

Chapter 3

The Empirical Evaluation of Guangxi New Manufacturing Industry

Lu Ma, Dong-li Zhao, and Xin Zhu

Abstract Confronting with many problems from environment, population and resource, new manufacturing industry is the hope for further economic development. However, for now, there is not an agreed evaluation system of new manufacturing industry. At the meantime, it is inadequate to empirical research in this domain. After researching some scholars' last research and analyzing actual manufacturing situation of Guangxi, the authors propose an evaluation system of new manufacturing industry. It is a four-dimensional evaluation system (Economy Benefit, R&D Capability, Energy-saving Efficiency and Environmental Protection Ability) and includes 19 secondary indexes. To guide further research, taking Guangxi as an empirical subject, this article evaluates Guangxi new manufacturing industry from different aspects and draws some conclusions by Using SPSS16.0 software to make principal component analysis. The contribution of this study is not only making an evaluation system but also providing reference to the Guangxi new manufacturing industry development path.

Keywords Evaluation • New manufacturing industry • R&D ability • Energy energy-saving efficiency • Environmental protection

Introduction

The rapid development of manufacturing has greatly contributed for GDP in China. The new industrialization is the road that every manufacturing industry will go in the future. With the world's economy development, manufacturing has become the leading economic department to achieve modernization,

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L. Ma (✉) • D.-l. Zhao • X. Zhu

Department of Management, Guangxi University of Technology, Liuzhou, China
e-mail: malu6655@163.com; dongli0224@163.com; zhuxinjupiter@hotmail.com

industrialization, informationization and urbanization in one country. However, Chinese manufacturing industry of rapid development is facing unprecedented challenges containing environment and resources. In order to cope with the multiple constraint factors, the future manufacturing industry must rely on scientific and technological innovation, lower energy consumption, and reduce environmental pollution, increasing employment, to realize the dual ascension of economic benefit and competitive ability, and have to go a “new manufacturing industry” development path, which is a kind of people-oriented, positive developing, resource-recycling and protecting environmental way, to adapt the situation of China (Lianshui Li and Zhanyuan Du 2005).

Guangxi has achieved the rapid economic development since the reform and opening. According to comparable calculation, GDP grew from 7.585 billion RMB in 1978 to 717.158 billion RMB in 2008, it grew by about 94 times in a short span of 30 years, and its average annual growth rate was 16.37% which was higher than the average annual growth rate of the nation. In 2009, growth rate of Guangxi GDP ranked national fifth and the GDP was 775.916 billion RMB.

New Manufacturing Industry

New industrialization road will have to become one of the main growth modes of intensive way with economic growth mode which has gradually been changing from extensive mode to intensive. New industrialization is a way that high-technology, good economic returning, low consumption of resources, less contamination to environment, full-displaying of human resources' superiority (Bo Zeng et al. 2008). New manufacturing industry would adjust the industrial structure and promote industrial upgrading.

Industry is one of the most important forces to drive economic development of Guangxi, and it has a great contribution to GDP every year. Manufacturing is vital part of the industrial development, but manufacturing's contribution to Guangxi GDP was less than 30% in 2009. This seriously affected Guangxi economic development. Worse, the development of most Guangxi manufacturing will be hindered in the greatest degree by its high-cost and high-pollution. Therefore, it is very urgent that we should in-depth analyze and comprehensively evaluate every industry of Guangxi manufacturing to find good economic returning, well R&D capability, high-efficiency and good environmental protecting new industries.

The Evaluation System of New Manufacturing Industry

New manufacturing industry is a new concept following new industrialization that proposed by Li Lianshui and Wang Huaiming etc. in recent years. However, the evaluation system is not taken notice by scholar until Wang Huaiming put forward a

four-dimensional index system including four first-class indexes and 21 second-class indexes in 2010 (Huaiming Wang 2010). This paper refers this four-dimensional index system, analyzes the actual condition of Guangxi and finally constructs a new four-dimensional index system including 19 second-class indexes. And then, these indexes are explained in detail.

Economy Benefit

Economic benefit is an important aspect to measure the degree of new manufacturing industry. So, I use four indexes (the ratio of industrial added value to total industrial output value (A1), the proportion of liquid assets to total assets (A2), sales profit margin (A3), and overall labor productivity (A4)) to reflect the economic benefit of Guangxi manufacturing. One index (the ratio of industrial quantity of employment to total industrial output value (A5)) shows how much contribution of the manufacturing industries of Guangxi to employment situation and the share of manufacturing industries' labor force in total labor force. The index, ratio of dependence on foreign trade (A6), evaluates the new manufacturing industry degree from the angle of foreign trade market (Shichun Li 2007).

