CSCanada
Higher Education of Social Science
Vol. 8, No. 4, 2015, pp. 64-69
DOI: 10.3968/6837

ISSN 1927-0232 [Print]
ISSN 1927-0240 [Online]
www.cscanada.net
www.cscanada.org

The Research on Dependent Paths and the Development of Emerging Industry in Chongqing

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Received 5 February 2015; accepted 20 March 2015
Published online 26 April 2015

Abstract

The Path Dependence Theory is widely applied to the study of theoretical models of the system economics in recent years. Based on it, this dissertation does a systematic study of Chongqing's industry in the past decades. It is apparent that the development of Chongqing's industry depends on some paths typically. According to the further analysis of positive and negative effects of the dependent paths, it reveals the mechanism of its evolution and dynamic development, and makes a judgment for the direction of Chongqing's emerging industry.

Key words: Dependent paths; Emerging industry; Positive effect; Negative effect

Huang, L. X. (2015). The Research on Dependent Paths and the Development of Emerging Industry in Chongqing. *Higher Education of Social Science*, *8*(4), 64-69. Available from: URL: http://www.cscanada.net/index.php/hess/article/view/6837
DOI: http://dx.doi.org/10.3968/6837

INTRODUCTION

In the past two years, whatever China or the globe, are faced with the economic crisis which took the overproduction as the essential characteristics. In order to solve the economic crisis, the Chinese Government quickly issued a top ten industrial restructuring and rejuvenation program, but the main function of the restructuring and rejuvenation of these overproduction industries is to stabilize the economy and employment, control over the quickly economic decline. It is difficult to play a total and complete role to overcome the economic crisis. If the economy of China wanted to walk out the plight of economic crisis and entered a new round of rapid and healthy growth, it must rely on the rise of new industries. Modern international economic history shows that every major economic crisis is accompanied by the birth and growth of new industries, and eventually becomes a fundamental force to get rid of economic crisis.

1. THE PATH DEPENDENCE OF CHONGQING'S INDUSTRIAL DEVELOPMENT

1.1 The Path of Development of Chongqing's Industry

In modern times, the development of Chongqing's industry has experienced three major leaps. The first is marked by the Sino-Japanese war in 1937. Before the war, it showed the characteristics of typical agricultural and pastoral society. At that time, Sichuan (including Chongqing) mainly produced food, Tung oil, bristle, medicinal plants, silk, sugar, salt and so on (see Table 1), while there were less factories and it was basically in a handicraft industry era.

In 1935, Chiang Kai-shek did a speech of "Sichuan should be regarded as the base area of reviving the nation" in Chongqing and identified the status of Sichuan (including Chongqing) as the anti-Japanese base area. Until 1937, the war broke out, Chongqing finally headed for a big opportunity of industry development. On the one hand, out of the requirement of the war, Chongqing's transportation, technology, finance and other conditions continued to improve. On the other hand, the nationalist government authorities organized large factories movement toward the inland. At that time, Chongqing has more than 200 inland factories, which accounted for one-third of the total number of the movement. By 1944, the industry of Sichuan (including Chongqing) has made amazing speed of development (see Table 2).

Table 1
The Industrial Statistics of Prewar Sichuan (Include Chongqing)

Category of industry	Number of factory	Proportion	Quantity of capital	Proportion	Number of workers	Proportion
Total	583	100.00	6458	100.00	18710	100.00
Silk reeling	20	3.4	1500	23.1	6273	33.6
Silk weaving	1	0.2	30	0.5	30	0.2
Cotton weaving	462	79.3	1130	17.5	4340	23.2
Food industry	6	1.0	390	6.1	128	0.7
Match manufacturing	34	5.8	446	7.0	5969	31.9
Soap manufacturing	18	3.1	300	4.6	400	2.1
Leather manufacturing	3	0.5	200	3.0	270	1.4
Glass manufacturing	12	2.1	377	5.8	150	0.8
Paper manufacturing	1	0.2	80	1.2	80	0.4
Alkali manufacturing	2	0.3	130	2.0	140	0.8
Stone industry	2	0.3	1210	18.7	129	0.7
Oil refining	14	2.4	130	2.0	570	3.0
Electrical manufacturing	2	0.3	35	0.5	18	0.1
Machine industry	5	0.9	500	7.8	210	1.0
Smelting industry	**1**	**0.2**	——	——	——	——

Note. Source: Li (1943, p.19).

