Research on the integration and development of advanced manufacturing and modern service industries in Jiangsu Province

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Abstract. With the continuous development of the economy, the manufacturing and service industries have gradually shown a trend of integration. This study constructs the evaluation index system of the integration of the advanced manufacturing and modern service industries in Jiangsu Province from the three dimensions of integration scale, integration structure and integration efficiency. Finally measures the integration degree of the two industries in Jiangsu Province and the development of the specific three dimensions. The study found that: 1) Overall, the integration of advanced manufacturing and modern service industries in Jiangsu Province is at a moderate level of integration. 2) From the perspective of the scale of integration, from 2015 to 2017, the contribution ratio of advanced manufacturing industry is larger, and after 2017, the contribution ratio of modern service industry is larger; from the perspective of integration structure and integration efficiency, the overall contribution of modern service industry is higher than that of advanced manufacturing. The conclusions of this paper have reference value for promoting the integration and development of advanced manufacturing industry and modern service industry, and provide empirical evidence and suggestions for promoting the integration of the two industries in Jiangsu Province.

Keywords: Jiangsu Province, Advanced Manufacturing, The modern service industry, Integration.

1. Introduction

With the deepening of industrialization, China's manufacturing industry has begun to enter a new era of structural adjustment and industrial upgrading, the importance of advanced technology to the manufacturing industry has become increasingly prominent, and the proportion of advanced manufacturing in the industrial system is increasing. In the process of economic development, the scale of the advanced manufacturing industry continues to expand, its internal need for a more meticulous division of labor, while the technical level, and management level requirements are also getting higher and higher, therefore, the modern service industry came into being. Since there is a natural connection between the development of manufacturing and service industries, the interaction and integration between modern service industries and advanced manufacturing industries is also an inevitable trend.

Secondly, according to the facts of economic development, as the relationship between the modern service industry and the advanced manufacturing industry becomes closer and closer, the positive role of the modern service industry in promoting the advanced manufacturing industry is becoming more and more obvious. Specifically, the development of the modern service industry has effectively promoted the upgrading of advanced manufacturing, and its emergence has refined the internal division of labor and become an important supporting force for promoting the upgrading of advanced manufacturing; the modern service industry is conducive to reducing the transaction costs of manufacturing production, and some business outsourcing not only improves work efficiency but also reduces production costs; while the modern service industry drives the rapid improvement of advanced manufacturing, it also requires that advanced manufacturing must adjust and optimize the industrial structure on time to match it. Therefore, the development of the modern manufacturing industry is conducive to adjusting and optimizing the industrial structure, not only that, but the

development of the advanced manufacturing industry also provides market demand and development direction for the modern service industry, providing it with greater development space.

2. Literature review

In the process of studying the integration relationship between the productive service industry and the manufacturing industry, scholars used data at the national, regional, and provincial levels to quantitatively analyze the relationship between the two from the perspectives of industrial association, interaction, and spatial collaborative positioning, and the research methods used were different.

Many scholars start from the perspective of the integration trend of the productive service industry and manufacturing industry and believe that the integration of the two is in line with the phenomenon of coupling in physics. Therefore, the concept of coupling is introduced into the field of economics, and it is believed that the integration between the modern service industry and the advanced manufacturing industry is deepened in the process of continuous coupling and coordination, so the view is put forward: the degree of integration between the productive service industry and the manufacturing industry depends largely on the coupling and coordination between the two. Therefore, the integration of the two is examined by constructing an industrial integration measurement model.

Wang Yuzhen[1] clearly pointed out that the two have an inherent phenomenon of "coupled development" when studying the relationship between modern service industries and the advanced manufacturing. Su Yongwei[2] took the provincial panel data from 2005 to 2018 as a sample and constructed an industrial integration measurement model. He examined the integration level of the productive service industry and manufacturing industry in 31 provinces across the country. In the end, it was concluded that the index of the integration level of manufacturing and productive service industries in China was 0.8787, reaching a high level of integration.