R&D Ability

R&D ability is a leading index to measure the degree of Guangxi new manufacturing industry. Two of the second-class indexes, the ratio of R&D expenditure to total industrial output value (B1), the proportion of R&D quantity of employment to quantity of industrial employment (B2), show R&D funds and talents investment. The other indexes, the ratio of quantity of science and technology employment to quantity of industrial employment (B3), the proportion of science and technology activity expenditure to total industrial output value (B4), totally reflect the amount of science and technology investment.

Energy-Saving Efficiency

Sustainable development is how every industry can be always young. The index of energy-saving efficiency mainly shows energy utilization efficiency and energy consumption. Amount of energy consumed for every unit of economic output (C1) and amount of electricity consumed for every unit of economic output (C2), these two indexes reflects Guangxi manufacturing industries energy-saving intensity and efficiency. The other two indexes, the proportion of every manufacturing industry's energy consumption to total energy consumption in Guangxi (C3) and

the proportion of every manufacturing industry's electricity consumption to total electricity consumption in Guangxi (C4), reveal the condition of Guangxi manufacturing industries energy consumption and could draw the energy dependence and dissipation contribution of Guangxi manufacturing industries.

Environmental Protection Ability

It is a decided way that creating stable & harmonious ecological environment if Guangxi manufacturing can develop enduringly and stably later (Yongquan Lv 2010). The attainment rate of the industrial waste water (D1), the attainment rate of the industrial SO₂(D2), the attainment rate of soot (D3), the attainment rate of industrial dust(D4), and the rate of volume of industrial solid wastes utilized to volume of industrial solid waste produced (D5) are used to measure "greening" degree of Guangxi manufacturing industry.

The Empirical Evaluation of Guangxi New Manufacturing Industry

Each dimension evaluation is needful before final new degree evaluation. Because comprehensive evaluation is based on four dimension evaluation (Jinrong Zheng and Fuyuan Xu 2010). And every evaluation can decide whether one factor is vital or not. This study uses SPSS16.0 software to make principal component analysis on 30 Guangxi manufacturing industries, and the data almost comes from the "Guangxi Statistical Yearbook of 2010".

Economic Benefit Evaluation

As the 95% accumulative total variance contribution was standard, it could gain weight after orthogonal rotating. Then, data computation could get Table 3.1. The higher comprehensive score the better economy benefit.

We could see some results from Table 3.1. First, in 2009, Tobacco Processing was the best economic benefit in Guangxi manufacturing industries, but it ranked 4th from the bottom in A5. At the same time, it ranked 1st in A1. Second, in the top ten economic industries ranked by economic benefit were light industries. At last, there was great difference among different manufacturing from comprehensive score (Table 3.1).

Table 3.1 Economic benefit ranking of Guangxi manufacturing industries in 2009

Manufacturing industries	Score	Ranking
Tobacco processing	2.486	1
Recycling and disposal of waste	1.463	2
Nonmetal mineral products	0.564	3
Medical and pharmaceutical products	0.403	4
Instruments, meters, cultural and office machinery	0.348	5
Beverage production	0.267	6
Farm and sideline products processing	0.245	7
Printing and record duplicating	0.122	8
Chemical fiber	0.082	9
General equipment manufacturing	-0.070	10
Transport equipment manufacturing	-0.088	11
Raw chemical materials and chemical products	-0.097	12
Timber processing, bamboo, cane, palm fiber and straw products	-0.114	13
Oil processing, coking and nuclear fuel processing	-0.134	14
Smelting and pressing of nonferrous metals	-0.141	15
Food production	-0.145	16
Communication equipment, computer and other electronic equipment manufacturing	-0.189	17
Handicraft and other manufacturing	-0.199	18
Cultural, educational and sports goods	-0.231	19
For special purposes equipment manufacturing	-0.247	20
Rubber products	-0.261	21
Electric equipment and machinery	-0.264	22
Smelting and pressing of ferrous metals	-0.269	23
Plastic products	-0.284	24
Metal products	-0.351	25
Textile industry	-0.429	26
Furniture manufacturing	-0.437	27
Papermaking and paper products	-0.462	28
Leather, fur, feather (wool) and related products	-0.691	29
Garments, shoes and accessories manufacturing	-0.875	30

R&D Ability Evaluation

It was the same as Economic Benefit Evaluation that accumulative total variance contribution, data computation. Guangxi equipment manufacturing industry top ranked in Table 3.2. They are emerging capital-and-technology-intensive industries and their R&D expenditures were much more than other industries (Lianshui Li and Huaiming Wang 2009). Next, The No.1 was still Tobacco Processing in this evaluation. Then, Guangxi labor-intensive industries' R&D ability was weak. Finally, it is a pressing issue to strengthen Guangxi manufacturing R&D ability. Therefore, we should invest more money to R&D and science and technology activity as much as other province (Guangxi Statistical Bureau 2011).