Table 2
The Private Factory Statistic of the Period of Anti Japanese War, Sichuan (Include Chongqing) (1944) (Unit of Money: Million Yuan)

Category of area	Number of factory	Quantity of capital	Value of pre-war currency	Number of workers
Chongqing	1461	819.4	101.0	64701
Sichuan	813	858.6	93.7	52146

Note. Source: Xu and Wu (2003, p.548).

Comparing Table 1 and Table 2 of the data, we can find that regardless of the number of factories, capital, or workers, Chongqing alone is far exceeding the total of pre-war Sichuan (Chongqing). These enterprises changed Chongqing's industrial productivity. Along the Yangtze River, East along the Yangtze River, West to Jiangjin, north from Hechuan, South to qijiang, Chongqing industrial zone was formed. It was the only complete comprehensive industrial zone in the rear. Further analyzing the industrial structure of Chongqing, it can be drawn that the industrial structure which mainly processed agricultural and sideline products and textile industry in pre-war period has been largely improved and the industrial system which takes ordnance, chemical industry, machinery, iron and steel, textiles and foodstuffs as its pillar industry is established, which is also the most important industrial center in the rear area (see Table 3).

Table 3
The Survey O=of Chongqing Private Factory Category (Until 1943.8)

Category of industry	Number of factory
Oil refining	14
Machine industry	313
Chemical industry	129
Electrical manufacturing	50
Textile industry	126
Civil engineering industry	13
Food industry	65
Culture industry	95
Hydropower industry	2
Miscellaneous	11
Total	818

Note. Source: Jian (1943).

According to *A History of Modern Chongqing City*: in 1937, there were only 77 factories, which had capital more than 10,000 yuan, in Chongqing, accounting for 1.96 percent of China's industries; however, in 1945, this number had reached 1,690. Meanwhile, because of the transfer of the Nationalist Government's political and economic center, many of the government institutions, military agencies, schools, hospitals and other institutions had moved to Chongqing, so the population grew very explosively. According to the researcher Ai Xinquan:

There were 0.38 million people in Chongqing in 1937; but in 1938, this number surged to more than 0.7 million, and then increased to more than 1.2 million by 1945. Population growth had brought Chongqing commercial prosperity and makes it become the commercial center of the rear area. The industries such as food and apparel were very developed. Chongqing had also grown into China's largest "Silver Capital" during the wartime; financial institutions gathered in the area from Datong Street to Shaanxi Road. By August 1945, Chongqing had more than 233 banks which grew by nearly 50 times as against the situation before the war, and deposited 1.35 billion yuan.

