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Exploring the New Development Direction of Suzhou Textile in the Big Data Period

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Abstract— *In the era of big data, the traditional manufacturing industry needs to use modern technology to promote technological change if it wants to maintain its vitality forever. Only by correctly measuring which technical factors promote the development of Suzhou textile industry can we grasp the root and promote the industry to continue to contribute to the economic development of Suzhou. Based on the data of Suzhou from 2009 to 2017, this paper uses multiple regression analysis to study whether there is a correlation between the output of textile industry and some technical factors and the strength of the correlation. The results show that the output of textile industry is related to the R&D expenditure, the number of enterprises engaged in industrial scientific and technological activities, the number of enterprises engaged in specialized scientific and technological institutions and the number of invention patents.*

Keywords— *Suzhou Textile Industry, Big Data, Technology, Large and Medium-sized Enterprises.*

I. Introduction

As for "big data", research organization Gartner believes that "big data" requires new processing mode to have stronger decision-making power, insight and discover and process optimization ability to adapt to massive, high growth rate and diversified information. As a representative of the new generation of information technology, big data has been successfully applied in a series of links such as design, research and development, manufacturing, sales, service, etc., which promotes the integration and innovation of industrial production and the Internet. In the face of the tide of big data, the traditional manufacturing industry needs to take the initiatives to learn and make full use of the powerful data analysis and prediction ability of big data to timely sense the change of market competition environment, accurately control the demand preference of consumers, and promote the internal management reform of enterprises. At present, big data is flexibly used in medicine, social management, retail and other industries. For example, Shanghai Anti-fraud Center is using big data to monitor and analyse whether people have received fraud calls and intervene in the first time to prevent the lives and property of residents from being infringed [1].

Suzhou is one of the important textile bases in China. It is located in the Yangtze River Delta region, enjoying unique natural resources and geographical location, and is known as the "Silk Palace". Suzhou textile industry is the pillar industry of Suzhou traditional manufacturing industry, which maintains a high rate for local employment and finance. However, with the severe global economic situation, fierce competition in Southeast Asian market, rising cost of resources and labor, tax and environmental protection policies, the contribution rate of textile industry to Suzhou industrial output value dropped from 86.18% in 2010 to 41.45% in 2017 [2].

Large and medium-sized enterprises are the main body of industrial structure, also the forerunner of advanced production technology. They promote and drive the technological progress of large numbers of small enterprises [3]. Scientific and technological innovation is the driving force of enterprise development and the strategic commanding point of competition among enterprises. The scientific and technological development ability and technological level of large and medium-sized enterprises determine the level of an enterprise's international competitiveness and its division of labor in the market economy, and, to a certain extent, the position and Prospect of regional economic development. Therefore, it is of great practical significance to study the power of scientific and technological innovation of enterprises [4]. At present, the leading enterprises in Suzhou textile industry mainly include Hengli Group and Shenghong holding. Hengli believes that the elimination of backward equipment and the integration of industrial resources will become the key to the upgrading and development of the textile industry. The key of success is to enhance the added value of products through independent innovation and product differentiation, and quickly and effectively grasp the market development. Under the guidance of the group's science and technology innovation strategy, the company has completed the development of special polyester industrial yarn, manufacturing process and new products. The company has independently developed a variety of practical new fabrics and obtained the national patent [5]. Under the situation of energy conservation and emission reduction at home and abroad, Shenghong group has carried out innovation management in combination with the characteristics of Chinese printing and dyeing industry, planned and managed the production process to achieve waste reduction and resources. It meets the current environmental requirements. Change the industrial pollution control mode from "end treatment" to "pollution prevention oriented" pollution control strategy and realize "green printing and dyeing" and "clean production" [6].

II. Research Model

Based on the theory of technological innovation driven enterprise development and technological progress of leading industries of large and medium-sized enterprises, this paper uses multiple regression analysis to accurately measure the correlation degree and regression fitting degree between various factors, as to improve the effect of prediction equation.

