSTRACT: Industrial transformation represents a unique economic phenomenon in China's regional economy, and old industrial city reconstruction has long been a key problem that affects state security. As a typical old industrial city in China, Shenyang established its heavy industrial city position in the First Five-year Plan period (1953–1957), and this industrial structure has been consolidated for a long time. After 1978, Shenyang began its long lasting industrial reconstruction in an all-round way by 3 main initiatives including restructuring economic system, upgrading traditional industrial technology and developing high-tech industry. In the end of the 1990s, it could be identified that remarkable structural changes took place in city economy at large as well as individual industrial sector. According to the GDP proportion change, Shenyang is on the way to a high level industrial structure. The secondary industry also engendered significant shifting as smelting and textile industry declined sharply but IT industry increased largely. Although the ratio of the heavy industry to the light industry changed periodically, the heavy industrial output value most time kept a high proportion over 60% of the gross industrial output value in the past five decades. Shenyang has favorable conditions for developing equipment manufacturing industry, but it should carry out the program by establishing its leading role in urban economy plan, building "Theme Industrial Parks", improving Tiexi Industrial Zone, removing any kind of system barrier, enlarging private and other ownerships economy and improving technology, marketing and management by IT application. In response to economy globalization, Shenyang needs to expand the cooperation worldwide and improve the cohesion with surrounding cities.

KEY WORDS: industrial transformation; industrial structure; urban development; Shenyang

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1 INTRODUCTION

Shenyang, one of the largest industrial cities in China, has undergone a very arduous regeneration process since China initiated its market-oriented reform in the end of the 1970s. Shenyang was well known as a heavy industrial city in the past, with a very comprehensive industrial sector of manufacturing machine tools, transmit and transform electricity equipments, aircraft, automobile, medicine, metalwork, textile, construction materials etc. As the central city of Northeast China at large, it plays a key role in finance, commerce, transport, technology and culture. In 2000, Shenyang was the sixth largest city in China by nonagricultural population in urban planned area. The city administrative area is $12.98 \times 10^3 \text{ km}^2$ that is made up of 9 districts and 4 suburban counties with a total population of $6.85 \times$

10^6 , of which 3.95×10^6 is nonagricultural. Being the provincial capital of Liaoning Province, it consolidates with surrounding large-and medium-sized cities constituting the fourth largest agglomeration in China (Fig. 1).

Industrial transformation in Shenyang has both economic and political significance, as it is a famous old industrial city that has long been a key experimental city for state-owned enterprises (SOEs) reform. China's reform and opening up have achieved great economic success in the southeast coastal areas, but it has brought about a big regional disparity too. The spillover effects of the southeast coastal areas is by no means significant as expected (BRUN *et al.*, 2002). Old industrial cities particularly in Northeast China are still struggling for surviving. Politically, it is lack of stringency for displaying progressiveness of the socialist market

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Fig.1 Location of Shenyang City

economy with Chinese characteristics if there is not great breakthrough for old industrial transformation. Chinese government addressed that China would take a new road to industrialization in the 21st century, and emphasized support for industrial transformation of the Northeast China and the like. This means that Shenyang will meet new opportunities to deepen the ongoing industrial reconstruction. However Shenyang is confronted with very intricate problems in restructuring SOEs, adjusting urban industrial structure and settling down hundreds of thousands of laid-off workers (LI and LI, 2001). The paper attempts to find some policy implications by exploring the urban industrial transformation process.

2 FORMATION OF HEAVY INDUSTRIAL CITY

Shenyang is located at the bank sides of the Hunhe River, and is open to the Liao River Plain. Around the city, there are very abundant mineral resources such as coal, oil and iron etc. The favorable natural endowments have cultivated a long city history, but rapid growth happened in the last century, particularly after 1948 when the People's Liberation Army emancipated Shenyang in the civil war, the city became an important industrial city of the People's Republic of China.