Yang Xinhong[3] took Guangdong Province as an example, based on the coupling coordination degree model, and constructs an evaluation index system for the integration of advanced manufacturing and modern service industries. The research results show that the integration of the two industries in Guangdong Province has reached a good coordination stage.

In addition to constructing a fusion model from a holistic perspective, some scholars consider the reliability and continuity of statistical data and believe that the input-output model that reflects the quantitative dependence between input and output within the economic system can better reflect the relationship between modern service industries and advanced manufacturing industries. Peng Hui and Kuang Xianming[4] used the 2010-2014 international input-output table, the degree of integration of China's manufacturing industry and the productive service industry was measured and compared at home and abroad. They found that the integration of China's industrial integration is relatively lagging, and the productive service industry is overly dependent on the manufacturing industry.

With the continuous development of the gray correlation analysis method after Professor Deng Julong proposed the gray control system theory in 1982, many scholars have incorporated gray control theory into the research on the integration of advanced manufacturing and modern service industries by constructing gray correlation models. The gray correlation model is based on the number of factors, and the degree of correlation is judged by the geometric relationship and curve similarity of the factor series, and the development trend is studied, that is, the strength, size, and order of the relationship between the factors are described by the gray correlation order. Compared with traditional econometric models, the advantage of this model is that there is no strict requirement for the size of the study sample, the problem of multicollinearity can be avoided, and the application range is wide. The degree of agreement with the results of the qualitative analysis is high.

Liu Chunguang[5] used the gray correlation analysis method, starting from the three dimensions of integration scale, integration depth, and integration speed, establishing an index system to measure the integration development degree of Hunan the advanced manufacturing industry, and the modern service industry, and finally found that the correlation between the advanced manufacturing industry and the modern service industry in Hunan Province exceeded 0.65, which had a high correlation. Sun Wenbo and Feng Lin[6] Constructed a grey correlation model to study the integration of the

manufacturing and knowledge-intensive service industries in Hebei Province. the results show that the overall correlation between the two is high, and the relative changes are almost the same, but lower than the national average.

With the continuous progress of metrology, scholars have begun to cite vector autoregressive models for dynamic relationship research in order to further study the relationship between manufacturing and service industries more scientifically. The vector autoregressive model (VAR model) uses multi-range concatenation to study the relationship between multiple endogenous variables, and in each equation, the dynamic relationship of all endogenous variables is estimated by the endogenous variables regressing the lagging values of all endogenous variables in the model. The advantage of this model is that it gets rid of the high dependence of the traditional econometric model on economic theory, and mainly from the perspective of statistical analysis, it uses multi-variable prediction and analysis of random disturbances to the dynamic impact of variable systems on the magnitude, plus or minus and duration of the variable system.

Cui Li[7] used the VAR model. The interaction and integration relationship between manufacturing and productive service industries in the western region was studied, and it was found that the degree of interaction and integration between the two was not obvious.

Wei Yanqiu and Gao Shouhua[8] took the time series data from Zhejiang Province from 1994 to 2015 as a sample. They constructed an autoregressive model VAR of the two variables of manufacturing and productive service industries and empirically analyzed the long-term dynamic relationship between manufacturing and productive service industries using the generalized impulse response function and variance decomposition. However, it is worth noting that the VAR model has high requirements for samples. If the sample size is small, it is easy to cause large errors in the model.

In the process of research, the research methods of scholars are not uniform, and some scholars consider that there may be influencing factors that are difficult to remove in the calculation process of statistical data, so they obtain data through questionnaires. For example, Gui Huangbao et al. [9] took Henan Province as the research object. Questionnaires and exploratory factor analysis methods were used to explore the influencing factors influencing the integration and development of the productive service industry and the equipment manufacturing industry in Henan Province by constructing a theoretical model of influencing factors. Qi Liangqun and Zhang Qingnan[10], leading scholars who study the integration relationship between equipment manufacturing and productive service industries, put forward the connotation of network integration from the perspective of value chain decomposition and integration, collected data by using questionnaire methods, and constructed structural equation models to empirically test the influencing factors of network integration.

