

Research about the Advanced Manufacturing Services with Empirical and Development Status in Guangxi: Based on the Theory of Input-Output

Zhi-Ping LU^{1,a}, Yuan-Yuan YAN^{1,b,*}, Xiang WU^{1,c}

¹School of Management, Guangxi University of Science and Technology, Liuzhou, P.R. China

^a404840561@qq.com, ^b1198033660@qq.com, ^c542460556@qq.com

*Corresponding author

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Abstract. This paper describes the introduction of advanced manufacturing and manufacturing services in China and the global. Basis on that, we analyze the development of the advanced manufacture services with models and indicators. By using the theory of input-output to analyze the coefficient proportion of investment in advanced manufacturing services input and manufacturing sub-sector input of Guangxi, we can conclude something from it.

Introduction

Advanced manufacturing, which is recently proposed, is a concept of the domestic economy. It is mainly about innovation of technical, management, industry, development patterns and other aspects. With the development of the manufacturing sector, more and more enterprises begin to improve service in the proportion of its business operations. This phenomenon is called “manufacturing services” by economists. It reflects the change in the terms of manufacturing enterprise integration services to sell products [1].

There are two levels of manufacturing services in this paper .The first one is so-called the service of input, which is to say the elements of service play an increasingly important role in the total investment of the manufacturing sector. The second one is the service of business, which is also known as output of services, is all the products and services output occupy an increasingly important position in the manufacturing sector. Manufacturing services is the process of manufacturing enterprises from producers to who provide full-service [2]. The output ratio of the proportion of investment business service elements and service offerings continue to rise in this process.

The status of advanced manufacturing services in China and foreign countries

Based on the listed companies on the global database (OSIRIS database), Nelly analyzed that the proportion of service among China's listed companies in 2007 was only 2%, which reached over 20% in 2009[4].But US-listed company's advanced manufacturing services was more than 50% in 2009 [3].According to the situation from 2012 annual reports of listed companies in China, the proportion of 15 representative companies listed companies advanced manufacturing services business total revenue is generally not high, only one exceeds 20%, but still 6 companies are less than 10%.All around the world, such as IBM, Dell, GE, Nike and many other companies are in transition to a service-based model from a manufacturing model. For example, services revenue of IBM in 2011 accounted for 82.1% of the total revenue, profit before tax services business accounted for 92.9% of the total profit [4]. In summary, the level of advanced manufacturing services in China is generally lower.

Therefore, this paper analyzes these two aspects of the research. By modeling and quantitative indicators to analysis advanced manufacturing service input coefficient, manufacturing input

coefficient and the proportion of intermediate inputs by industry of Guangxi, we provide a reference for advanced manufacturing services to enhance the level of Guangxi.

Data selection and model building

Based on the newest the division regulations of three kinds of industries in China, we can divide the services into 16 industries, and the manufacturing was divided into 17. In this paper, the raw data come from input-output tables of 42 sectors in 2002&2007. By calculating the coefficient of directly consumption and completely consumed, to analyze the level of advanced manufacturing services and evolution in Guangxi.

The theory of input-output is raised in the 1930s by Leontief, who is the well-known economist in the America, as well as the Nobel laureate. The method is used to analysis economic aspects problems with numbers [5].The various sectors of the national economy includes investment into the physical inputs and services. Input-output coefficients are the important tools of input-output analysis. Direct consumption coefficient and complete consumption coefficient can reflect the interdependencies between the various sectors of the national accounts. Direct consumption coefficient refers to the total output of the unit production process j-product (or industry) sector of the direct consumption of the i-product division of goods or services. Direct consumption coefficient is generally indicated by the letter A. Complete consumption coefficient is the sum of the i-product division products or services directly or indirectly consume consumption when the j-products division to provide a unit for each end-use. Complete consumption coefficient is generally indicated by the letter B.

Direct consumption coefficient is calculated as follows:

$$a_{ij} = \frac{x_{ij}}{x_j}, (i, j = 1, 2, 3 \dots n) \quad (1)$$

Where: x_{ij} stands for the units of a product (or industry) sector total output; x_j stands for the value of the product division of goods or services.

Complete consumption coefficient matrix can be obtained direct consumption coefficient matrix operations. The formula is:

$$B = (I - A)^{-1} \quad (2)$$

Where: I was of the same order unit matrix A , $(I - A)$ is the famous Leontief matrix.

