

# New Industrialization Development Tendency and Its Level Measure

## Empirical Studies of Chongqing Municipality

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**Abstract**—This paper measures the new industrialization level and its development tendency in Chongqing by analytic hierarchy process and grey correlation degree analysis through a specially-constructed evaluation indicator system. As the study demonstrates, the city's longitudinal new industrialization development has presented an inversed-U pattern; when referring to specific sectors, some traditional industries have a relatively high standard in the process of new-industrialization, whilst other emerging and promising ones have a low level. Hence, the paper proposes a plurality of countermeasures and suggestions, with the purpose of providing reference for the implementation of a new industrialization development strategy.

**Keywords**-new industrialization, analytic hierarchy process (AHP), grey correlation degree

### I. INTRODUCTION

In 2002, The Sixteenth CPC National Congress first explicitly raised the tasks and basic requirements for new industrialization roads, and the Seventeenth CPC National Congress further pointed that new industrialization road shall be continued firmly, and the optimization of industry structures shall be given adequate attention. Both in the "11th Five Year Plan" and the "12th Five Year Plan" and in the government work report of recent years, new requirements have been raised for new industrialization, namely, independent innovation shall be boosted, industry structure shall be adjusted and optimized, strategic new industries shall be fostered greatly, the transformation of economic development manner shall be sped up, and modern industry system shall be constructed; hence, these series of significant policies and measures have shown clear directions for the industry development of China.

The reason why new industrialization is "new" is that new industrialization is not only connected to traditional industrialization but also differs from traditional industrialization greatly. Lv Zheng (2003) held that China's

new industrialization road differs from the past traditional industrialization road, namely, the policy of public ownership as the main body and the coexistence of various ownerships is persisted in; therefore, the function of market mechanism shall be made full use of, the economic growth manner with high energy consumption shall be changed, and meanwhile, simple urban and rural two layered structure shall be broken, and rural population shall be encouraged to cluster in the urban area[1]. Gu Shengzu, Zheng Lingyun (2005) held that the most obvious mark for distinguishing "new" and "old" industrialization lies in five transformations: transforming from the initiating of the government to the boosting of the private capital, transforming from low cost competition advantages to technology innovation competition advantages, transforming from the leading of the stated owned enterprises to the cooperation between the large, middle and small enterprises, transforming from focusing on material assets accumulation to human resources development, and transforming from rough development mode to intensive cluster development mode[2]. Liu Shijin (2005) believed that the difference between new industrialization and traditional industrialization mainly are mainly in the merging and reconstruction of high technology on traditional industries, the improvement of industry structure and resources configuration internationalization degree, the change of development ideas and strategies, and the shortening of time for similar industrialization phases[3].

How to construct corresponding indicator system and how to measure the development level of new industrialization via empirical study are the important contents of assessing the new industrialization degree of a region of an industry. Xie Chun, Li Jian (2011) measured the development level of China's new industrialization via constructing new industrialization assessment indicator system[4]. From another perspective, Luo Yongle (2012) utilized hierarchy analysis, factor analysis and the like

indicator comprehensive assessment method to measure the new industrialization of a certain area, and compared the new industrialization degree of different areas[5]. Presently, most of the research achievements are focused on the new industrialization development level of a certain area, while there are few to measure and compare the new industrialization level of different industries within a region from the perspective of industry development. And the research by the paper will fill the above theoretical blank. The paper, based on the new industrialization development tendency of Chongqing Municipality and the new industrialization level of various industries, performs empirical study and provides political suggestions on the new industrialization development strategy for Chongqing Municipality.

## II. RESEARCH DESIGN

### A. Method Selection and Data Sources

Analytic Hierarchy Process (hereinafter referred as AHP) is a multi-principle policy making method, which divide the relevant elements of policy making into goals, principles, schemes and the like hierarchies, and classify the subjective judgment of persons into certain hierarchy and quantity with certain standards. With AHP, the indicators constructed in the indicator system can be arranged in subjective sequence, and the indicators can be given different weights with scientific methods, and thus an indicator system with hierarchy can be constructed. Analytic Grey Correlation Process is a systematic correlation analytic method, which measures the correlation degree between the factors as per the similarity or difference degree of the development trends of the factors, and has no specific requirements on the sample quantity. Analytic Hierarchy Process and Analytic Grey Correlation Process can solve the problems in the above empirical analysis, and logically, the comprehensive application of the above processes can solve the problems in the research of the paper.