The second great leap was marked by the "Third-Line Construction" period, and it brought Chongqing a new round of development in industry and technology. The so-called "third-line construction", basically included the middle-western region of China hinterland except Xinjiang, Tibet and Inner Mongolia." Third-Line Construction" is a major strategic decision the CPC central committee and Chairman Mao made in the mid-1960s. As the center and the biggest cities in the "Third-Line Construction", the central committee of CPC and the state council made a decision: "With Chongqing as the center, we can set up a manufacturing base which can produce conventional weapons and have corresponding raw materials and machinery industry within three years or slightly longer period", "with Chongqing as the center, we will gradually establish the industries of machine tools, automobiles, instrument; and set up machinery industry which service for national defense directly." The first step of the "Third-Line Construction" which lasted more than 10 years (1964-1980), is a large number of state-owned enterprises and institutions moving from coastal to inland. The relocation work started in the second half of 1964, mainly taking the form of overall relocation and part of move, which means some move all, others move some inside part of workshop and section, and then merged with local factories in Chongqing, or built some new factories. Based on incomplete statistics, from 1964 to 1966, 15 enterprises and institutions involving the central ministry moved to Chongqing from Beijing, Shanghai, Liaoning, Guangdong and other 12 provinces and cities, with 43,488 workers. At the same time, the central government had arranged construction and extension work of 59 key projects and supporting projects among the "Third-Line Construction" projects in Chongqing from the second half of 1964 to 1967. These projects focused on the weapons industry, shipbuilding, electronics, aerospace industry, metallurgy, chemical industry, machinery industry, transport infrastructure and other fields. Starting in 1965, on shipping industry construction projects, taking Chongqing as the center, the area along the Yangtze River which included Yongchuan, Jiangjin, Fuling and Wanxian had been building a relatively integrated shipping manufacturing base; by the 1980s, the number of shipbuilding enterprises built in Chongqing had reached nearly 10 such as Qianwei Instruments Factory and Chongqing Shipyard. In the aspect of electronics and aerospace industry, the government had expanded Chongqing Radio Factory, Chongqing Micro-motor Factory and Bashan Instrument Factory, and built three research institute of microelectronics in the Chongqing area one after another; to match these projects, Chongqing had also constructed and expanded the testing instrument factory, radio factory of second, third, fourth and other factories, and thus forming an electronic industry base with more than 30 electronic industry projects, which could produce 14 categories of more than 320 varieties electronic products for the national defense and the civil. In the aspect of metallurgical industry, the government completed many projects such as the reconstruction of Chongqing Iron & Steel, Chongqing Special Steel, Sanjiang Steel, the restoration of Southwest Aluminum Processing Factory, Chongqing Copper Tube Factory, and the construction of Chongqing Aluminum Factory. In the aspect of chemical industry, the government had invested in the construction of a series of backbone enterprises such as Sichuan Vinylon Works Group, Chongqing Variance Factory, Chongqing Phosphate Fertilizer Factory, and invested in the reconstruction & expansion of a number of older enterprises such as Tianyuan Chemical Works, Changshou Chemical Factory, Chongqing Chemical Factory. In the aspect of mechanical industry, the reconstruction & expansion of Chongqing Mining Machinery Factory, Chongqing Crane Factory and the construction of Sichuan Instrument Complex, Chongqing Experimental Equipment Factory had been completed one after another. In the aspect of transport infrastructure, the projects mainly included the construction of Chuan-Qian Railway, Xiang-Yu Railway, Jialing River Bridge, Fu River Bridge and Chaoyang Bridge, and their construction & expansion of the ports, wharves and airports.

By "Third-Line Construction", up to the end of the program in the 1970s, Chongqing had formed five pillar industries included the metallurgy, chemical, machinery, textile and food industries, and established a close-knit defense industry production system that had relatively complete categories which is given priority to with conventional weapons manufacturing, electronics, shipbuilding, aerospace, nuclear industry, etc.. By 1980, combining the "Three Line" enterprises with original arsenal, Chongqing had 38 military industrial enterprises and research institutes, the original value of the fixed assets reached 1.8 billion yuan, accounting for 20% of the city's industrial original value of fixed assets. And Chuan-Qian, Xiang-Yu (constructed during the "Third line construction" period), Cheng-Yu railway (built in the early 1950s) and the Yangtze River golden waterway, constitute the 4 external traffic artery of Chongqing, and coupled with the air transport and road transportation, greatly improved the traffic conditions of Chongqing, and made

Chongqing become the water and land transportation hub of upper Yangtze river. Furthermore, convenient traffic also pushed forward the development of small towns and the economy along the line; made Chongqing initially form an urban system which had various sizes and different functions, to play an important role in economic development.

Reform and Openness, especially Chongqing separated into its own municipal district on June 18, 1997, was the mark of Chongqing's third development opportunity. In the period of great development of Chongqing industry, industrial output grew from 126 billion yuan to 1578.5 billion yuan over the period 1997 to 2013, increasing by 13.08 times. Industrial structure became more reasonable, and drove the city into the stage of industrialization.

We study industrial firms whose output value is more than 10 billion Yuan and 8 industrial firms' output value is more than 50 billion Yuan among all the industrial entrepreneurs in Chongqing. Firms in Chongqing are no longer in defective fragile conditions, they become stronger and stronger. since direct jurisdiction a bitch of giant enterprises constantly emerge, like Changan automobile and Southwest aluminum group with accelerated process of new industrialization and enhanced industrial concentration, stand on the development strategy, Big investment, Big pillar, Big base, Big enterprise and Big project. 6+1 industrial bases (6 means six pillar industries which are Automobile motorcycle, equipment manufacturing, petrochemical and natural gas material industry, electronic information and energy industries. 1 means a labor intensive industry) has preliminaries formed, as industrial development connotation has already deeply changed.

Since Chongqing direct jurisdiction, new distribution forms gradually at the speeding step of industry distribution adjustment which is Nanping electronic instrument industrial district, Banan Yudong cars and heavy machinery processing industrial district, Jiangbei Ranjiabai precision machinery and instruments industry and Shiqiaopu scientific research district. In the 1990s, two state development zones, Chongqing economic and technological development zone and Chongqing high technological development zone, formed based on it. However, constructed Liangjiang new district must supply new growth point for Chongqing economy.

