The SWOT and Countermeasures Analysis about Automotive Manufacturing Servitization in Guangxi Based on the Perspective of R&D Input

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Keywords: Automotive manufacturing, Servitization, Total factor productivity (TFP), Research and development (R&D).

Abstract. At first, this paper estimated the total factor productivity of the automobile manufacturing industry in Guangxi from 2005 to 2014. The study found that the total factor productivity in Guangxi is lower than Shanghai. Then, based on the perspective of R&D input, we analyzed the SWOT of the service transformation of automobile manufacturing industry in Guangxi. This paper proposes transformation path of service automobile manufacturing industry and gives some countermeasures and suggestions.

Introduction

Automobile industry is one of the key industries in Guangxi. In 2014, the output of automobile industrial is 215.52 billion yuan accounting for 13.7% of the total cost of the production in Guangxi, which is of great significance to economic development to Guangxi. The number of Automobile manufacturing enterprises are 323 accounting for 2.4% of the number of car companies in China. The production of cars are 2.09 million accounting for 8.8% of the national car production. The staffs of Auto manufacturing is 131 thousand in Guangxi, including 8653 personnel in research and development accounting for 6.6% of all staffs. The funds of R&D input is 2.667 billion yuan accounting for 1.24% of the total output value of the automobile industry.

The "13th Five-Year Plan" was brought into action since 2016, which was the key to the transformation and upgrading of manufacturing industry in China, "Made in China 2025" proposed "innovation driven" strategy which intended to make China's manufacturing industry seize the opportunity for a new round of industrial revolution and master its own core technologies by the technological revolution to change the traditional mode of production and improve the quality and production efficiency. On the one hand, in the traditional automotive industry, the processing and manufacturing sectors lack technology, which is easy to be copied. However, services sectors especially technical content development, design and other aspects are rich in high technology, which is not easy to be copied, so it is possible to obtain long-term competitive differentiation advantage. On the other hand, automobiles have a high energy consumption and emissions brings pollution problems to the environment. So in order to obtain competitive advantage in the period of transform and upgrade, the auto manufacturing industry in Guangxi should form its conversion mode from the low value-added process about processing and manufacturing to the high value-added process about design and research.
The TFP Calculation

Total factor productivity can be decomposed into technical efficiency and technical progress. Technical efficiency is due to the introduction of new technology and scientific management methods, improving the production efficiency of enterprises and reflecting the effective use of resources. Technological progress mainly refers to the new technology of knowledge accumulation and improve, through the progress of technology, to promote the upgrading of industrial structure.

Methodology and Data

This paper uses DEA-Malmquist index to measure the total factor productivity about automobile manufacturing in Guangxi from 2005 to 2014, and comparing with the Shanghai automobile manufacturing. The basic data come from “Guangxi Statistical Yearbook” and “Shanghai Statistical Yearbook”.

(1) Input variables.

- Labor input. This paper selects the annual average number of labor input variables of automobile manufacturing workers.
- Capital investment. To estimate original value of fixed assets capital involves the selection of depreciation rate, but depreciation rate in time dimension are significant differences in dimensions and industry. So the paper select the auto industry output value as output variable and deflate the price based on 1990.

(2) Output variable.

Considering the existence of the inventory, gross industrial output value more than sales revenue can accurate measure of output. Due to the gross value of industrial output is measured in current prices, so this article select auto gross industrial output value as output variable and deflate the price based on 1990.

Results

We can see the results from Table 1, Guangxi auto manufacturing total factor productivity growth mainly comes from the contribution of technological efficiency. It demonstrates that the accumulation of knowledge and technology improvement is one of the most important factors to promote Guangxi auto transformation. The average level of total factor productivity, efficiency change and technical efficiency growth of auto manufacturing in Guangxi are lower than Shanghai.
Table 1. Malmquist index and decomposition in Guangxi and Shanghai from 2005 to 2014.