Table 3.2 R&D ability ranking of Guangxi manufacturing industries in 2009

Manufacturing industries	Score	Ranking
Tobacco processing	3.020	1
For special purposes equipment manufacturing	1.889	2
Transport equipment manufacturing	0.732	3
Instruments, meters, cultural and office machinery	0.469	4
General equipment manufacturing	0.293	5
Medical and pharmaceutical products	0.233	6
Electric equipment and machinery	-0.058	7
Beverage production	-0.087	8
Smelting and pressing of nonferrous metals	-0.175	9
Raw chemical materials and chemical products	-0.364	10
Textile industry	-0.404	11
Rubber products	-0.424	12
Food production	-0.446	13
Nonmetal mineral products	-0.465	14
Farm and sideline products processing	-0.484	15
Furniture manufacturing	-0.500	16
Printing and record duplicating	-0.511	17
Smelting and pressing of ferrous metals	-0.530	18
Papermaking and paper products	-0.530	19
Metal products	-0.537	20
Communication equipment, computer and other electronic equipment manufacturing	-0.551	21
Timber processing, bamboo, cane, palm fiber and straw products	-0.569	22

Energy-Saving Efficiency Evaluation

The computing process was similar with before. Table 3.3 showed energy-saving efficiency ranking of Guangxi manufacturing industries in 2009. The no.1 is Smelting & Pressing of Ferrous Metals. The top four industries are traditional energy-intensive. Second, the last was Chemical Fiber, but its ranking of economic benefit was in the top ten. Third, it was worthy noting that the light industries of Guangxi ranked in the end and it was relative to ranking of economic benefit. Fourth, the most part of them were lower than zero, which testified Guangxi manufacturing industries had to pay much attention to energy conservation and energy utilization.

Environmental Protection Ability Evaluation

The computing process was similar with before. There were some conclusions gotten from Table 3.4. First of all, the industries which had better environmental protection ability were light industries. Second, it was conspicuous that Tobacco

Table 3.3 Energy-saving efficiency ranking of Guangxi manufacturing industries in 2009

Manufacturing industries	Score	Ranking
Smelting and pressing of ferrous metals	3.692	1
Smelting and pressing of nonferrous metals	2.398	2
Nonmetal mineral products	1.541	3
Raw chemical materials and chemical products	0.550	4
Farm and sideline products processing	0.442	5
Papermaking and paper products	-0.095	6
Timber processing, bamboo, cane, palm fiber and straw products	-0.130	7
Transport equipment manufacturing	-0.183	8
Metal products	-0.285	9
General equipment manufacturing	-0.288	10
Handicraft and other manufacturing	-0.289	11
Electric equipment and machinery	-0.322	12
Plastic products	-0.331	13
Textile industry	-0.332	14
Beverage production	-0.344	15
For special purposes equipment manufacturing	-0.355	16
Recycling and disposal of waste	-0.372	17
Food production	-0.375	18
Oil processing, coking and nuclear fuel processing	-0.382	19
Medical and pharmaceutical products	-0.383	20
Communication equipment, Computer and other electronic equipment manufacturing	-0.398	21
Rubber products	-0.408	22
Leather, fur, feather (wool) and related products	-0.408	23
Tobacco processing	-0.414	24
Printing and record duplicating	-0.415	25
Garments, shoes and accessories manufacturing	-0.418	26
Furniture manufacturing	-0.420	27
Instruments, meters, cultural and office machinery	-0.462	28
Cultural, educational and sports goods	-0.691	29
Chemical fiber	-0.875	30

Processing was second in this table, and first in Tables 3.1 and 3.2, only ranked in the latter in Table 3.3.

In the case of that, Tobacco Processing was able to be the closest industry of new manufacturing industry if it improved energy-saving efficiency (Lundquist et al. 2008). Overall, Guangxi manufacturing industries had well environmental protection ability. So we can say that was good for people, society and environment, which should be keeping (Guerrieri and Meliciani 2005).