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This paper selects the data of large and medium-sized enterprises in Suzhou Textile Industry from 2009 to 2017 and uses Stata software to analyze and calculate. This paper uses the method of "minimum maximum standardization" to standardize the data, as to eliminate the dimensional relationship between variables and make the data comparable. The data are from Suzhou statistical yearbook and Suzhou city situation and market power (2009-2017).

Considering the availability of data, this paper studies the linear relationship and builds an evaluation model by selecting five factors: the contribution of the output value of the textile industry of large and medium-sized enterprises, the number of Industrial Science and technology activity enterprises, the internal R & D science and technology activity expenditure, the number of enterprises running special science and technology institutions and the number of invention patents.

III. Empirical Analysis

A. Results of Model

In this paper, the output value of textile industry of large and medium-sized enterprises is taken as the independent variable, and the number of large and medium-sized industrial science and technology activity enterprises, the internal R & D science and technology activity expenditure, the number of enterprises running special science and technology institutions, and the number of invention patents are taken as the independent variable for multiple regression analysis. Due to the time limit of invention patents, the use of patents will make a positive contribution to the output of enterprises within a certain period of time, so there is a lag phenomenon between the amount of patent stock and the change of output value. Therefore, this paper deals with the lag model of patent factor and takes it as a new independent variable (lpatent) to participate in regression analysis. The results are shown in Figure 2-1 below:

Source	SS	df	MS	Number of obs	=	8
				F(5, 2)	=	313.63
Model	.936196101	5	.18723922	Prob > F	=	0.0032
Residual	.001194008	2	.000597004	R-squared	=	0.9987
				Adj R-squared	=	0.9955
Total	.937390109	7	.133912873	Root MSE	=	.02443

outputvalue	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
enterprise	1.542881	.1161844	13.28	0.006	1.04298	2.042782
cost	.4613754	.1083869	4.26	0.051	-.0049759	.9277267
institution	-.6281867	.0961251	-6.54	0.023	-1.04178	-.2145936
patent	.3439429	.0727989	4.72	0.042	.0307145	.6571713
lpatent	.3943771	.0674789	5.84	0.028	.1040388	.6847154
_cons	-.5201235	.1192391	-4.36	0.049	-1.033168	-.007079

Fig. 2-1. Results of multiple regression analysis

B. Analysis of Model

From the above results, the complete model can be written as follows:

$$Outputvalue = -0.520 + 1.543enterprise + 0.461cost - 0.628institution + 0.344patent + 0.394lpatent$$

From the results of the model, we can see that the five variables selected in this paper can explain the change of 99.87% of GDP. Among them, the number of large and medium-sized industrial scientific and technological activity enterprises has a positive role in promoting the total output value of the textile industry, which shows that the existence of large and medium-sized enterprises with scientific and technological research and development activities will play an incentive role in the industry, which is conducive to improving the total output value of the industry. The second factor is the influence of internal R&D expenditure on output value. It can be seen the output value will increase with the increase of expenditure. The expenditure of internal funds comes from three parts: government, enterprises and overseas. In recent years, the internal investment of enterprises has been stable at about 98% to 99%. It is shown that investment of internal R&D funds is mainly attributed to the internal investment of enterprises, and government subsidies and overseas support only play a weak auxiliary role. The third factor is the number of special-purpose scientific and technological institutions run by enterprises. Although the confidence interval contains 0, the p-value passes the test at the significance level of 5%. A negative coefficient indicates that the special-purpose scientific and technological institutions play a certain role in hindering the output value, which may be due to the high investment, low work efficiency and unbalanced production and investment of the special-purpose scientific and technological institutions. The last two factors are to study the relationship between the number of invention patents and the output value. The regression results show that both are in a positive incentive trend. This shows that the use of patents will make the industry maintain a comparative competitive advantage and promote the progress of the industry. In addition, the lag effect of patents is obvious, which shows that the combination of non-current year's patent technology renewal and current year's patent will play a more powerful role in promoting the upgrading of the industry.