3. Status analysis

This paper summarizes the research of current scholars on advanced manufacturing and modern service industries and obtains the definition of the two industries that are most suitable for the current development situation.

3.1 Advanced manufacturing

With the rapid development of China's economy, China's manufacturing industry has also made remarkable achievements. However, from the perspective of the global industrial value chain, the current Chinese manufacturing industry is generally in the middle and low sections of the value chain. In order to improve the status of China's manufacturing industry in the global value chain, the state proposes to vigorously develop advanced manufacturing. In 2020, the state proposed to “accelerate the construction of a manufacturing power and accelerate the development of advanced manufacturing”. Therefore, the advanced manufacturing industry shoulders the heavy responsibility of transforming a manufacturing power into a manufacturing power.

In this context, many domestic scholars have begun research in the field of advanced manufacturing, defined the connotation of advanced manufacturing from multiple angles, and summarized that the advanced manufacturing industry generally has the following characteristics:

determined by multiple factors, including manufacturing technology, production mode, product research and development, automation and intelligent production process.

In 2018, the National Machinery Industry Information Research Institute released the "Definition and Countermeasures of the advanced manufacturing industry" report, which defines China's the advanced manufacturing industry as a general term for the manufacturing industry that applies innovative technologies, processes, materials, and other elements and can fully reflect the development direction of advanced productivity. Specifically, it includes the following three aspects: 1) The advanced manufacturing industry formed by the traditional manufacturing industry using cutting-edge technology and new technologies to transform and upgrade. 2) A new type of advanced manufacturing driven by technological innovation. 3) The advanced manufacturing industry is produced by the increasing degree of servitization of the manufacturing industry.

Based on the original definition, Li Jinhua[11] combined the value chain theory and thought the advanced manufacturing industry is redefined as a modern manufacturing industry that continuously absorbs modern new technologies such as computer technology, a new generation of information technology and digital technology, and is widely used in the whole process of product research and development, design, production, service, management and so on. Compared with the traditional manufacturing industry, the advanced manufacturing industry has the advantages of high product quality, high production efficiency, clean production process, good efficiency, and is at the front of the value chain. Therefore, based on the above analysis, this paper selects the definition of the advanced manufacturing industry by Li Jinhua.

3.2 The modern service industry

From the above discussion on the relationship between manufacturing and service industries, it can be seen that because scholars have different views on the relationship between the two, the definition of modern service industries is also different.

The current definition of the modern service industry in China comes from Xu Guoxiang and Chang Ning[12], who believe that the modern service industry originated from the process of industrialization, used modern information technology, management concepts, business methods, and organizational forms, is a high value-added, high-level, knowledge-based production and life service industry. Wang Yuzhen proposed that the modern service industry, also known as the modern productive service industry, refers to the form of service industry based on the productive service industry, that is, the service provided for production, business activities, and government management rather than directly for the final consumer. After comprehensively considering the role of the modern service industry in driving and optimizing the manufacturing industry, Meng Xiao[13] supplemented the definition of the previous scholars, arguing that the modern service industry not only includes the emerging service industry that emerged after technological innovation but also includes the traditional service industry after technological upgrading and transformation.

The concept of the modern service industry, which is generally recognized by foreign scholars, comes from the advanced productive service industry proposed by American economist Greenfield[14] in 1966. The scholar believes that the advanced productive service industry is different from the consumer service industry for final consumers, and is a service industry that uses information technology to directly provide "modern service flow" to producers, without being limited by space and time, and mainly provides creativity, professional knowledge, consulting and other services.