In the 1950s, it was the heydays of Shenyang as the city gained the rapid developing opportunity from the First Five-year Plan (1953–1957). And 6 of the 156 state key projects assisted by the Soviet Union were distributed in Shenyang (WANG, 2002). These projects had laid a primary foundation for the city economy structure and sustained a long period of growth to the

1970s. During this period, the total investment in basic construction from the central government amounted to 1.61×10^9 yuan (RMB), and 1.11×10^9 yuan of which was put in the secondary industry, accounting for 4.4 percent of the state total; 0.85×10^9 yuan was put in the machinery industry. There were totally 1500 construction projects in the First Five-year Plan period in Shenyang. By implementing these projects, Shenyang had attained to a high level in manufacturing aircraft, machine tools, pneumatic tools, electrical wire and cable, ventilator, heavy mining machine, large-scale transformer, high and low voltage switch, steel-making stove, sanitation ceramic, agricultural chemical, refined food etc. The industrial products were allocated to the whole country and sold to 50 countries worldwide. By 1957, gross output value of the secondary industry went up to 2.39×10^9 yuan, which was 3 percent of the whole nation. Shenyang became the third largest industrial city in China.

At the beginning of the Second Five-year Plan in 1958, Chinese government launched a political and economic movement that is well known as "the Great Leap Forwards" (GLF). The GLF movement quantitatively swelled up urban industry, the gross industrial output value was up to 6.37×10^9 yuan in 1960, which was 1.7 times as much as that in 1957, and 5.1 percent of the whole country (Municipal Chronicles Office, 2000). This figure was only next to Shanghai, Tianjin and Beijing. The main products such as melting equipment, generator and electromotor increased by 10 times, moreover some kind of products such as automobile, tractor, plastic, cement were firstly produced in this period. As a result, at the end of GLF movement, Shenyang was deeply transformed to be a very important industrial base under the help of the whole country, and it began to produce great returns to the country. In the GLF period, under the planned-economy, 29 150 technicians and administrators were sent to help other cities, over 80%–90% products were allocated across the country by the central government, which included 37 524 metal-cutting machine tools, 145 551t mining equipments, 23.80×10^6 kilo volt-ampere transformers, 37 778km cable, 159 704 interchangeable equipments, 2.43×10^6 standard cases of tabulate glass, 7449t caustic soda (Municipal Chronicles Office, 2000). The total profit handed in the central government amounted to 2.75×10^9 yuan, which was more than 2 times the investment on the basic construction from the central government in the same period. However the rapid booming up had brought negative impact on urban economy. The biggest problem was a consider-

able unbalance between heavy industry and light industry and among other sectors. For instance, the ratio of investment in heavy industry to light industry was 20:1 in 1960, compared with 14:1 in 1957. Investment in heavy industry was 12.1 times as much as that in light industry in the same period. Unbalance investment was detrimental to light industry and heavy industry to the very end. Heavy industry biased policy had a long impact up to now.

From 1963 to 1965, under the central government principle of "Adjustment, Consolidation, Replenishment, Improvement", Shenyang City put forward a policy of "compressing heavy industry, enhancing light industry, and prolonging service line to agriculture". The policy had a very positive impact. Mining, smelting and machinery sectors were cut down as planning, while most light industrial sectors were improved. By the end of 1962, the heavy industrial proportion had been down to 62.7 percent. In accordance with the structural change, a large number of enterprises were closed or merged with others, and urban population decreased. There were 617 enterprises in 1960, nevertheless, the number decreased to be 436 by 1962, with 29.3% enterprises being cut off (Municipal Chronicles Office, 2000). By September of 1963, Shenyang had almost finished cutting down the overdeveloped enterprises in GLF period, which led to 293×10^3 jobs loss and 461×10^3 citizens decrease. Adjusting policy was well paid off. In the end of 1963, most difficulties were overcome, and up to 1965, the whole urban economy began to change better. Unbalance industrial structure was optimized, the ratio of the heavy industry to the light industry recovered to that of 1957, most industrial sectors proceeded steadily. From 1963 to 1965, annual average increasing rate of gross industrial output value was 21.7%, which surpassed that of the First Five-year Plan period. However the growth rate of heavy industry was 25.24% annually, which was still much higher than the 15.5% of the light industry. It was marvelous that almost all industrial products attained higher records than ever before. Moreover, profound improvements were achieved in producing technology and the product quality improved notably. Two hundred and eighty-three kinds of main products had reached the state advanced level, 20 out of the main products had reached the international level.

