Empirical Analysis of the Textile Manufacturing Industry in Guangdong Province Based on the Input-Output Method

Jingxuan Li and Qiong Long
Business school Beijing Institute of Fashion Technology Beijing, China

Keywords: Textile, Input-Output Method, Direct Consumption Coefficient, Complete Consumption Coefficient.

Abstract: Based on the latest input-output data of Guangdong Province in 2017, the article researches and analyses the total output, industrial ripple effects and industrial structure of the textile industry in Guangdong Province. The induction of the textile manufacturing industry in Guangdong Province is lower than the social average, but its influence is higher than the social average, and it is more closely related to other industries; the analysis of the intermediate input rate and the intermediate demand rate shows that the textile manufacturing industry in Guangdong Province belongs to the intermediate product-based industrial sector, which has the nature of a means of production and low value-added. In this regard, it is recommended that the textile manufacturing industry in Guangdong Province undergoes digital industrial upgrading to increase the added value of the industry.

1 INTRODUCTION

The global textile and apparel industry is undergoing the fifth international transfer, a new round of industrial transfer, under the constraints of developed countries and the challenges of emerging developing countries, China's textile and garment industry labor cost advantage has gradually weakened (Lu, 2013). The textile industry has always been a traditional pillar industry in Guangdong Province, and it has made outstanding contributions in various fields such as market prosperity, employment expansion, technological innovation, brand creation, etc., and is the top priority of the high-quality economic development of Guangdong Province. With the development of Guangdong's textile industry, it has also led to the exuberant development of other related industries and the overall national economy. However, with the continuous optimisation of the industrial upgrading and value chain, China's textile industry has gradually fallen into many difficulties such as sloppy production methods, low value-added rate, serious pollution and severe product homogenisation. In order to better cope with the environmental dilemma, empowering the whole chain of the textile industry with the digital economy, accelerating the upgrading and transformation of the textile industry, and achieving high-quality development have become one of the hot issues concerned by academics, the industry and even the government (Li, 2018).

In this context, this paper uses the input-output model, and based on the input-output table of Guangdong Province in 2017, the quantitative dependence of the input-output between the textile manufacturing industry itself and other economic sectors in Guangdong Province is in the economy of Guangdong Province. The influence and spillover effect in the analysis are carried out. This paper adopts the methods of combining industrial economics and input-output economics, combining qualitative analysis and quantitative analysis, combining static analysis and dynamic analysis, etc. to study the development of textile manufacturing industry in Guangdong Province. Finally, it is concluded that Guangdong Province should strengthen the support of the textile industry in terms of digital transformation, R&D innovation, financial support, and speeding up the construction of independent brands according to the changes in the domestic and foreign economic environment.

* Corresponding author

Li, J. and Long, Q.
Empirical Analysis of the Textile Manufacturing Industry in Guangdong Province Based on the Input-Output Method.
DOI: 10.5220/0012022500003620
In *Proceedings of the 4th International Conference on Economic Management and Model Engineering (ICEMME 2022)*, pages 11-16
ISBN: 978-989-758-636-1

2 DEFINITIONS

The textile industry studied in this paper refers to the textile manufacturing industry, which specifically includes cotton textile and dyeing finishing, wool textile and dyeing finishing, hemp textile and dyeing finishing, silk and silk textile and dyeing finishing, chemical fibre weaving and dyeing finishing, knitting or crochet fabric and its products manufacturing, household textile manufactured products manufacturing, industrial textile manufactured products manufacturing, etc (Zhao, 2018). The classification of textiles was collated according to the rules for the preparation of input-output tables in Guangdong Province and the industry classification code table of the national economy, as shown in Table 1.

Table 1: Definition of textiles.

Code	Sector
17027	Cotton, chemical fibre textiles and dyeing and finishing products
17028	Woolen Textiles and Dyeing and Finishing Products
17029	Hemp and silk textiles and processed products
17030	Knitting or crochet and articles thereof
17031	Fabricated textile products
18032	Textile clothing and apparel
19033	Leather, fur, feathers and articles thereof
19034	Shoes

The economist Vassily W. Leontief first proposed the input-output analysis in the 1930s, which allowed for a comprehensive analysis of the balance between inputs and outputs of the various sectors of the national economy and between them. Through the study of the structure of the national economy, Leontief and other economists proposed and developed input-output tables based on previous studies on the interdependence of economic activities, and the input-output model (I-O model) was also developed based on input-output tables. The I-O model is also based on input-output tables.