Combined with the actual policies, it can be seen that in 2012, the Ministry of Science & Technology of the People's Republic of China issued the Document No. 70 "Twelfth Five-Year Plan for the Development of the modern service industry Science and Technology", which proposes that the modern service industry is a service industry based on modern science and technology, especially information network technology, which is mainly supported by modern science and technology, and is based on new business models, service methods and management methods, including emerging service industries that have emerged with the development of technology, and also includes the transformation and upgrading of traditional service industries using modern technology. In 2019, the

National Bureau of Statistics announced the new statistical classification standards for the productive service industry, defining the scope of the productive service industry including R&D design and other technical services for production activities, cargo transportation, general aviation production, warehousing, and postal express services, information services, financial services, energy conservation, and environmental protection services, productive leasing services, business services, human resource management, and vocational education and training services, wholesale and trade-economic agency services, and product support services.

In response to the call for national policies, the Jiangsu Provincial Government announced the "Ten Hundred Thousand Action Plan for Modern Service Industries in Jiangsu Province" in 2012, which mentioned that the development of modern service industries in Jiangsu Province will focus on ten key industries for the transformation and upgrading of financial services, modern logistics, scientific and technological services, software and information services, creative design, trade and exhibitions, cultural education, energy conservation and environmental services, tourism, and health, and the transformation and upgrading of traditional service industries.

From the above, it can be seen that although the definition of the modern service industry is not the same, the modern service industry generally has the following characteristics: 1) Supported by emerging information technology and mainly based on high technology. 2) Related to the manufacturing industry, the traditional service industry can also be transformed into a modern service industry through technological transformation. 3) Industries that provide intermediate input services for goods and services to producers.

4. Theoretical analysis

Since the Third Industrial Revolution, the service industry has developed rapidly and its contribution to economic development has gradually increased. Therefore, the relationship between manufacturing and service industries has also received widespread attention from scholars at home and abroad. Research on the relationship between manufacturing and services began in the 1980s, and in the process of deepening the development of manufacturing and service industries, the following three views have emerged:

The earliest formed view is the theory of demand, represented by Francois[15] who believed that in the process of sustained economic development, with the continuous improvement of the level of technology, the development of the manufacturing industry will reach a certain level before the demand for the service industry. Combined with the process of changes in China's economic structure, with the in-depth development of Industrialization and Urbanization in China, there has been a demand for modern logistics, finance, and other service industries. Therefore, when discussing the relationship between the productive service industry and the manufacturing industry, scholars based on the theory of demand put forward the view that the premise and basis for the emergence and development of the productive service industry is the development demand of the manufacturing industry. That is, the manufacturing industry is in a dominant position, and the productive service industry is in a subordinate position.

When studying the synergistic agglomeration and integrated development between the productive service industry and the manufacturing industry at the micro-level, Luo Liangwen and Sun Xiaoning[16] clearly proposed that the productive service industry is endogenous to the manufacturing sector.

However, some scholars do not agree with the view of demand theory and put forward the supply theory point of view. Representative scholars include Markusen[17],

Lundvall B[18], Hansen N[19], and others believe that the improvement of production efficiency in the internal links of the manufacturing industry depends on the development of the productive service industry, that is, the productive service industry is in the dominant supply position. Its impact mechanism is that the increase in the level of development of the productive service industry can bring value-added goods and services to the manufacturing industry, which in turn indirectly improves the production efficiency of the manufacturing industry.

However, in addition to the development of the service economy with the development of Internet technology, the cross-border development between manufacturing and productive service industries has begun, and the traditional industrial boundaries have gradually blurred. In the process of continuously studying the relationship between the productive service industry and the manufacturing industry, scholars have gradually gotten rid of the above two one-way dominant relations, and widely believe that the productive service industry and the manufacturing industry are interdependent interactive and integrated relationships.