From 1966 to 1975, namely the Third and Fourth Five-year Plan periods, the whole country was rolled into an unprecedented disastrous political convulsion—"the Great Cultural Revolution". The long lasting social turmoil badly damaged the national economy. It is

estimated that the total GNP loss during the 10 years was more than 6×10^9 yuan in Shenyang (Municipal Chronicles Office, 2000). The industrial profit decreased sharply too, from 680×10^6 yuan in 1966 to 200×10^6 yuan in 1968, and the downtrend kept until 1976. There were 27 enterprises in deficit in 1973, the number increased to 45 in 1976. Not the less, the most serious problem was the loss of a large number of the persecuted experts and technicians in varied sectors, which directly affected innovation of technology and products. There were only 640 new products developed by the key enterprises in the 10 years, the number was merely one third of those in the Second Five-year Plan period. In conclusion, during the period of "the Great Cultural Revolution", Shenyang industry was generally in stagnation or retrogressed a lot except for commencing some new sectors such as electronics industry and chemical industry.

In the Fifth Five-year Plan period from 1976 to 1980, China was going into an era of transformation from the planned- to market-economic system. After 1978, the Chinese government readdressed the principle of "Adjustment, Consolidation, Replenishment, Improvement" as implemented nearly 20 years ago. Shenyang began to restructure its economy and society, and the restructuring program was much effective and made preliminary achievement by 1983. Most works in the Fifth Five-year Plan period were recovering economy on the edge of collapse, though the regeneration works were far from accomplishment.

To sum up, the transition process in the past three decades, indicates that the largest achievement was the establishment of heavy industrial foundation under a sheer planned-economy system, urban economy basically was developed in light of an extensive growth mode, and a very rigid heavy industrial structure was formed. Regretfully, little attention was paid to intensive growth; there was a small part of investment in developing new technology. Consequently, by the end of the 1970s, overall industrial technological level was dropped behind, and there were a great deal of reconstruction works left.

3 RECONSTRUCTION OF OLD INDUSTRY CITY

3.1 Restructuring Economic System

Corresponding with the national overall situation, Shenyang was approved of the experimental city for urban economic reform in 1984, then transforming the old industry was given high priority over the other

works. The first step was to tackle economic management reform by giving more rights to enterprises to make them act on their own, breaking down traditional allocation pattern that both the enterprises and workers got "free lunch" from state and enterprises respectively so as to motive creativity of enterprises and workers. In the middle of the 1990s, as the reform went deep, Shenyang further clarified its objective to formulate a modern corporate system, and began to standardize the system by mobilizing the existing state-owned assets, transferring creditors rights to shareholders, restructuring enterprises by allying, merging, lease, contract, trusteeship in accordance with the principle of "Clearly established ownership, equal right with responsibility, separation of administration from enterprise and scientific management". In the end of 1998, 100 percent of the state-owned assets were authorized to contractors, and there were 75 large share-holding corporations Ltd, 2269 state-owned and collective-owned corporations Ltd, 327 share-holding corporations, and 17 corporations for running municipal state-owned assets, 450 small-sized enterprises (Statistical Bureau of Liaoning Province, 1999). The second step was to restructure branch function by breaking down out-dated administrative model, and setting up a new management mechanism according to the internal laws of enterprises and market. Much attention was paid to restructuring tertiary, construction sector and scientific research. The third step was to transform finance and credit operation system. Since then it has been legitimate for investment flowing among different sectors or industries, and individuals were allowed to invest in enterprises. The fourth step was to change government function by simplifying government departments and transferring more decision rights to enterprises, enhancing municipal function in planning, coordination, servicing and supervision, establishing and improving four systems of decision-making, consultation, execution and information. But the most important breakthrough was the separation of the government function from enterprises management and from all the competitive economic activities. Most governmental branches in relation to economy activity were transformed to be enterprises with clear responsibility.

Another breakthrough happened to industrial internal restructuring. Blockades among sectors, branches and areas were removed, new production patterns of specialization were set up, so that Shenyang could march ahead towards reorganizing production procedure according to specialization principle and developing technological cooperation among varied enterprises at mul-

tipple levels. Large- and medium-sized enterprises acted as the vanguards in the development of new brand products by ways of integrating similar technology, applying production factors including funds, labor forces, technology, equipments and workshops etc., making corporation among manufacturing, banking, distribution and trading, and building centers for transport, storage, accounts settling and market information.