1.2 Path-Dependence Analysis of Industry Development in Chongqing

North, an American economist, thinks path-dependence is similar to inertia in physic. Once someone enters one path (no matter it is positive or negative), a dependence of the path will probably happen. The given direction of certain path will be self-reinforcement in further development. It means present and future decisions are decided by past decisions. Compared with Figure 3 and Figure 4, Chongqing preliminarily formed industry structure taking armaments factories, chemical industry, machinery, steel, textile and food as pillar industries during the Anti-Japanese war. However, up to 2013, pillar industries formed during the Anti-Japanese war are still in important position in Chongqing six pillar industries (automobile motorcycle, equipment manufacturing, petrochemical and natural gas material industry, electronic information and energy). Industries in Chongqing whose total output value is more than 50 billion Yuan concentrate on transportation equipment manufacturing industry, communications equipment industry, computer and others electronics equipment manufacturing industry, non-ferrous metal smelting and rolling processing industry, electricity, heat production and supply industry, chemical raw materials and chemical products manufacturing industry, ferrous metal smelting and rolling processing industry, electronic machinery and equipment manufacturing, Non-metallic mineral industry and Agricultural food processing industry. These belong basically to pillar industries in the Anti-Japanese war or their industry chain's extensive sectors. Though the position of the textile industry is decreased, it still occupies high proportion.

Chongqing industries show significantly path-dependence characteristic achieving great progress after 90 years' development since the Anti-Japanese war. According to study, three factors play important roles in forming path-dependence of Chongqing industries. a) Special location advantage factor in special background. Chongqing, a badlands and ambient occlusion, has severely terrible traffic condition before the Anti-Japanese war. These location factors are the largest barrier in developing economy at the age of peace, however, these restrain factors can become the best natural barriers to defense at the age of war. It is the most direct reason why Chongqing develops path variation. In particular, Chongqing can hardly get the first and second development chance without vulnerable party defensive demand. b) Unique resource and social environment result in lock-up due to increasing returns. Southwest region represented by Chongqing and Sichuan is expanse, resource-rich and well development on agricultural and pastoral economy. Chengdu Plain, a traditional agricultural area in Sichuan, own large amount of fertile land to feed people. Meanwhile, many inland enterprises can be met by its abundant recourses like iron ore, coal, copper and silk. During three-line construction, history reselects Chongqing mainly because of its relatively strong industries power especially ordnance industry. Seven historical arsenals (Wangjiang, Changan, Jianshe, Kongya, Jialin, Changjiang, jianglin) are in dominant position in china. Secondly, Chongqing has strongly related ability as comprehensive old industrial base. Furthermore, as an old industrial base, Chongqing's traffic and energy condition are good. Although there is only Chengdu-Chongqing railway at that time,

Chuanqian railway would be soon built. Particularly, Yangtze River Golden Waterway supplies good condition for industrial products output. Chongqing power plants were the largest power plants in Southwest region depend on abundant coal at that time. c) Government is an important push in forming path-dependence. Taking transportation infrastructure as an example, inconvenient traffic is usually the main factor of restricting poor areas social economic development and Chongqing is not exception. It is far beyond image that Chongqing can complete industry variation from agricultural society to industrialization just through self-accumulation without government Omnibearing support in material, capital, talents, technology and policy, because of investment in infrastructure is vast, long cycles, high capital coefficients and low added value supplied directly. During the Anti-Japanese war and the beginning of three-line construction, only one railway, Yunnan-Tibet railway, is built. Today, Sichuan railway Xiangyu railway, Chengdu-chongqing railway and Yangtze River Golden Waterway constitute four lager arteries of Chongqing outbound traffic together. To some extent, economic development path-dependence in poor area is actually government-dependence.