The study and application of input-output analysis can provide a useful scientific tool for building a country's economy, and most countries update and compile input-output tables every few years. As the input-output table of Guangdong Province is not updated and released every year, this paper uses the latest updated input-output data of Guangdong Province in 2017 to conduct empirical analysis of the direct consumption coefficient, complete consumption coefficient, intermediate demand rate, intermediate input rate and other relevant indicators of the textile and garment industry.

The total output of the textile manufacturing industry in Guangdong Province reached 211.55 billion yuan in 2007, and 254.38 billion yuan in 2012, representing a year-on-year increase of 16.8%; in 2017, the total output reached 316.25 billion yuan, representing a year-on-year increase of 24.3%.

The total output of the textile manufacturing industry in Guangdong Province has been increasing year by year, indicating that the textile manufacturing industry in Guangdong Province has formed a certain scale and more complete industrial system, and has a certain influence in the economic development of the province.

3 METHODS

As the direct consumption coefficient helps to understand the strength of the interdependence and constraints among the various sectors of the national economy, and also provides an important economic parameter for the construction of input-output models, the direct consumption coefficient is used in this paper to illustrate the extent to which the textile manufacturing industry in Guangdong Province consumes products from other sectors in the production process, in order to reflect the degree of dependence of the textile manufacturing industry on other industrial sectors.

The direct consumption coefficient of the textile manufacturing industry in Guangdong Province reflects the direct consumption of products in various sectors of the textile manufacturing industry during the production of a product, specifically the ratio of the consumption of a certain product to the total output of the textile manufacturing industry. Its calculation formula is as follows.

$$a_{ij} = \frac{x_{ij}}{x_i} (\mathrm{i}, \mathrm{j} = 1,2, \ldots, \mathrm{n}) \quad (1)$$

In this equation a_{ij} is the direct consumption coefficient; x_{ij} is the direct consumption of a product in sector j to sector i; x_j is the total input of sector j. The direct consumption coefficient is an important and fundamental coefficient for modelling and is considered to be the core of the input-output model.

The coefficient of complete consumption of the textile manufacturing industry in Guangdong Province is the coefficient of all the textile manufacturing industry's production of a product The amount of products used in each industrial sector in

the chain, expressed as b_{ij}. Its calculation formula is as follows.

$$b_{ij} = a_{ij} + \Sigma_{k=1}^{n} b_{ik} a_{jk} (\mathrm{i,j} = 1,2,\dots,\mathrm{n}) \quad (2)$$

The intermediate demand rate is expressed as the ratio of intermediate demand in each industry sector to final demand in that industry and is calculated as shown in equation (3).

$$G_i = \frac{\sum_{j=1}^{n} X_i}{\sum_{j=1}^{n} X_{ij} + Y_i} (\mathrm{i,j} = 1,2,\dots,\mathrm{n}) \quad (3)$$

In this equation G_i is the intermediate demand rate of industry i; Yi is the final demand component of industry sector i.

The intermediate input rate is the ratio of intermediate inputs to total inputs in the production of an industrial sector in one year and is calculated as shown in equation (4).

$$F_i = \frac{\sum_{i=1}^{n} X_{ij}}{\sum_{i=1}^{n} X_{ij} + D_j + N_j} (\mathrm{i,j} = 1,2,\dots,\mathrm{n}) \quad (4)$$

In this equation F_j is the intermediate input rate of industry j; D_j is the full depreciation cost of industry j in 1 year; and N_j is the value created by industry j.

4 RESULTS & DISCUSSION

4.1 Analysis of the Direct and Complete Consumption Coefficients of Textiles in Guangdong Province

Based on equation (1), the direct consumption coefficient for the textile manufacturing industry in Guangdong can be estimated, as shown in Table 2 (due to space constraints, only the top 10 industries are listed in this paper).

In general, the larger the aij, the greater the direct dependence of sector j on sector i. Sectors with direct consumption coefficients above 0.01 should be those with higher consumption. Table 2 shows that the top five industries closely linked to the textile manufacturing industry in Guangdong Province are textiles, chemical products, production and supply of electricity and heat, wholesale and retail, and agricultural, forestry and fishery products and services. Among them, the direct consumption of the financial sector ranks in the top ten, indicating that the development of the textile manufacturing industry has a certain demand-pull effect on capital and is an industry with a strong financing nature.

Table 2: Top 10 direct textile consumption factors in Guangdong Province.