Additionally, restructuring the rural and urban collective economy was auxiliary measures for the all-around city transformation. On the basis of the practical status in the suburban counties, Shenyang had made another round of adjustment on productivity layout in such aspects as developing and improving industries with local advantages; pooling talents, funds and technology for a few promising establishments; changing the single industry to a more diversified economy of agriculture, industry, commerce, catering trade and transport.

3.2 Upgrading Traditional Industrial Technology

In consideration of the poor situation of the out-dated technology and equipment constituting most enterprises at the initial stage of reform and opening up, to upgrade technology became a very imperative task for industrial transformation in that time, though this remains to be an tough work up to now. Shenyang began to cut the "Gordian knot" by ways as follows. The first was the reconstruction of the pillar industries rather than all industries by attracting foreign direct investment and importing technology, in order to make a holistic improvement on technology, equipment, management and marketing and so on. Among all sectors, equipment manufacturing was given priority. In light of principle of "grasping the major and deregulating the minor", Shenyang approved of 30 key corporate groups to be supported in priority by 2000. The second was to improve the old brand product and make innovations and keep ceaseless substitute products in order that they could keep advanced position both at home and abroad. For example, in 2000 Shenyang assessed 50 key brand products like Jinbei coach, computer, color TV, air-condition, machine tool and so on, all kept a high increasing rate. Market revenue of the top 5 brand products reached 10×10^9 yuan that shared 42% of the total. The third was to reconstruct backbone enterprises, and make them catch up with the international advanced level. From 1985 to 2000, total investment in innovation and reconstruction of old industry was 33.1×10^9 yuan, 34.42% of which was from the central

government^①.

3.3 Developing High-tech Industry

In the Sixth and Seventh Five-year Plan periods, Shenyang focused on developing computer, aircraft and biologic pharmacy industries and IT products on the base of existing industries. By the end of the Seven Five-year Plan period, the high-tech industries had been converged to two state level economy development zones. Shenyang Hi-tech Industry Development Zone, approved by the State Council in March 1991, is in the southern part of the city with 34.2 km² of planned-area. It stands in the top 10 of 53 state level high-tech development zones, its gross industrial output value was 20.3×10⁹ yuan in 2000, and the main industries are electronics and IT application, new material, biologic engineering and environmental protection technology and so on. The State Council approved Shenyang Economy and Technology Development Zone in April 1993, which is in the southwest suburban with 32 km² of planned-area. Its objective was to modernize the urban traditional industries and act as a carrier for some reorganized enterprises out of the inner city, so it has a roughly similar industrial structure like the city but with high technology and advanced equipment. Machinery, chemical industry, light industry and pharmacy remains the pillar industries, the gross industrial output value in 2000 was 19.2×10⁹ yuan. In sum, after ten years of development, Shenyang City has grown 6 types of high-tech industries including IT industry, automatic and robot industry, environment protection industry, new material industry, bio-pharmaceutical industry and modern high-tech agriculture. High-tech industrial output value shared 25.1% of gross industrial output value in 2000.

4 INDUSTRIAL STRUCTURAL SHIFT SINCE 1978

Shenyang had experienced a profound industrial structural change from 1978 to 2000. First, the industrial proportion in gross domestic product (GDP) had changed reasonably with the primary industry decreasing from 7.5% to 5.7% and the secondary industry decreasing from 68.5% to 56.1%, but the tertiary increasing from 24% to 39.2%(Table 1), which implied that Shenyang was going to reach a high-level industrial structure.