<table>
<thead>
<tr>
<th>Region</th>
<th>Guangxi</th>
<th>Shanghai</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Efficiency change</td>
<td>Technical efficiency</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005-2006</td>
<td>1.017</td>
<td>1.144</td>
</tr>
<tr>
<td>2006-2007</td>
<td>0.892</td>
<td>1.137</td>
</tr>
<tr>
<td>2007-2008</td>
<td>1.122</td>
<td>0.968</td>
</tr>
<tr>
<td>2008-2009</td>
<td>1</td>
<td>1.205</td>
</tr>
<tr>
<td>2009-2010</td>
<td>0.881</td>
<td>0.964</td>
</tr>
<tr>
<td>2010-2011</td>
<td>0.854</td>
<td>1.381</td>
</tr>
<tr>
<td>2011-2012</td>
<td>1.285</td>
<td>0.896</td>
</tr>
<tr>
<td>2012-2013</td>
<td>1.034</td>
<td>0.98</td>
</tr>
<tr>
<td>2013-2014</td>
<td>0.917</td>
<td>1.053</td>
</tr>
<tr>
<td>Mean</td>
<td>0.992</td>
<td>1.072</td>
</tr>
</tbody>
</table>

SWOT Analysis

Strength

Automobile industry is one of the key industries in Guangxi. It has a batch of well-known enterprises, national car key laboratory, and the support of R&D funds. In 2006, the auto industry in Guangxi has 1133 R&D personnel persons which the number is 8653 in 2014. It has increased by 6.6 times in 9 years. R&D funds from 2006 in 505 million to 2014 in 2.669 billion yuan, increased by 4.2 times and enterprise funds have been the main source of R&D funds in Guangxi.

Weakness

Guangxi auto industry core competitiveness is not strong, in the automotive manufacturing and spare parts. Except for several well-known enterprises, most enterprises, R&D investment and the gap between the developed provinces and regions has become increasingly apparent in the supply chain of low-end. In addition, it can be seen in Table 2, scientific research and technology service industry in Guangxi induction coefficient of only 0.49. The higher induction degree coefficient is, the greater role to promote the supply of other departments. It shows that the service supply driven, automobile manufacturing industry in the aspect of R&D spending more need to rely on independent research and development. The data comes from 2012 input-output table of 42 departments in Guangxi.
Table 2. The reaction coefficient of producer services of Guangxi in 2012.

<table>
<thead>
<tr>
<th>Producer Services</th>
<th>Reaction coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation, warehousing and postal services</td>
<td>1.46</td>
</tr>
<tr>
<td>The financial sectors</td>
<td>1.40</td>
</tr>
<tr>
<td>Wholesale and retails</td>
<td>1.31</td>
</tr>
<tr>
<td>Leasing and business services</td>
<td>1.02</td>
</tr>
<tr>
<td>Information transmission, software and information technology services</td>
<td>0.64</td>
</tr>
<tr>
<td>Scientific research and technical services</td>
<td>0.49</td>
</tr>
</tbody>
</table>

**Opportunity**

In the period of "the 13th Five-Year Plan", the national decides to support industry structure changing and promotes the transformation of service about driving the development of industrial economy. Guangxi actively responses to the policy in the way of supporting the transformation and upgrading of the auto industry, encouraging the development of new energy vehicles and creating a favorable policy environment for independent innovation. In addition, science and technology innovation has become the focus in the national various universities and research institutions.

**Threat**

The fierce competition in the international and domestic car market, Europe and the United States and other countries implement the "Industrialization" strategy. Besides, automobile industry cluster in other provinces in China all actively seek the path of intelligent manufacturing. The effect Guangdong industry radiation and driving on Guangxi is weakness. There is a certain "siphon effect" which made in the research and development in Guangxi. In consequence, Guangxi will face the high technology talent competition.

**Countermeasures**

**Path selection**

Guangxi automobile manufacturing enterprise of service can implement input and output servitization at the same time. On the one hand, it should increase production of the service, on the other hand, it should increase the output of business services. Achieving servitization through the research and development path can strengthen its core competitiveness and also regard research and development, design and planning advisory services as one of the main business of the enterprise. In addition, it can provide technical support for the sale and maintenance of cars, etc.