Wei Yanqiu and Gao Shouhua used time-series data from Zhejiang Province to develop a long-term dynamic relationship between manufacturing and productive services. Empirical analysis shows that there is a certain interaction between the manufacturing industry and the productive service industry in Zhejiang Province.

5. Empirical analysis

After collating the research of the previous scholars in related fields, this paper determines the construction of an indicator system to measure the integration and development level of advanced manufacturing and modern service industries in Jiangsu Province.

5.1 The determination of the number of network layers Research ideas

After reading the literature of scholars in the field of advanced manufacturing and the modern service industry, this paper comprehensively considers the methods selected by the scholars and the difficulty of data acquisition, and decides to establish the integration evaluation index system for advanced manufacturing and modern service industries in Jiangsu Province from the three dimensions of integration scale, integration structure, and integration efficiency, so as to further examine the integration degree and integration path of advanced manufacturing and modern service industries in Jiangsu Province, and finally propose countermeasures to promote the integration of the two industries according to the empirical results.

5.2 The specific scope of the two industries in Jiangsu Province

Due to the different levels of economic development and development models between provinces and cities in the country, the policy guidance and forms of advanced manufacturing and modern service industries are different, and the specific scope of advanced manufacturing and modern service industries in Jiangsu Province is defined in combination with the specific policies of the Jiangsu Provincial Government in the development of the two industries and the actual situation.

5.2.1 Jiangsu Province's the advanced manufacturing industry specifically covers the industry

Promoting the development of advanced manufacturing clusters is an important way to promote the optimization and upgrading of the manufacturing industry and participate in the division of labor and cooperation in the global industrial chain. Therefore, Jiangsu Province responds to the call of national policies to improve the overall level of manufacturing development by developing advanced manufacturing clusters.

In 2018, the People's Government of Jiangsu Province issued a plan to accelerate the cultivation of 13 world-class advanced manufacturing clusters and promote the coordinated development of industries, enterprises, technologies, talents, and brands. Based on the development status of 27 industries, after comprehensive consideration of industrial influence, cluster characteristics, development basis, and potential, taking into account traditional industries and strategic emerging industries, 13 industrial clusters such as new power (new energy) equipment, engineering machinery, Internet of Things, cutting-edge new materials, biomedicine, and new medical devices, textiles and clothing, integrated circuits, offshore equipment and high-tech ships, high-end equipment, energy conservation and environmental protection, core information technology, automobiles and parts, and new displays were finally determined as key cultivation objects.

In recent years, under the guidance of government policies, the advanced manufacturing cluster in Jiangsu Province has achieved good development.

In 2021, the Ministry of Industry and Information Technology of the People's Republic of China will select 25 advanced manufacturing clusters as key cultivation targets around key areas such as new-generation information technology, high-end equipment, new materials, and biomedicine, of which 6 clusters in Jiangsu Province are located, namely: Wuxi Internet of Things Cluster in Jiangsu Province, Software and Information Service Cluster in Nanjing City, Nanjing City in Jiangsu Province, New Power (Smart Grid) Equipment Cluster in Nanjing City, Jiangsu Province, Suzhou Nano New Material Cluster in Jiangsu Province, Xuzhou Construction Machinery Cluster in Jiangsu Province, and Changzhou New Carbon Materials Cluster in Jiangsu Province. In June, the China Electronics Information Development Institute released a list of China's top 100 advanced manufacturing parks, and 23 parks in Jiangsu Province were selected, accounting for nearly 25%.

However, since that China has not yet established a perfect advanced manufacturing statistical system, only a high-tech industry statistical survey system, it has not yet been able to use specific numerical indicators to reflect the development level of advanced manufacturing in Jiangsu Province. Therefore, combined with the definition of the advanced manufacturing industry in the preceding article and the specific form of advanced manufacturing development in Jiangsu Province, the scope of the advanced manufacturing industry in Jiangsu Province is defined in this paper is equivalent to the scope of high-tech industries of the same caliber.