Table 1 Composition of GDP of Shenyang City (%)

Year	Primary Industry	Secondary Industry	Tertiary industry
1978	7.5	68.5	24.0
1985	8.4	60.9	30.7
1990	8.7	52.2	39.1
1995	6.8	53.6	39.6
2000	5.7	56.1	39.2

Source: Shenyang Statistical Yearbook of 1978, 1985, 1990, 1995, 2000

Secondly, the proportion of the heavy industry output value (HIOV) and the light industry output value (LIOV) in the gross industrial output value changed respectively as one went up and the other went down. It is very clear that there are totally 5 fluctuation cycles from 1949 to 1997, which features long cycles earlier and short cycles lately (Fig. 2). The reason was the combination effects of pre-periods industrial reconstruction and further enhancement on machinery. The sixth cycle commenced with heavy industry increasing and light industry decreasing in 1997. Although the fluctuation happened periodically, the heavy industry has basically maintained a high proportion over 60% in the past five decades, which guarantees Shenyang's leading role as equipment manufacturing industrial city in China at large.

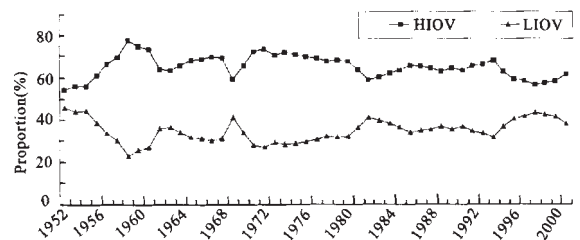


Fig.2 Proportion change of light and heavy industries in gross industrial output value(1952-2000)

The most significant structural change happened inside the secondary industry. Table 2 displays output value shift of 22 industrial sectors from 1978 to 2000. We can identify that the largest changes happened to 3 sectors, namely smelting, electronic and telecommunications equipment, and textile industry. Being the urban traditional industries in the past, smelting and textile industries, declined largely in the periods, from 11.9% to 3.8% and from 5.5% to 1.1% respectively. Meanwhile electronic and telecommunications equipment production or IT industry increased

① Shenyang Statistics Bureau, 2002. Shenyang Statistical Yearbook.

Table 2 Sector percentage of gross industrial output value of Shenyang City (%)

Sector	1978	1985	1990	1995	2000
1 Smelting	11.9	10.2	13.2	8.1	3.8
2 Production and supply of tap water & electric power	0.3	—	—	2.4	6.3
3 Mining & quarrying	1.8 ^①	1.2	1.8	0.8	0.7
4 Petroleum processing and coking		0.9	1.6	0.6	0.3
5 Medical and pharmaceutical products	14.1 ^②	3.5	4.5	4.3	6.6
6 Rubber products		3.2	3.5	2.5	2.3
7 Plastic products		1.3	0.9	1.2	0.8
8 Raw chemical materials and chemical products		4.8	6.0	4.9	3.1
9 Machinery		31.7	26.8	29.4	32.5
10 Electric equipment and machinery	48.1 ^③	11.1	13.8	12.0	10.7
11 Metal products		7.3 ^⑤	4.7 ^⑥	5.6	2.0
12 Electronic and telecommunications equipment				5.1	18.5
13 Construction material products	2.4	3.6	3.3	3.4	1.7
14 Timber processing and furniture manufacturing	1.1	1.2	0.7	1.3	0.8
15 Food industry	6.2	6.9	7.5	8.5	6.5
16 Textile industry	5.5	5.2	4.5	3.2	1.1
17 Garments and other fiber products	2.5	2.5	2.1	1.5	0.9
18 Leather products	1.2	1.2	0.7	0.6	0.4
19 Papermaking and paper products	0.9 ^④	1.5	1.5	1.0	0.4
20 Printing products		1.4	1.3	1.3	0.4
21 Cultural, educational, sports and art goods	1.6	0.8	0.4	1.1	0.3
22 Others manufacturing	2.4	0.5	0.7	1.3	0.1

Note: ① the sum of sector 3 and 4; ② the sum of sector 5, 6, 7 and 8; ③ the sum of sector 9, 10, 11 and 12; ④ the sum of sector 19 and 20; ⑤ the sum of sector 11 and 12; ⑥ the sum of sector 11 and 12

Sources: Shenyang Statistical Yearbook of 1978, 1985, 1990, 1995, 2000

considerably, and it is going to be another pillar industry not only inside the secondary industry but also inside the urban economy as a whole. The changes of the other 19 sectors were not significant to the urban economy compared with the formers, because they occupied a relative low proportion of the gross industrial output value. Machinery plus IT industry contributed to 51% of the gross industrial output, which well explained its dominant role. Overall, the structural transition inside the secondary industry gradually turns to technology intensive and value-added sectors with new sectors increasing and traditional sectors withering off, and some industries such as medical and pharmaceutical production still keeps an important position.