IV. Recommended Measures

Based on the multiple regression analysis of the data of the science and technology level of the large and medium-sized textile industry in Suzhou from 2009 to 2017, this paper concludes that: on the whole, the science and technology innovation of the large and medium-sized enterprises is an effective driving force for the upgrading of the textile industry, but the role of the science and technology innovation in promoting the transformation and upgrading of the textile industry has not been fully released because of the lag of the invention patents and the imbalance of the production and investment of the special research and development institutions of the enterprises. Specifically, the coefficient of the number of large and medium-sized enterprises with scientific and technological activities is the largest, which is the main driving force to promote production capacity. Therefore, the government and enterprises should continue to support and encourage technological innovation and the introduction of advanced technologies, grasp the intelligence and flexibility of emerging technologies in the big data period, and provide technical support and guarantee for the transformation and upgrading of traditional textile industry. Traditional manufacturing enterprises need to develop and make use of

network, digital and intelligent technologies, and move forward to production process automation, process management digitalization, enterprise information networking and intelligent manufacturing cloud. Therefore, scientific and technological innovation should focus on the following aspects to promote industrial upgrading:

A. Build a Sharing Economy Platform and Optimize the Allocation of Industrial Resources

In view of the current problems of repetition, redundant construction and low level of specialization in traditional industries, the development of sharing economy can make full use of existing resources, solve the problem of structural overcapacity in the industry, so that enterprises only need to focus on improving innovation capacity and developing their own advantages, and promote resource conservation and green environmental protection. The sharing economy needs to rely on the improvement and construction of big data platform, credit system and service system. For example, existing information platforms in the textile industry include China silk capital network, Oriental market exchange, announcement network, Yunfang City, etc., but the platform data are scattered and there are no standard sharing economic norms, so the situation of sharing is poor. On the other hand, it is suggested that government departments and industry associations should jointly organize the establishment of Suzhou textile industry big data platform, on the other hand, establish the sharing economic standards and norms, and establish a sound industry credit system. Sharing mode can include: Creative sharing, resource sharing, capital sharing and data sharing.

B. Adhere to Brand Culture Innovation and Create Regional Brand Advantages

Brand building and cultural communication are important ways for the industry to enhance its influence and cohesion. Industrial transformation and upgrading need to pay attention to the promotion of enterprise brand value, highly integrate technology investment and enterprise culture, and establish the concept of "culture creates brand value". At the same time, the construction of brand culture should not only absorb excellent traditional Chinese culture, but also boldly learn from foreign culture, integrate innovation, and integrate economy. In addition, in the context of rising labor costs, brand strategy transformation is also an urgent task. Textile enterprises should actively comply with the wave of technological innovation, through independent innovation and establishment of independent brands, transform the industry from OEM (OEM) to ODM (independent design) and OBM (independent brand).

C. Government Supports in Industrial Development and Joint Efforts to Build a New Batch of Large and Medium-sized Enterprises

a. Fund Management

Under the market economy, the capital of an enterprise is like the blood of the human body constantly circulating. Whether the capital turnover and circulation of an enterprise are smooth and effective is the fundamental condition for the survival and development of an enterprise. Therefore, when enterprises raise funds, they should judge the situation, not only grasp the present, but also have insight into the future. When they use funds, they should be scientific and reasonable, not only highlighting the key points, but also taking full care of them. Enterprises need to formulate sound capital management strategies to attract overseas investment, indirectly promote the globalization of enterprise products, reasonably allocate the internal R&D funds and government subsidies, improve the efficiency of capital utilization, and ensure that the internal expenditures get the corresponding output. The government needs to formulate relevant preferential tax policies, expand the financing channels and proportion of enterprises, and increase the investment of scientific research funds in the industry.

b. Talent Management

The core of industrial transformation lies in the introduction and training of high-quality and innovative talents. At this stage, Suzhou textile industry should further improve the multi-level human resource training system, make full use of industrial clusters, industry university collaboration, and realize talent joint training with universities and scientific research institutes. On one hand, we should strengthen the construction of professional colleges and universities and set up intelligent manufacturing specialty with the times. At the same time, pay attention to the training of technical workers. Although the application of intelligent equipment reduces the amount of manpower, there is a big gap in demand for skilled workers who understand both production and machine language. On the other hand, we should learn from other successful transformation areas to recruit talents, actively carry out talent introduction plans and introduce rare high-end talents.

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