According to the classification standards of high-tech industries released by the National Bureau of Statistics in 2017, high-tech industries refer to the manufacturing industries with relatively high R&D investment intensity in the national economic industries, including pharmaceutical manufacturing, aviation, spacecraft and equipment manufacturing, electronic and communication equipment manufacturing, computer and office equipment manufacturing, medical equipment and instrumentation manufacturing, and information chemical manufacturing. Therefore, this paper selects relevant data from high-tech industries in Jiangsu Province to reflect the development level of advanced manufacturing in Jiangsu Province.

5.2.2 The modern service industry in Jiangsu Province specifically covers industries

Combined with the above analysis of the characteristics of the modern service industry, this paper collates the research literature of domestic scholars on the modern service industry in recent years, and summarizes the industries covered by the modern service industry mentioned in the scholars' literature as follows:

Table 1. Some scholars have defined the scope of modern service industries

Scholar	Definition	Covered industries
Liu Chunguang	The modern service industry	Exclude all services other than wholesale and retail trade, accommodation, and food services
Wang Yuzhen	The modern service industry	Finance, insurance, immovable industry (real estate industry), consulting industry, information service industry, science and technology development, technical services, business services, education and training, and other industries
Cui Li	Productive services industry	Transportation, warehousing and postal services, finance, wholesale and retail trade, real estate, leasing

		and commercial services, information transmission, software and information technology services, scientific research and technical services
Wei Yanqiu, Gao Shouhua	Productive services industry	Ten categories of productive service industries
Luo Liangwen, Sun Xiaoning	Productive services industry	Transportation, warehousing, and postal services; information transmission, computer services, and software; leasing and business services; finance; scientific research and technical services

Therefore, this paper comprehensively considers all the above factors and combines the specific development of the service industry in Jiangsu Province, and now defines the specific industries of the modern service industry in Jiangsu Province as transportation, warehousing, and postal industry; information transmission, software and information technology service industry; financial industry; real estate industry; leasing and business service industry; scientific research and technical service industry; education; culture, sports, and entertainment industry.

5.3 The advanced manufacturing and the modern service industry integration evaluation index system in Jiangsu

The main purpose of this paper is to measure the integration and development of the two industries in Jiangsu Province by establishing a suitable index system according to the actual development of advanced manufacturing and modern service industries in Jiangsu Province. In this paper, two indicators, the comprehensive development level index and the coupling coordination index, are selected to finally measure the situation of integrated development.

5.3.1 Construct an indicator system

Synthesizing the conclusions reached by scholars in related fields and the actual situation of the integration and development of advanced manufacturing and modern service industries in Jiangsu Province, this paper believes that the integrated development of the two is mainly manifested as 1) to guide the formation of a new model of integrated development. 2) Explore the path of key integration development areas. 3) Give play to the role of diversified and integrated development.

According to the expression of the integration of the two industries, this paper refers to the index system of scholars Liu Chunguang and Yang Xinhong, combined with the definition of the two industries in the previous article, and constructs the evaluation index system for the integration of advanced manufacturing and modern service industries in Jiangsu Province from the three dimensions of integration scale, integration structure, and integration efficiency, and the specific index content is shown in Table 2.

Table 2. Integration evaluation index system

Industry	Latitude	Metric Information	Variable representation
Advanced Manufacturing	Convergence scale	The growth rate of the gross value of high-tech industries	X_1
		The average number of employed people in high-tech industries	X_2

	Convergence structure	The ratio of the number of people employed in high-tech industries to the total number of employed people in the manufacturing industry	X_3
		The ratio of the output value of high-tech industries to the output value of manufacturing industries	X_4
	Convergence efficiency	Labor productivity in high-tech industries	X_5
Modern Service Industries	Convergence scale	Growth rate of the gross value of modern services	Y_1
		The average number of employed persons in modern services	Y_2
	Convergence structure	The ratio of the number of the modern service industry employees to the total number of employed people in the service industry	Y_3
		The ratio of the total value of the modern service industry to the total value of the service industry	Y_4
	Convergence efficiency	Labor productivity in the modern service industry	Y_5

The period of the data required for this study is 2015-2019, and all the indicator data are from the annual China Labor Statistics Yearbook, Jiangsu Statistical Yearbook, High-tech Statistical Yearbook, and Jiangsu Provincial National Economic and Social Development Bulletin.