Sector	Direct consumption factor	Rank
Textiles	0.452877	1
Chemical products	0.087286	2
Production and supply of electricity and heat	0.05566	3
Wholesale and retail	0.049968	4
Agriculture, forestry and fishery products	0.026881	5
Clothing, footwear, hats, leather and down and their products	0.018342	6
Transport, storage and postal services	0.015812	7
Paper, printing, educational and sporting goods	0.01518	8
Finance	0.009171	9
Coal mining products	0.008222	10

The complete consumption factor gives a more complete The higher the coefficient, the closer the techno-economic linkages.

As the coefficient of complete consumption reveals the direct and indirect links between sectors, it provides a more profound picture of the quantitative relationships of intersectoral The coefficient of complete consumption reveals the direct and indirect linkages between sectors and provides a more profound picture of the quantitative relationships of intersectoral dependence, or it helps to provide a more comprehensive picture of direct and indirect consumption. From (2), the coefficient of complete consumption of the textile manufacturing industry in Guangdong Province can be estimated as shown in Table 3 (due to space constraints, only the top 10 industries are listed in this paper), the coefficient of direct consumption and the coefficient of complete consumption of textile The textile manufacturing industry is ranked 1st in both the direct and complete consumption coefficients.

Table 3: Top 10 textile complete consumption factors in Guangdong Province.

Sector	Complete consumption factor	Rank
Textiles	0.857798	1
Production and supply of electricity and heat	0.131212	2
Oil and Gas Extraction Products	0.1248	3

Metal mining products	0.09827	4
Chemical products	0.07939	5
Petroleum, coking products and processed nuclear fuel products	0.052327	6
Gas production and supply	0.051867	7
Metal smelting and rolling products	0.04651	8
Agriculture, forestry and fishery products and services	0.044093	9
Non-metallic and other minerals extracted products	0.042991	10

4.2 Analysis of Textile Industry Types in Guangdong Province

Industries can be classified into four categories based on their intermediate demand and intermediate input rates, which are intermediate product-based basic industry sector, intermediate product-based industry sector, final demand-based basic industry sector and final demand-based industry sector.

The intermediate demand rate for textile manufacturing in Guangdong Province in 2017 can be estimated based on equation (3) (due to space constraints, only the top 10 industries are listed in this paper), as shown in Table 4.

Table 4: Top 10 intermediate demand rates in Guangdong Province.

Sector	Intermediate demand rate	Rank
Non-metallic and other ore mining products	0.933247754	1
Leasing and business services	0.906543291	2
Metal smelting and rolled products	0.837592937	3
Production and supply of electricity and heat	0.824753441	4
Non-metallic mineral products	0.75383005	5
Products from oil and gas extraction	0.749181401	6
Metal ore mining products	0.73512476	7
Finance	0.680603731	8
Textiles	0.67978268	9
Transportation	0.666471962	10

Table 4 shows that the textile manufacturing sector has an intermediate demand rate of 0.68, ranking 9th out of all sectors, indicating that more of the products produced in the textile manufacturing sector are used in the production of other sectors and that the textile manufacturing sector is a raw material industry in nature.

According to equation (4), the intermediate input rate of textile manufacturing industry in Guangdong Province in 2017 can be derived, as shown in Table 5.

Table 5: Top 10 intermediate input rates in Guangdong Province.

Sector	Intermediate input rate	Rank
Gas production and supply	0.825905	1
Metal smelting and rolled products	0.805583	2
Communications equipment, computers and other electronic equipment	0.802464	3
Construction	0.796504	4
Metal products	0.792679	5
Textiles	0.791349	6
Transportation equipment	0.789385	7
Paper, printing, educational and sporting goods	0.787193	8
General equipment	0.78177	9
Chemical products	0.780915	10

The intermediate input rate indicator is used to measure the amount of product that needs to be put into other sectors to produce a unit of that sector's goods, and since intermediate input + depreciation + value added = total input to the industry, there exists an equation of intermediate input rate + value added rate = 1. The value added rate = 1. The higher the rate of intermediate inputs, the lower the rate of value added in an industry. Table 5 shows that the textile manufacturing industry has an intermediate input rate of 0.79, ranking 6th among all sectors, indicating that the textile manufacturing industry in Guangdong Province is an industry with a high intermediate input rate and low value added. In the future, Guangdong Province should increase its efforts in upgrading and transforming the textile manufacturing industry, and strive to improve the value-added industry. In the future, Guangdong Province should make more efforts to upgrade and transform the textile manufacturing industry and strive to increase the added value of the textile manufacturing industry.