The analysis of advanced manufacturing service input coefficients in Guangxi

In order to meet the needs of the analysis, we have been processed the 2002&2007 original input-output tables in Guangxi and the National. We merged the 42 sectors into six major industries, which are agriculture, mining, manufacturing, water and electricity production, supply, construction, services , and got the new input-output tables[6] (Table 1).

Based on Table 1, we can further calculate the coefficient consumed directly completely in Guangxi and the whole country (Table 2).

In recent years, we can know the total investment in the manufacturing services increased in Guangxi from 2002 to 2007 from Table 1. Thus, the trend of advanced manufacturing services in Guangxi is upward. However, the tendency of manufacturing services into the proportion of Guangxi is go down, which can be seen from Table 2.The coefficient directly consumed fells from

0.1887 to 0.0963 in 2002, and the complete consumption coefficient services fell from 0.5543 to 0.2686 in that year, which is consistent with the national tendency. Compared with the national average, the investment in Guangxi manufacturing services is slightly less [7].

Table1 Invested in 2002& 2007 after the merger of industry output tables in Guangxi

2002	Agriculture	Mining industry	Manufacturing	Water and electricity industry	Building industry	Services	Total output
Agriculture	1415955	7204	1429734	0	55728	320023	9446702
Mining industry	382	59120	1355153	184104	325431	5671	1278450
Manufacturing	1508286	171522	8108259	46206	3187242	2139977	21424904
Water and electricity industry	40208	64725	906608	75538	39504	544577	1443535
Building industry	1830	1619	9017	276	0	203455	6268375
Services	366104	322829	4043331	454160	1012434	4454228	17555851
Value Added	6113937	651432	5572802	683251	1648036	9887919	
Total investment	9446702	1278450	21424904	1443535	6268375	17555851	
2007	Agriculture	Mining industry	Manufacturing	Water and electricity industry	Building industry	Services	Total output
Agriculture	2952739	5095	5268992	0	38412	433843	20262157
Mining industry	291	131258	4284059	1219126	151750	5215	2321480
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Manufacturing	3961854	338592	22500275	205929	6602614	5164947	56614690
Water and electricity industry	113349	197994	2112859	2902492	135277	768012	7656368
Building industry	0	546	24852	2451	54663	203232	12460596
Services	820428	318360	5450447	695189	2126079	6052974	35518237
Value Added	12413497	1329635	16973205	2631180	3351800	22890015	
Total investment	20262157	2321480	56614690	7656368	12460596	35518237	
Agriculture	2952739	5095	5268992	0	38412	433843	20262157
Mining industry	291	131258	4284059	1219126	151750	5215	2321480

Table2 The comparison of coefficient in advanced manufacturing and the services sector between Guangxi and the national

Index Years	Guangxi		Nationwide	
	A direct consumption coefficient	Complete consumption coefficient	A direct consumption coefficient	Complete consumption coefficient
2002	0.1887	0.5543	0.1216	0.3865
2007	0.0963	0.2686	0.0835	0.3396

The manufacturing to the service sector completely consumed coefficient in Guangxi is lower than the national, which is 0.7098 in 2007. It is optimistic that Guangxi manufacturing services for directly consumption coefficient is higher than the national, which is 0.0128 in 2007. With the pace of industrial transformation and upgrading, Guangxi will gradually narrow the gap with other parts of the country on the coefficients completely consumed.

The analysis of coefficients about Manufacturing Sector service input in Guangxi

There are 17 manufacturing industries in the input-output tables of 42 sectors in Guangxi during 2002&2007. By calculating, we can get the coefficients of manufacturing sub-sectors of services in Guangxi (Table 3).

Table 3 The coefficients of manufacturing sub-sector service input in Guangxi

Industry	Years	2002	2007
Manufacturing	0.1887	0.0963	
Food manufacturing and tobacco processing industry	0.1798	0.0955	
Textile industry	0.1555	0.0553	
Textile, leather and feather products industry	0.1738	0.0472	
Wood processing and furniture manufacturing	0.1434	0.0614	
Paper printing and Educational and Sports Goods	0.1625	0.0794	
Petroleum processing, coking and nuclear fuel processing industry	0.1090	0.0260	
Chemical Industry	0.2005	0.0991	
Non-metallic mineral products industry	0.2018	0.1399	
Metal smelting and rolling processing industry	0.1831	0.1098	
Fabricated Metal	0.1378	0.0833	
General, special equipment manufacturing	0.2144	0.0974	
Transportation Equipment Manufacturing	0.2180	0.0785	
Electrical machinery and equipment manufacturing	0.2123	0.1118	
Communications equipment, computers and other electronic equipment manufacturing	0.2927	0.0778	
Instrumentation and Cultural Office Machinery	0.2169	0.0785	
Crafts and other manufacturing	0.1611	0.0899	
Scrap waste	0.0000	0.0326	