All data are sourced from 2004-2012 Chongqing Municipality Statistics Yearbook. The data processing is divided into two parts: the first part is the research on

Chongqing Municipality new industrialization development trends, and the statistic data from 2003-2011 are adopted; the second part is the measurement on the new industrialization degrees on various industries of Chongqing, and the section data of 2011 are adopted. As the statistic standards for 2012 Chongqing Municipality Statistic Yearbook changes a lot, no statistic data of industrial increase values exist; in the paper, data simulation method is adopted to perform regression prediction on the data of past years, and thus the increase values of various industries of Chongqing in 2011 are gained.

### B. Indicator Selection and Weight Calculation

Based on relevant empirical research achievements, the paper constructs a three-layered new industrialization assessment indicator system composed of a goal hierarchy, a domain hierarchy and a basis indicator hierarchy. Wherein, the goal hierarchy is the new industrialization level, the domain hierarchy is composed of 4 parts, namely, technological content, economic benefits, resources utilization and environmental protection, and human resources, and each domain hierarchy contains several specific indicators. After the indicator system is constructed, each indicator shall be given certain values and calculated, and consistence suggestions shall be given. In Step One: a judgment matrix is constructed to perform one-to-one comparison, and "1-9" scale method is used to given values to the matrix as per the importance, and the relative importance of each indicator shall be determined for calculation. In Step Two: the canonical matrix receives normalization processing, the matrix is thus transformed into canonical matrix, and then the corresponding indicator level weight is gained as per average value which is calculated by the row of the canonical matrix is. In Step Three: consistency check is performed to judge whether each indicator has satisfactory consistency. After calculation, the consistency rate of the domain hierarchy is 0.1, and the consistency rate of the foundation indicator hierarchy is 0.0438, so both are less than or equal to 0.1; through consistency check, the new industrialization assessment indicator system is gained, as is illustrated in Table 1.

TABLE I. NEW INDUSTRIALIZATION LEVEL ASSESSMENT INDICATOR SYSTEM

Goal Hierarchy	Domain Hierarchy	Weight	Foundation Indicator Hierarchy	Weight
New Industrialization Level	Technological Content	0.4673	Scientific and technical personnel weight (%)	0.26402
			Scientific and technical institute input weight (%)	0.02584
			Product research and development input rate (%)	0.12253
			New product output value percentage (%)	0.05491
	Economic benefit	0.2772	Industrial added value rate (%)	0.07268
			Total assets contribution rate (%)	0.01533
			Ratio of Profits to Cost	0.03257
			Product sales rate (%)	0.15662
	Resources utilization and environmental protection	0.1601	Production value energy consumption (ton standard coal/ten thousand Yuan)	0.09046
			Unit industrial sewage discharge amount (ten thousand ton/ ten thousand Yuan)	0.01881
			Unit industrial waste gas discharge amount (hundred million cubic meter/ ten thousand Yuan)	0.00885
			Unit industrial solid waste discharge amount (ten thousand ton/ ten thousand Yuan)	0.04198
	Human Resources	0.0954	Industrial employee weight (%)	0.07155
			Industrial overall labor productivity (Yuan/person year)	0.02385

III. CHONGQING MUNICIPALITY NEW INDUSTRIALIZATION DEVELOPMENT TENDENCY AND THE LEVEL MEASURE

A. Gray Correlation Degree Measure

Suppose  $X_{ij}$  and  $X_{0j}$  to eliminate different dimension and magnitude orders, perform “non-dimensionalization” treatment on the original data, and the original data after non-dimensionalization and the optimal value of the  $\lambda_{ij}$  and  $\lambda_{0j}$  respectively. The grey correlation coefficient between the No. j indicator of the tth year and the optimal value of the No. j indicator of the tth year shall be calculated as per the following formula:

$$\xi_{ij} = \frac{\min_t \min_j |\lambda_{0j} - \lambda_{ij}| + \rho \max_t \max_j |\lambda_{0j} - \lambda_{ij}|}{|\lambda_{0j} - \lambda_{ij}| + \rho \max_t \max_j |\lambda_{0j} - \lambda_{ij}|}$$