5.3.2 Data Processing

Because of the magnitude differences between the selected metrics, the raw data needs to be standardized. All the indicators in this article are forward indicators, so the method of extreme value normalization is adopted, and the final normalized data is shown in Table 3 and Table 4 (To facilitate subsequent calculations, this article moves the normalized data back one unit.）

Table 3. Standardized data for various indicators of the advanced manufacturing industry

	X1	X2	X3	X4	X5
2015	1.1053	2	2	1	1
2016	1.1579	1.6990	1.6768	1.3256	1.4606
2017	2	1.5602	1.5354	1.6047	1.4355
2018	1.5526	1.4215	1.4091	1.8605	1.6766
2019	1	1	1	2	2

Table 4. Standardized data for indicators in the modern service industry

	Y1	Y2	Y3	Y4	Y5
2015	1	1	1	1	1
2016	2	1.4949	1.5394	1.4723	1.0367
2017	1.8386	1.9797	2	2	1.1042
2018	1.3288	1.6801	1.5348	1.8967	1.9321
2019	1.1599	2	1.7882	1.7905	2

5.3.3 The entropy method determines the weights

In this paper, the entropy method is used to calculate the weights of each indicator as shown in Table 5.

Table 5. The weight of the rating index for two industries

	Variable	Weight		Variable	Weight
Advanced Manufacturing	X_1	0.2592	Modern Service Industries	Y1	0.2146
	X_2	0.1774		Y2	0.1677
	X_3	0.1773		Y3	0.1474
	X_4	0.2082		Y4	0.1636
	X_5	0.1779		Y5	0.3067

5.3.4 Composite Level of Development Index

Advanced manufacturing and modern services are two distinct but interplaying systems, so the composite level of development index is calculated using a weighted sum. Among them, the weight is the weight of each sequence parameter of the advanced manufacturing industry.

The calculation formula is as follows:

$$g(x) = \sum_{j=1}^{n} \lambda_j x_j, \quad \sum_{j=1}^{n} \lambda_j = 1 \qquad (1)$$

$$g(y) = \sum_{j=1}^{n} \gamma_j y_j, \quad \sum_{j=1}^{n} \gamma_j = 1 \qquad (2)$$

g(x) is the comprehensive development level index of advanced manufacturing, and the larger its value, the higher the development level of advanced manufacturing.

g(y) is the comprehensive development level index of the modern service industry, and the larger its value, the higher the level of development of the modern service industry. Calculated according to the above formula

Table.6. Jiangsu Province The advanced manufacturing industry Integration Development Evaluation Index System Composite Index

Year	Scale		Structure		Efficiency	g(x)
	λ_1X_1	λ_2X_2	λ_3X_3	λ_4X_4	λ_5X_5	
2015	0.2865	0.3548	0.3546	0.2082	0.1779	1.3820
2016	0.3001	0.3014	0.2973	0.2760	0.2598	1.4346
2017	0.5184	0.2768	0.2722	0.3341	0.2554	1.6569
2018	0.4024	0.2522	0.2498	0.3874	0.2983	1.5901
2019	0.2592	0.1774	0.1773	0.4164	0.3558	1.3861

Table.7. Comprehensive Index of The Evaluation Index System for the Integrated Development of The modern service industry in Jiangsu Province

Year	Scale	Structure	Efficiency	g(y)