Based on the analysis, we can see that the services input coefficients of chemical industry, non-metallic mineral products, transport equipment manufacturing and other manufacturing services, although decline, which is still greater than that of manufacturing services. As the service into scrap waste industry is low, it is rose to 0.0326 in 2007, which shows an upward trend. Food manufacturing and tobacco processing industry and other manufacturing services have the higher investment but a downward trend. It is worth noting.

The analysis of services sub-sector share of intermediate inputs in manufacturing in Guangxi

Intermediate inputs from the service sector share of the industry in manufacturing point of view, the most increase were tourism, health, social security and social welfare, an increase of 0.1522%, 0.1357%, which compared with 2002. The dropped mostly were Information transmission and computer services, transportation and warehousing, finance and insurance which were less 6.0370%, 1.2757%, 1.0157% compared with 2002 (Table 4).

Based on the analysis of table 4, among the 16 services sub-sectors, there were four intermediate inputs into manufacturing industries in specific gravity greater than 0.5 in 2007, which were transportation and warehousing, wholesale and retail trade, finance and insurance, leasing and business services. There were also 11 manufacturing industries in the relatively low proportion of intermediate inputs. However the proportion of tourism, health, social security and social welfare were on the rise. While, the postal services, information transmission, computer services and software industry, accommodation and catering, real estate, scientific career, other social services,

culture, sports and the proportion of those eight begin to decline ,which should be paid attention to.

Table 4 The proportion of intermediate inputs in manufacturing a variety of services

Index Industry	Intermediate service inputs		Manufacturing accounted for the proportion of intermediate inputs		
	2002(Ten thousand)	2007(Ten thousand)	2002 (%)	2007 (%)	Rise/Drop (%)
Intermediate service inputs	17555851	35518237			
Service in the middle of manufacturing inputs	4043331	5450447	18.8721	9.6273	-9.2448
Transportation and warehousing	764737	1298581	3.5694	2.2937	-1.2757
Postal Services	7010	5571	0.0327	0.0098	-0.0229
Information transmission, computer services and software industry	1337351	116099	6.2420	0.2051	-6.0370
Wholesale and retail trade	992497	2571027	4.6324	4.5413	-0.0912
Accommodation and Catering Services	113774	143449	0.5310	0.2534	-0.2777
Finance and insurance	426350	551604	1.9900	0.9743	-1.0157
Real Estate	27663	26400	0.1291	0.0466	-0.0825
Leasing and Business Services	229102	359062	1.0693	0.6342	-0.4351
Tourism	1219	89386	0.0057	0.1579	0.1522
Scientific career	39997	60861	0.1867	0.1075	-0.0792
Integrated Technical Services	13996	11295	0.0653	0.0200	-0.0453
Other social services	41722	87466	0.1947	0.1545	-0.0402
Education	12499	16193	0.0583	0.0286	-0.0297
Health, social security and social welfare	5439	91173	0.0254	0.1610	0.1357
Culture, Sports and Entertainment	29974	22282	0.1399	0.0393	-0.1005
Public and Social Organization	0	0	0	0	0
Intermediate inputs into manufacturing	21424904	56614690	100. 00	100. 00	100. 00

The conclusions

Based on all above, we empirical and make research into the advanced manufacturing services in Guangxi, and we can draw the following points:

1. The whole investment in advanced manufacturing services in Guangxi has risen significantly, but the proportion is still insufficient. The coefficient of complete consumption is lower than the national average. But with the high speed of industrial restructuring and upgrading in Guangxi, the proportion of investment in manufacturing services gradually increased in 2007, and the gap reduced when compared with the rest of the country .
2. The service level of commitment in manufacturing industries is much different in Guangxi. There is a higher proportion of investment in the traditional manufacturing and services than advanced manufacturing services.
3. The service trades in the production of manufacturing investment degree are different in Guangxi. The proportion of traditional service industry accounts for manufacturing intermediate input is higher than the emerging service industry.

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