5 EQUIPMENT MANUFACTURING INDUSTRY AS PILLAR INDUSTRY

China is facing a big challenge to uplift its economy to a higher level by generating internal economic energy after more than twenty years of reform and opening up. It appears that the lag of equipment manufacturing industry become a bottleneck to the industrial structure improvement, for high growth rate of China's economy in the past years largely depends on importing a large number of advanced equipments from the developed

countries. Therefore, in the Tenth Five-year Plan Period (2001–2005), it is emphasized to revitalize national equipment manufacturing industry. Being typical equipment manufacturing industrial city in the past, Shenyang maintains multiple advantages over many others (GU, 2002). The first is that the city possesses large scale of economic foundation. By the end of 2000, there have been 44 above designed size industrial enterprises, and total assets had been more than 69×10^9 yuan, which was about 40% of the city's total. There were 0.3×10^6 workers in this sector, which was roughly about 50% of the city's total. All the main indicators including gross industrial output value, market revenue of industrial products, tax and profit were around 40% of the city's total. The second is that the city has developed a series of backbone products, which have long held an advanced position domestically for its strong capability in forming a complete set for such equipments as high voltage transformer, minerals extraction, conveying and processing equipments, petrochemical industrial equipments etc. Also, Shenyang is the biggest base in China for manufacturing digital machine tool, transmit and transform electricity equipments. The third advantage is its comprehensive and interweaved industrial structure equipped with 20.3×10^9 yuan of assets on which the new sectors are based. In addition,

Shenyang has laid a strong scientific and educational basement with tens of thousands of experts and skilled workers.

In light of state circumstance and the favorable conditions for developing equipment manufacturing industry, Shenyang designed its industrial orientation in the city's Tenth Five-year Plan and the program for the years up to 2010 that it will establish a new industrial pattern with agriculture as the foundation, high-tech industry as the leader, advanced equipment manufacturing industry as the kingpin, service industry as the principal part. In the period of the Tenth Five-year Plan, three main objectives for equipment manufacturing industry will be realized, the annual average increasing rate will be kept at 10%, the proportion of gross industrial output value will be up to 50% by 2005, and the overall labor productivity of industrial enterprises will be doubled. By the year 2020, Shenyang has been going to be an advanced equipment manufacturing industry city in the world (GU, 2002).

The program is heart stirring but quite another matter to be carried out. In view of present condition and difficulties, it is reasonable to implement the program by a series of policies and measures simultaneously. The first initiative is to adjust industrial layout within the urban area with equipment manufacturing industry as the pillar, to build several "Theme Industrial Parks" with distinctive characteristics and diverse functions and to speed up reconstruction of Tiexi Industrial Zone in particular. The second initiative is to remove all kinds of barriers and establish new links among different industries or sectors, so that cooperation could be undertaken effectively and flexibly and the city equipment manufacturing industry keep a concerted pace as a whole. The third initiative is to change investment structure, to increase investment in marketing and R&D while cutting back investment in production process. It is significant to build some technological incubators for developing new products and gathering technical personnel. Based on the Internet application inside enterprises as well as its popularity at regional level, Shenyang should pay more attention to virtual manufacture whereby to upgrade management, marketing and new technology development. The fourth initiative is to adjust ownership composition by cutting down or withdrawing state-owned capital while enlarging other ownership capital, particularly individual and private investment.