**Promote the Independent Research and Development**

Make full use of the existing new energy and talent advantages, by innovating in the industry-university-institute cooperation mode, make a breakthrough in the key technology and further enhance the ability of independent research and development of the automotive industry in Guangxi. Besides, improving the attraction of innovative talents especially the interdisciplinary talents who are familiar with both manufacturing operations and services.
business are proficient in both production technology and business knowledge. Finally, increase capital investment strength and promote the establishment and improvement of a large company's technology development center to promote the transformation of scientific research.

**The Internet Aid**

With the help of Internet, big data, etc., the auto industry improves the ability of obtaining knowledge and technology. So, in order to provide support for the transformation of service of the enterprise, information technology should be extensively penetrated in the R&D design, customer service and other aspects of service links.

**Promote the Development of Producer Services**

Promote the coordinated development of the automotive industry and producer services, the more balanced they develop, the more smoothly the manufacturing industry servicingizing will be. When it comes to the development of service industry, the idea that service plays a leading role should be set up. By developing science and technology service industry such as R&D, design, consulting and intellectual property, improve the quality of service and improve the competitiveness of service enterprises.

**Policy Support**

Actively guide the servitization of automobile manufacturing industry, strengthen government support for the independent research and development of the enterprise further, increase the proportion of government spending in the R&D funds and make government funds play a role of "leverage effect" in enterprise funds. Strengthen the introduction and cultivation of service personnel, on this basis, attract a group of outstanding automotive technology and comprehensive service talents to Guangxi in the transformation of service work.

**Literature References**

Vandermerwe and Rada (1998) put forward the concept of service for the first time [1], then many scholars began to study the theme of service. Ji-guo Liu (2007) had studied the concept of manufacturing servitization[2]. Qun-hui Huang, Jing-dong Huo (2014) had studied the factors of manufacturing servitization[3]. Yong-deng Zhao (2012) had studied the manufacturing service transformation path [4]. Cha-pin Hu (2014) had studied the relationship between manufacturing servitization and corporate performance [5]. Zhi-biao Liu (2011) had a research on manufacturing and service industries fusion [6]. Xue-gang Shi, Er-shi Qi (2012) had a research on manufacturing servitization and enterprise innovation ability by modern manufacturing services for enterprise independent innovation to provide the necessary supporting services, help enterprises to shorten the innovation process, reduce the innovation cost and improve the efficiency of innovation, and improve the innovation ability of enterprises [7].

Schumpeter (1934) believed that within the enterprise research and development and innovation is the decisive factor to promote technological progress and economic growth. Davies(2004) pointed out from the Angle of enterprises to provide integrated solutions, manufacturing enterprise can be involved in research and development, design, planning and other industrial chain upstream stage [8]. Through the path of service implementation, manufacturing enterprise can improve its core competitive ability is closely related to the level
of research and development and design. Above research shows that the product innovation capability is through new product research and development to marketing the whole process of comprehensive ability, technology element, talents element, capital element is the result of comprehensive action.


In measuring the efficiency of economic growth and technological progress which is the most commonly used indicator of total factor productivity, based on the above analysis, this article through to the Guangxi auto manufacturing total factor productivity measurement and decomposition, analyze of the total factor productivity growth which is derived from the improvement of technical efficiency and technical progress, and compared with the Shanghai automobile industry analysis, thus put forward some suggestions in the transformation of Guangxi auto manufacturing servitization.

Conclusions
During the period of "the 13th Five-Year Plan", manufacturing transformation of service will become a trend. As the auto manufacturing industry is a pillar industry of Guangxi, it can effectively promote Guangxi economy continues to speed up the transformation of service development and efficient operation. However, Guangxi auto manufacturing investment is still in a lower level in research and development. In order to improve automobile manufacturing total factor productivity in Guangxi, it should further strengthen R&D funds and R&D personnel input through the accumulation of technology and knowledge of ascension. Choose suitable transformation path from low value-added processing and manufacturing link to the research and development of high value-added services such as link. Step by step in the research and development of manufacturing service implementation can feedback, form good virtuous circle mechanism.

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References