Wherein, the value of the distinguishing coefficient  $\rho$  is generally taken as 0.5.  $\xi_{ij}$  is the grey correlation coefficient between the No. j indicator and the optimal indicator of the No. j indicator of the tth year after the tth years’ of new industrialization. Finally, the new industrialization grey correlation coefficient of the tth year shall be calculated as per the following formula:

$$\gamma_t = \sum_{j=1} \xi_{ij} \omega_j$$

Wherein,  $\omega_j$  is the weight of the above foundation indicators,  $\gamma_t$  is the new industrialization grey correlation coefficient of the tth year of Chongqing, the value range of  $\gamma_t$

between 0 to 1; so the larger the value of  $\gamma_t$  is, the higher the new industrialization development level of the year in the scope is.

B. Chongqing Municipality New Industrialization Development Tendency Analysis

The paper selects the annual data of 2003-2011, and grey correlation algorithm shall be used to calculate the new industrialization level of each year in the sample period of Chongqing, and the results are illustrated in Figure 1.

The new industrialization level of Chongqing in 2003-2008 achieved continuous improvement, reaching the peak in 2008. However, after 2008, the new industrialization development level fell gradually, and the new industrialization grey correlation value of 2011 only equaled to that of 2007. Although the global financial crisis in 2008 didn’t influence China’s financial system, yet it greatly influenced China’s substantial economy development, so the industries of Chongqing got great shock. However, due to insufficient domestic demand and the blocking to product export, excess production capacity of industries are further caused, industry economic downward pressure became stronger; the enterprises had to increase scientific research input strength and decrease product yield, and thus increase the scientific content of products and increase the research and development strength of new products to maintain the market share of the enterprises. The scientific expenses of the industries in Chongqing reached the peak in 2008, so this is the reason why the grey correlation degree value of new industrialization in 2008 when the financial crisis broke out was the highest. With the putting forward of the state “Four Thousand Billing Plan”, the government-guided investment

to infrastructure projects made the industrial economy of Chongqing Municipality increase with high speed after the blocking in 2008. Although economic manner pulled by the government-guided investment made the total industrial output value of Chongqing get rapid increase after 2008, it also restrained the improvement of the scientific contents of some products, and some middle and large scale enterprises lost the motivation of increasing scientific research and development; therefore, the total industrial output value increased in recent years, but the input of industrial scientific expenses fell gradually. Although the energy conservation and emission reduction in recent years has achieved significant achievement, industrial value energy consumption and “three wastes” emission amount have fell gradually, resources and environmental problems have been improved gradually; however, on the whole, new industrialization level still falls year by year, so the new industrialization level of Chongqing needs further improvement.

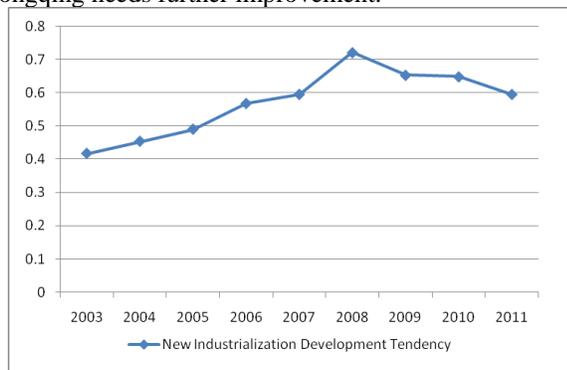


Figure 1. New Industrialization Development Tendency of Chongqing Municipality(2003-2011)