6 CONCLUDING REMARKS

Industry has its own life cycle, so it is natural for the old

industrial city to evolve forwards according to its intrinsic law. From experiences or lessons of the old industrial cities in the developed countries such as Manchester and Glasgow in Britain (WILLIAMS, 1996 ; DONNISON and MIDDLETON, 1987), this kind of process is actually led by the combination of national and international forces. However, what happens here is more complicated and difficult, for China is going on deep social and economic transitions simultaneously at present. In retrospect of Shenyang's industrial transformation process mentioned above, it is easy to find that before reform and opening up the central government played absolutely dominant role in developing or formulating the urban industries. In particular, the 6 key projects in the First Five-year Plan had brought about the most profound impacts on urban economy up to now. While after 1978 Shenyang not longer got adequate funds from the central government for industrial reconstruction. The reason, to a large extent, is that the central government had moved the state economic gravity center to the southeast coastal area for an all-around opening up deliberately to the western world since then. Consequently, in response to the state regional policy orientation, most foreign direct investment has flown to the southeast coastal areas (BAO *et al.*, 2002; DEMURGER *et al.*, 2002). Owing to long time deficiency in investment, an originally simple industrial problem by now has been deteriorated to be much complicate problems including poor industrial technology, a large number of laid-off and unemployed workers, polluted environment, social security and so on. It is impossible to overcome the very comprehensive difficulties without strong support such as investment or special preferential policies from the central government. Meanwhile, Shenyang must break through system constrains, speed up institutions reform, and enhance economic cooperation with Occidental countries. With respect to the composition of the secondary industry, it is nearly necessary to adjust the ratio of heavy industry to light industry subjectively because modern equipment manufacturing industry is exactly the comparative advantage even though a lot of difficulty remains to be overcome. IT application is the central work to improve the existing equipment manufacturing industry.

Another strategic initiative is that Shenyang should improve cohesion with cities nearby by 1) establishing a regional coordinating committee under provincial government; 2) building unified regional transport and communication networks and integrated eco-environment protection infrastructures; 3) forming a clear

functional division among the cities, with each city having its own distinctive economic features (WANG *et al.*, 2001); 4) unifying IT application in banking, finance and commerce etc.; 5) building a unified regional market system and so on. By practicing these policies, Shenyang can promote its leading role as a comprehensive service city in the central Liaoning agglomeration.

All in all, in response to the opportunities such as the development of the western China and China's entry into WTO, Shenyang needs to grasp and integrate any domestic or abroad favorable factors to create an industrial structure with competitiveness and distinctive local characteristics.

REFERENCES

- BAO Shu-ming, CHANG Gene Hsin, SACHS Jeffery D *et al.*, 2002. Geographic factors and China's regional development under market reforms, 1978–1998[J]. *China Economic Review*, 13(1):89–111.
- BRUN J F, COMBES J L, RENARD M F *et al.*, 2002. Are there spillover effects between coastal and noncoastal regions in China? [J]. *China Economic Review*, 13(2–3): 161–169.
- DEMURGER Sylvie, SACHS Jeffery D, WOO Wing-thye *et al.*, 2002. The relative contribution of location and preferential policies in China's regional development: being in the right place and having the right incentives [J]. *China Economic Review*, 13(4): 444–465.
- DONNISON David, MIDDLETON Alan, 1987. *Regionerating the Inner City: Glasgow's Experience* [M]. London:Routledge & Kegan Paul.
- GU Chun-li, 2002. Orientation of "Made in Shenyang"—Investigation and policy for Shenyang's equipment manufacturing industry [J]. *Technological Development of Enterprise*, 4: 16–17. (in Chinese)
- LI Qing-yang, LI Fang-hua, 2001. Employment situation and the available policies for Shenyang [J]. *Journal of Shenyang University*, 13(1):12–14.(in Chinese)
- Municipal Chronicles Office, 2000. *Shenyang City Chronicles (Vol.3)*[M]. Shenyang: Shenyang Publisher.(in Chinese)
- Statistical Bureau of Liaoning Province, 1999. *An Historical Great Leap: Review of Liaoning Past 50 Years (1949–1999)* [M]. Beijing: China Statistics Press.
- WANG Hong-tao, 2002. Retrospect and prospect of Shenyang's old industrial base construction [J]. *Macroeconomics*, 7:18–21.(in Chinese)
- WANG Yan-hong, YU Hong-fei, HU Yan-chang *et al.*, 2001. Orientation of Shenyang City and its sustainable development strategy [J]. *Journal of Shenyang Agricultural University Social Science*, 3(2):128–133.(in Chinese)
- WILLIAMS Gwyndaf, 1996. Manchester [J]. *Cities*, 13(3): 203–216.