According to the three-dimensional structure of the industry, the textile and garment industry in Guangdong Province is characterised by a high rate of

intermediate demand and a high rate of intermediate inputs, and its structure is classified as an intermediate product-based industry sector, which is highly driven by the upstream industry and is also highly dependent on the downstream enterprises. The textile manufacturing industry in Guangdong Province is one of the province's pillar industries and should be further improved by increasing its interconnectivity with other industries.

5 CONCLUSIONS

According to the above analysis, the total output of the textile manufacturing industry in Guangdong Province has been rising year by year, and the growth rate has slowed down. However, it is still the pillar industry of Guangdong Province. The textile manufacturing industry in Guangdong Province has a strong pull on the national economy of Guangdong Province. It is a strong contributor to the national economy. From the analysis of industry types, it can be concluded that the textile manufacturing industry in Guangdong Province is an intermediate product-based industry sector, with the nature of a means of production. It has the nature of a means of production and has a low value-added rate (Ning, 2021).

From the overall trend of textile development in Guangdong Province, structural upgrading of the textile industry is the key to maintaining the sustainable development of the industry. Based on the position of the textile and garment industry in Guangdong Province and China's textile and garment industry in the global value chain, and also in the context of the era of industrial reform in the digital economy, the following suggestions are made in a comprehensive manner.

Firstly, in the context of the current digital economy, the textile and garment industry in Guangdong Province should accelerate the process of building a new digital infrastructure represented by industrial interconnection and data centres, build an information service platform for the entire textile industry chain with the help of big data technology, connect the data islands between the upper, middle and lower reaches of the textile industry, activate the value of data, realise the interconnection and mutual sharing and integration of textile industry information resources, and accelerate the promotion of the digital The digital economy is embedded in the depth and breadth of the textile industry chain in Guangdong Province, helping to upgrade the textile industry in Guangdong Province.

According to the changes in the domestic and international economic environment, enhance the all-round support for textile enterprises in terms of digital transformation, R&D innovation, financial support, platform support and speeding up the construction of independent brands, and increase the general fiscal expenditure on the digital transformation of the textile industry. Continuously optimise the business environment for the development of textiles and garments in response to the different characteristics of different segments of the industry and the different degrees of development of the digital economy. Relying on the effect of modern textile industry clusters in Guangdong Province, the industry layout will be further optimised and digital transformation will be promoted by industry and by focus, such as focusing on digital research and development, flexible production, online and offline integrated sales, intelligent supply and digital services, so as to realise the all-round integration of the digital economy with the textile industry.

From the perspective of the textile and garment industry's relevance to other industrial sectors, the structure of the upstream and downstream supply chain industries will be optimised, thereby promoting the upgrading of the textile and garment industry's production capacity. For the wholesale and retail trade industry, new media tools are vigorously implemented so as to promote the textile and garment industry to achieve a high level of e-commerce with coordinated development online and offline; in the chemical industry, textile fabric technology is comprehensively implemented and corresponding research and development teams are trained to enhance the performance of garment products; for agriculture, the current Internet thinking can be used to achieve a situation where agriculture can better serve the textile and garment industry, improve the supply structure and Promote agriculture to achieve technology-based planting, thus forming a tripartite integrated data supply chain for factories, enterprises and the sales end.

ACKNOWLEDGMENT

This research was sponsored by the Funding for postgraduate dissertation projects in the Beijing Institute of Fashion Technology of Business (No.110501990112), the Beijing Social Science Foundation Research Base Project (No.17JDGLB003) and the "Light of Textile" China Textile Federation Higher Education Teaching Reform Research Project

(No.2021BKJGLX095). The authors thank the anonymous reviews for their insightful comments.

REFERENCES

Lu, A., Hao, S. L.. Organization of the apparel industry. People's Publishing House, Beijing, 2013, pp. 102-105.

Li Mingjie, Lu An. Research on the development of textile manufacturing industry in Zhejiang Province based on input-output analysis. Wool Spinning Technology, 2018, 46(03): 79-84.

Ning Hao Ran & Long Qiong. An empirical analysis of the development of China's textile and apparel industry based on input-output model. Western Leather, 2021, 43(24): 1-3.

Zhao Jun Dove, Lu An, Zhu Guanghao. Empirical analysis of the influence of the textile and garment industry in Beijing. Wool Spinning Technology, 2018, 46(04):85-89.