### C. Chongqing Municipality New Industrialization Level Measure

Suppose  $\gamma_i$  is the new industrialization level of the  $i$ th Category industry of Chongqing Municipality, and the grey correlation values of the new industrialization development degree in 2011 of all the industries shall be calculated as per the above grey correlation algorithm. As the statistics standards of 2012 Chongqing Municipality Statistic Year Book differs from that of the former years, exploitation

auxiliary activity industry and metal work, machinery and equipment repair service industry were added, and rubber product industry and plastics product industry were merged for statistics, and traffic and transportation manufacturing industry were divided into automobile manufacturing industry, railway, ship, aerospace and other transportation equipment manufacturing industries. To guarantee the consistence of statistics standards with former years, and for the purpose of calculating the industrial added values of each industry via data simulation, the two new added industries are not included, and the automobile industry and other transportation equipment manufacturing industry are merged for data analysis, and finally each industry is selected for grey correlation degree calculation, and the new industrialization level of each industry is illustrated in Table 2.

From the rank of the new industrialization level of each industry in Chongqing on the grey correlation values, the new industrialization degree of the heavy industry sectors is lighter than that of the light ones, which demonstrates that the industries of Chongqing is stilled guided by heavy industry. The new industrialization degree of the manufacturing industry is higher than that of the mining industry and the energy production and supply industry. Eight of the top ten industries in ranking belong to the manufacturing industries, and the top five in ranking are all technology intensive and capital intensive manufacturing industries, which demonstrates that manufacturing is the leading industry of Chongqing's industries, and the new industrialization degree of technology intensive and capital intensive industries is high. The traditional competitive industries of Chongqing Municipality, such as Instrument and meter and culture, office use machinery manufacturing industry, ordinary equipment manufacturing industry, special equipment manufacturing industry, and transport and communication equipment manufacturing industry rank first, third, fourth and fifth respectively, which are far higher than the other industries. Therefore, it demonstrates that the industry sectors with industrial foundation has high new industrialization level, and constellation effect have significant promotion function of the improvement of new industrialization level of industries.

TABLE II. 2011 CHONGQING MUNICIPALITY NEW INDUSTRIALIZATION LEVEL OF EACH INDUSTRY

Industries	New Industrialization Level	Rank	Industries	New Industrialization Level	Rank
Instrument and meter and culture, office use machinery manufacturing industry	0.72874	1	Agriculture sideline product processing industry	0.47959	19
Pharmaceutical industry	0.68452	2	Cultural educational and sports goods manufacturing industry	0.47575	20
Ordinary equipment manufacturing industry	0.62820	3	Gas production and supply industry	0.47355	21
Special equipment manufacturing industry	0.62174	4	Chemical material and chemical product manufacturing industry	0.47319	22
Transport and communication equipment manufacturing industry	0.58639	5	Printing industry and record media copying	0.47157	23
Nonferrous metal mining and exploitation industry	0.57274	6	Leather, fur, feather (down) and their product industry	0.46922	24
Tobacco processing industry	0.56583	7	Rubber and plastic manufacturing industry	0.46174	25
Beverage production industry	0.52573	8	Wood processing and wood, bamboo, rattan, palm and grass product industry	0.46020	26
Furniture manufacturing industry	0.51764	9	Chemical fiber manufacturing industry	0.45383	27
Petroleum refining, coking and nuclear fuel processing industry	0.51685	10	Waste resources and waste and scrap recycling processing industry	0.45240	28
Electrical machinery and equipment manufacturing industry	0.50509	11	Textile and garment, shoes and cap manufacturing industry	0.44450	29
Ferrous metal mining and exploitation industry	0.50137	12	Coal mining and dressing industry	0.43743	30
Nonmetal minerals mining and dressing industry	0.50066	13	Water production and supply industry	0.43303	31
Metal product industry	0.48801	14	Ferrous metal smelting and rolling industry	0.43013	32
Communication device, computer and other electronic device manufacturing industry	0.48634	15	Electricity power and thermal power production and supply industry	0.42600	33
Food production industry	0.48574	16	Petroleum and natural gas extraction industry	0.42465	34
Textile industry	0.48567	17	Paper making and paper products industry	0.42215	35
Non-ferrous metal smelting and rolling industry	0.48363	18	Nonmetal minerals product industry	0.42191	36