Comprehensive Evaluation

As the 85% accumulative total variance contribution was standard, it could gain weight after orthogonal rotating. Then, it got simplified five factors. Among them,

Table 3.4 Environmental protection ability ranking of Guangxi manufacturing industries in 2009

Manufacturing industries	Score	Ranking
Cultural, educational and sports goods	0.524	1
Tobacco processing	0.519	2
Chemical fiber	0.515	3
Instruments, meters, cultural and office machinery	0.512	4
Communication equipment, computer and other electronic equipment manufacturing	0.496	5
Rubber products	0.488	6
Garments, shoes and accessories manufacturing	0.388	7
For special purposes equipment manufacturing	0.377	8
Furniture manufacturing	0.364	9
General equipment manufacturing	0.346	10
Recycling and disposal of waste	0.334	11
Transport equipment manufacturing	0.319	12
Metal products	0.268	13
Electric equipment and machinery	0.252	14
Medical and pharmaceutical products	0.247	15
Handicraft and other manufacturing	0.173	16
Beverage production	0.127	17
Nonmetal mineral products	0.108	18
Food production	0.103	19
Oil processing, coking and nuclear fuel processing	0.099	20
Smelting and pressing of ferrous metals	0.098	21
Plastic products	0.009	22
Farm and sideline products processing	-0.012	23
Raw chemical materials and chemical products	-0.037	24
Papermaking and paper products	-0.082	25
Textile industry	-0.185	26
Timber processing, bamboo, cane, palm fiber and straw products	-0.297	27
Smelting and pressing of nonferrous metals	-1.839	28
Leather, fur, feather (wool) and related products	-1.869	29
Printing and record duplicating	-2.362	30

the heavier load indexes were: A1, A4, B2, and B3; C1, C2, and C4; B1, and B4; D1, and D2; A5. Data computation would get Table 3.5.

Table 3.5 told us much information. Firstly, Tobacco Processing was the highest level of new manufacturing industry. Meanwhile, it also had strong environmental protection ability. Secondly, there were four FMCG (Fast-moving Consumer Goods) productions in top five industries. And these four industries had high-energy-efficiency. Thirdly, Nonmetal Mineral Products Ranked the last, and other heavy chemical industries also ranked latter on account of low scores in factor F2 and F5. At the end, Transport Equipment Manufacturing had great potential. But it could not rank top five for low score in factor F2 and F5.

Table 3.5 The new degree ranking of Guangxi manufacturing industries in 2009

Manufacturing industries	Comprehensive score	Ranking
Tobacco processing	1.416	1
Farm and sideline products processing	0.722	2
Beverage production	0.710	3
For special purposes equipment manufacturing	0.444	4
Food production	0.339	5
Instruments, meters, cultural and office machinery	0.129	6
Transport equipment manufacturing	0.102	7
Medical and pharmaceutical products	0.089	8
General equipment manufacturing	-0.004	9
Textile industry	-0.069	10
Electric equipment and machinery	-0.094	11
Furniture manufacturing	-0.143	12
Rubber products	-0.197	13
Raw chemical materials and chemical products	-0.213	14
Smelting and pressing of nonferrous metals	-0.249	15
Metal products	-0.261	16
Communication equipment, computer and other electronic equipment manufacturing	-0.279	17
Smelting and pressing of ferrous metals	-0.325	18
Papermaking and paper products	-0.405	19
Timber processing, bamboo, cane, Palm fiber and straw products	-0.521	20
Printing and record duplicating	-0.560	21
Nonmetal mineral products	-0.631	22

Conclusion

To sum up, it could be thought that the relatively high new degree manufacturing industries were mainly labor-intensive industries in Guangxi in 2009. Their economic benefits and R&D ability were better than other industries. So they could drive the overall development of Guangxi manufacturing in the future. Next, the capital-and-technology-intensive industries were following closely after labor-intensive industries. It resulted that it was a future trend that capital-and-technology-intensive manufacturing would be leading in Guangxi. Then, as analyzed before, the value added of capital-and-technology-intensive industries would get a boost in the next few years.

Overall, the new degree of Guangxi manufacturing industries was not high, though its economic benefit was obviously more than other industries. The most important reason of relatively low new degree of Guangxi manufacturing industries was fewer input of R&D, not only funds but personnel. Maybe the reason was the understanding of Guangxi new manufacturing industry was not very well, and most manufacturing industries still drove economic growth through the labor productivity (Fiona 2008). Guangxi manufacturing industries' investment and propaganda were greater in energy-saving & environmental protection. Especially,

the difference among them was small. There would be several manufacturing industries which were able to become a national leader in energy-saving & energy-recycling (Andersson 2004). However, it would need much more investment in environmental protection if Guangxi manufacturing industries wanted to develop on a large scale.

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