Study on Chongqing industrial path-dependence dilemma and new industry

1.3 Study on Chongqing Industrial Path-Dependence Dilemma

Chongqing industries have achieved great progress experiencing long-term development, however, part of them show stagnation locked in inefficiency status. Major performances are small industries economic aggregate and low proportion in china, being reasonable structure of firm, product and technology, lack of resources by restricting industries development, low comprehensive resources utilization and failure on elimination backward productivity. Reasons can be explored in the following aspects. One is Chongqing industries are lack of enterprises inner drive at long term. Enterprises inner drive is usually driven by innovation and economies of scale. However, Chongqing industral enterprises select embedded development path deeply depended on government, result in lag in technology and small capacity eventually, facing difficulty in forming inner drive and interactive behavior pushed by government, which are proposed by Schelling, and showing the characters of enclave economy. Second is restriction of congenital location disadvantages. Seeing from Chongqing's development opportunities, its industrial development is a major unconventional development model under unconventional status lead by government.

Located in the west and low-gradient of economic development, there is no doubt that talents and capital are on the net out-flowing condition. So its industries economic aggregate is small and economic growth is hypodynamia. Although economy increasing speed is fast and fast, Chongqing cannot develop without the support from the central government financial and currency policy. Third is restriction of institution. From historic aspect, Chongqing industrial economy is two elements economic model. It has military industry and civil industrial system. Each of them is separated. This economic model and its harm cannot be eliminated in the short term; from the reality aspect, Chongqing misses opportunities of carrying on global industrial transfer and industrial upgrading more than once because of the ubiquitous government backward management method and inefficiency operation in Chongqing and Southwest region.

2. RECOMMENDATIONS ON DEVELOPING NEW INDUSTRY IN CHONGQING

New industry is the new department industry accompanied by new scientific research achievements, new invention and application of emerging technology. It mainly means a series of new industrial sectors caused by the development of new technology, like Electronic, information, biology, new materials, new energy, ocean, space. On September 10, 2009 summer Davos economic BBS, strategic new industries key supported by china government, as Wenjiabao's opening speech illustration, content New energy, new materials, biological medicine, the third generation mobile communication, Triple play industries development and industrialization, low carbon economy and green economy. It is the first complete description about seven strategic new industries in china.

New industry can be divided into three parts roughly. They are industry formed by industrialization of new technology, new industry coming from transformation on traditional industry using high technology and industry formed by industrial operation of social public undertakings.

Developing new industry should match the following thinking based on path-dependence theory. Industrial path has self positive strengthen the effect. Technology can be updated constantly and local talents have capability to study, absorption and innovation about the technology. Resources, environment and economy must be coordinated development. Long term core competence has been formed with regional industry development and the requirement of support new industry policy from government can be met.

Chongqing government has draft Guidance about Speeding up the Informatization and Industrialization Fusion. It proposes Chongqing will be emphasis on guidance six industries, software development in mobile information industry chain, Chip manufacturing, SIM card manufacturing, pay phones and intelligent terminals, smart card read equipment and M2M terminals, concatenation. Chongqing will be concerns on pillar industry and push experiment and demonstration in

Informatization of industrial enterprises. Demonstration project in informatization of manufacture will implement at materials processing industry; demonstration project in application of informatization on industrial chain will implement at automobile motorcycle industry; demonstration in promotion of industrial equipment digitalization will implement at equipment manufacturing industry; demonstration project in improving energy saving through informatization will implement at Oil and natural gas chemical industry.

This development thinking cannot far more reflect the requirement of new industry according to current development foundation in Chongqing, possible evolution path and future requirement of economic competitiveness. For example, Transportation equipment manufacturing industry, the biggest industry in Chongqing, has strong industrial base and a wide application on new energy. However, only at the implementation of application of informatization on industrial chain, can it not develop well. Study BYD development model is meaningful. In the 1990s, Sanyo, Toshiba, Panasonic monopoly 90% market share when BYD enter rechargeable batteries market. BYD use manual production model to compete with Japanese automatic pipeline production model because BYD cannot afford advanced equipment, as a new entrant. However, manual production model needs low investment in innovation and can transfer quickly. It is suited to rapid product upgrading in batteries market. So BYD has achieved leaping development, surpass its traditional competitors and become giant enterprise in batteries market. BYD case shows developing new industry are not at high starting point and high difficulty. Study and innovation based on matching elements of the path dependence theory is most important.

Chongqing has exceptionally natural resources in biological medicine field. Chongqing can get a lot of achievements rely on big enterprises like Fuling pharmaceutical factory and advanced biological scientific laboratory of Southwest University in this field. Low carbon economy and green economy should be added into Chongqing new industry development perspective because Chongqing is an important ecological barrier in the upper Yangtze River.

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