	$\gamma_1 Y_1$	$\gamma_2 Y_2$	$\gamma_3 Y_3$	$\gamma_4 Y_4$	$\gamma_5 Y_5$	
2015	0.2146	0.1677	0.1474	0.1636	0.3067	1
2016	0.4292	0.2507	0.2269	0.2409	0.3180	1.4657
2017	0.3946	0.3320	0.2948	0.3272	0.3387	1.6873
2018	0.2852	0.2818	0.2262	0.3103	0.5926	1.6961
2019	0.2489	0.3354	0.2636	0.2929	0.6134	1.7542

6. Conclusions and policy recommendations

The following concludes the integration and development of advanced manufacturing and modern service industries in Jiangsu Province based on the empirical analysis results and proposes countermeasures for the further integration and development of the two industries in the future.

6.1 Conclusion of the analysis

From the perspective of the changes in the comprehensive index of advanced manufacturing and the modern service industry in Jiangsu Province, between 2015 and 2019, the comprehensive evaluation index of the advanced manufacturing industry experienced a process of increasing from 1.382 in 2015 to 1.6569 in 2017, and then falling back to 1.3861 in 2019, of which the scale index showed a downward trend, and the structure and efficiency index showed a continuously increasing trend. The composite evaluation index of the modern service industry has continued to increase, from 1 in 2015 to 1.7542 in 2019, with the largest change in size and efficiency.

From the perspective of time periods, from 2015 to 2017, the comprehensive evaluation index of the advanced manufacturing industry was greater than that of the modern service industry, indicating that the development level of the advanced manufacturing industry in Jiangsu Province between 2015 and 2017 was higher than that of the modern service industry; between 2018 and 2019, the overall development level of the modern service industry accelerated, and the comprehensive level was gradually higher than that of the advanced manufacturing industry.

6.2 Development Countermeasures

Based on the establishment and analysis of the above indicator system for the integration and development of advanced manufacturing and modern service industries in Jiangsu Province, this paper has a further understanding of the integration of the two industries in Jiangsu Province, and puts forward the following suggestions for the future development of the integration of the two industries in combination with the actual situation of the development of the two industries in Jiangsu Province:

1) Continue to accelerate the integration of the two industries and promote the optimization and upgrading of the industrial structure. With the continuous progress of information technology, the servitization of the global manufacturing industry has gradually deepened. Many developed countries have made the modern service industry a pillar industry of the country through re-industrialization, giving full play to the unique advantages of the modern service industry in the industrial chain, providing support for the development of the manufacturing industry, and enhancing the added value of products. Therefore, Jiangsu province should vigorously develop the integration of the two industries to actively learn from advanced regions and advanced enterprises, improve the efficiency of resource allocation between and within the industry, and guide the cultivation of new formats with deep integration of the two industries.

New business and new models to accelerate the deep integration of the two industries.2) Enhance the driving force of the two industry clusters and make every effort to promote the development of strategic emerging industries. Judging from the long-term development process of the Yangtze River Delta region, the competition between provinces and cities in terms of resources, markets, technology, and talents has gradually intensified. Therefore, to comprehensively promote the integration and development of advanced manufacturing and modern service industries in Jiangsu Province, we must

give full play to the advantages of the cluster, and the government actively guides the deepening of the division of labor system and the improvement of the value system of the two industries. Increase investment in innovation and research and development, overcome key technical difficulties, and seize the commanding heights of global industrial development.

3) Improve the development environment of the two industries and improve the mechanisms for the integrated development of the two industries. The business environment is important to promote the integration of advanced manufacturing and modern service industries, so it is crucial to break down the barriers to integration. The government can stimulate the vitality of enterprises through various channels such as preferential policies and decentralization so that more capital entities can enter the market. For example, to eliminate administrative monopolies, continue supply-side reforms, realize the free flow of high-quality production factors; establish and improve the intellectual property protection system, encourage the transformation of scientific research achievements, and enhance the technical content of the integration of the two industries.

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