#### IV. CONCLUSIONS AND SUGGESTIONS

The paper constructs a new industrialization assessment indicator system, utilizes the annual data of 2003-2011 to measure the new industrialization level of Chongqing Municipality, analyzes the development tendency of the new industrialization of Chongqing Municipality, and employs the section data of 2011 Chongqing Municipality industrial economy development to calculate the new industrialization level of each industry. As the research results demonstrate, (1)The new industrialization development of Chongqing Municipality has experienced a first-rise-then-fall process with 2008 as the turning point, and the insufficient scientific

research and development input also made the new industrialization level of industries fall when compared to 2008, so the new industrialization level of Chongqing Municipality need further improvement; (2)The new industrialization level of the manufacturing industries is higher than that of the other industries, and the top five in new industrialization level are all technology-intensive and capital-intensive type manufacturing industries; (3) The new industrialization level of the traditional competitive industries is obviously higher than that of the new industries, and the new industrialization development level of the industries with industry foundation is generally high.

Hereby, Chongqing Municipality shall continue the new industrialization development road, make the industrial economy stronger and larger, promote the the deep merging of informatization and industrialization, adjust the structure, change the manner, speed up to improve traditional industries, foster and develop new industries, and boost the industrial economy have greater scale, level, quality and efficiency. In specific terms, (1)Industrial cluster development shall be boosted. From the analysis of the new industrialization degree of each industry in Chongqing Municipality, the traditional industries with industrial foundation have high new industrialization level, and the advantages of industrial cluster development is prominent, so the resources configuration can be optimized, the logistics efficiency can be improved, the logistics cost can be reduced, the production and life service industries can be developed in coordination, and it will produce significant boosting function on the new industrialization development of the industries; (2)Capability of independent innovation shall be improved. From the overall new industrialization development tendency of Chongqing, the new industrialization level reached the peak after 2008 financial crisis, export blocking and insufficient domestic demand, which demonstrated that increasing scientific research and development input and improving capability of independent innovation are the efficient approaches to improve new industrialization level, and is also the basic requirements for new industrialization strategies; (3)Energy conservation and emission reduction shall paid attention to. The research and development and application of energy conservation and emission reduction shall be paid attention to, the resources shall be used reasonably, energy consumption can be reduced by clean energy and the recycling use of resources, thus the emission of industrial “three wastes” can be reduced, and green development and sustainable development road shall be continued, which makes the above conform to the point of new industrialization development strategy. (4)Human resources development and guarantee shall be

strengthened. On the one hand, labor guarantee shall be strengthened, especially, the development of vocational education shall be attached adequate attention, which will promote the Demographic Dividend play greater function; on the other hand, the cultivation of industrial scientific research and development staffs shall be strengthened, the introduction strength of innovation type group and talents shall be strengthened, which can provide talent support to the transformation and upgrading of industries and scientific innovation, human resources input can boost industrial economy growth, and the new industrialization development strategy with the human resources advantages developed greatly shall be implemented.

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#### REFERENCES

- [1] Z. Lv, “Discussion on China’s New Industrialization Road”, *Research on Economics and Management*, 2003(2):3-10.
- [2] S. Z. Gu, L. Y. Zheng, “New Industrialization and Second Undertaking of Hi-tech Development Zone”, *China Soft Sciences*, 2005(1): 15-22.
- [3] S. J. Liu, “Correct Understanding on New Industrialization”, *China Industrial Economics*, 2005(11):5-9.
- [4] C. Xie, J. A. Li, “New Industrialization. Evaluating Indicator System Construction of and Empirical Study on New Industrialization with Chinese Characteristics”, *System Engineering*, 2011 (3): 74-80.
- [5] Y. L. Luo, “A Dynamic Analysis on the Level of New-type Industrialization in China’s Western Region From the Angle of Western Region Development Program”, *Economic Geography*, 2012(2):27-32.