The Influence of Service Industry Opening to the Outside World on Industrial Synergy Agglomeration

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Abstract

Promoting the collaborative agglomeration of producer services and manufacturing is the key to achieving high-quality economic development. Accordingly, expanding the opening of producer services to the outside world is a necessary move to promote the collaborative agglomeration of industries.Based on China's provincial panel data from 2006 to 2019, this paper uses a fixed model to study the impact of service industry opening to the outside world on industrial collaborative agglomeration. The results show that the opening of service industry has a positive effect on industrial synergy agglomeration. By region, the opening up of service industry in eastern China has a positive impact, while that in central and western China is not obvious.

Keywords

Service Industry Opening; Industrial Synergy; Fixed Effect Model.

1. Introduction

In the context of China's economy entering a new stage, the characteristics of regional industrial synergy and agglomeration are prominent, and the issue of industrial development has triggered a hot social debate. The strategy of "manufacturing Power" proposed in the report of the 19th CPC National Congress has put forward new requirements for the coordinated development of industries, and it is urgent to realize the transformation and upgrading of industrial structure by coordinating the industrial system. The economic development experience of developed countries shows that industrial synergy agglomeration is permeable and can enhance the ability of industrial structure transformation. Single industrial agglomeration is an isomorphism of regional industries, which easily leads to evil competition among enterprises and produces adverse effects. On the contrary, due to its characteristics of specialization, networking and innovation, industrial collaborative agglomeration can promote the efficiency of resource allocation and thus promote regional economic growth. How to further improve the level of regional industrial synergistic agglomeration and coordinate the spatial distribution of national economy has become an urgent problem to be solved. In recent years, the industrial division of labor in China has been extended from inter-industry division to intra-industry division, and the trend of vertical specialization is gradually strengthened. Therefore, it is of great significance to improve the coordinated development level of the two industries in the region for optimizing the industrial structure and promoting industrial transformation and upgrading.

Opening to the outside world is a basic state policy and an inexhaustible driving force for China's economic development.Since the 18th National Congress of the Communist Party of China (CPC), the CPC Central Committee has unswervingly promoted opening-up, and China has opened wider to the outside world at a higher level.As an important part of China's opening up, the service industry is an important focus of building a new development pattern and

expanding high-level opening up. The scale and forms of opening up of China's service industry are increasing day by day. China is in a golden period of accelerating development of the service economy, with the added value of the service sector increasing by 8.2% year-on-year in 2021, accounting for 53.3% of GDP. With the rapid development of information technology, the tradeability of domestic services has been greatly improved, the demand for services has been significantly improved, and the service industry has developed rapidly in both the scale and form of opening up, becoming an important focus for China to expand the high-level opening up. Trade in services is a "potential sector" in the global trading system, and its role in global trade will continue to rise in the future. China's economy is undergoing a transition from highspeed growth to high-quality development. To properly open up producer services and promote the interaction and integration of producer services and manufacturing have become important measures for China to transform its economic development model and foster new economic drivers. Then the question is whether the opening of producer services to the outside world helps promote the agglomeration of manufacturing and producer services, and what is the influencing mechanism? There is no in-depth study on this issue in the existing literature.

2. Literature Review

Scholars mainly discuss the role of service industry opening up from the following two aspects.First, the impact of the opening up of the service sector on the manufacturing sector. Jingwen Xia et al. (2011) established VAR model based on China's time series data from 1990 to 2008, and analyzed the openness of Guangdong's service industry and its dynamic relationship with the level of Guangdong's industrial structure from the perspectives of trade opening and foreign investment opening in the service industry. It is found that the improvement of guangdong's industrial structure mainly depends on its own development. Comparatively speaking, the promotion effect of foreign investment openness in service industry is more sensitive and greater, and it mainly promotes the improvement of guangdong's overall industrial structure by acting on the tertiary industry. Based on Chinese provincial data, Yao Xing et al. (2012) found that the opening up of the service industry has a positive regulating effect on the production efficiency of the manufacturing industry. In regions with a high degree of opening up, the perfect service industry system makes the manufacturing efficiency improve rapidly and has an incomparable first-mover advantage. Feng Sheng (2014) analyzed the producer services space gathered on the impact of the manufacturing industry upgrade and spatial spillover effect, and found that producer services cluster upgrade of manufacturing has obvious promotion effect, this effect is not only reflected the influence of the manufacturing industry to upgrade this area, and through spatial spillover effect could obviously promote manufacturing up to the surrounding areas. In the transition period, the opening up of the service industry can effectively reduce the production cost of enterprises and enhance the competitiveness of Chinese enterprises (Minchun Han and Hankun Yuan, 2021).Further, Fangjing Li (2019) discussed the impact of service industry opening on enterprise mark-up rate from the perspective of manufacturing enterprises, pointing out that service industry opening is a positive factor affecting the mark-up rate of manufacturing enterprises. Compared with the introduction of service industry, going out has a more obvious effect on the improvement of enterprise mark-up rate. Yingying Liu (2021) static and dynamic model is established using the provincial panel data to test out whether short-term or long-term, productive service industry opening to the outside world are significantly improved the efficiency of China's manufacturing technology progress, and improve the total factor productivity of manufacturing industry, However, in the long run, the opening up of producer services inhibits the improvement of pure technical efficiency and scale efficiency in China's manufacturing industry. The second is to discuss the relationship between the opening up of producer services and the export of manufacturing enterprises. For example, For example, Li Zhang et al. (2021) believe that the

opening up of the service industry affects the export domestic value-added rate of enterprises by increasing the cost-plus rate of manufacturing enterprises, thus improving the division of labor status of enterprises in the global value chain. The opening up of service industry as an intermediary channel strengthens the positive effect of production segmentation on the quality of export products (Minchun Han and Hankun Yuan, 2022). However, in terms of improving the export competitiveness of manufacturing industry, the promotion effect of producer service imports is much better than that of producer service FDI (Yan Liu and Ping Huang, 2015). Clarifying the specific factors affecting industrial collaborative agglomeration is the prerequisite for realizing regional industrial collaborative agglomeration. Existing studies are mostly conducted under the dimensions of industry and space attributes of collaborative agglomeration itself, and mainly investigate the formation of industrial collaborative agglomeration from the perspective of industrial association (Xi Chen and Jianhua Zhu, 2018). The linkage between intermediate inputs and final product suppliers, shared labor market, information flow and knowledge spillover are considered to be the three key elements in the formation of collaborative industrial agglomeration (Ellison & Glaese;1997). Shuwang Yang, Ming Yi et al. (2006) clearly put forward that high transaction costs caused by regional cultural differences and degree of integrity have adverse effects on the formation and development of industrial agglomeration. Dejin Wu(2006) explained from the perspective of division of labor that collaborative agglomeration of related industries has a positive impact on reducing intraregional transaction costs. From the perspective of industrial economic geography, Feng Gao and Zhibiao Liu(2008) believed that industrial synergistic agglomeration is generated by the external economic effect and synergistic effect between industries. The synergistic agglomeration of manufacturing and service industry in the Yangtze River Delta is beneficial to reduce the negative externalities such as excessive competition caused by single industry agglomeration and realize the upgrading of industrial structure. From the perspective of division of labor, Xian Chen et al. (2014) discussed the development process, causes and complementary interaction between service industry and manufacturing industry in the actual development process, and concluded that the division of labor and cooperation between service industry and manufacturing industry promoted the synergistic agglomeration of the two industries. Shihao Liu (2020) used the data of The Yangtze River Delta region from 2007 to 2017 to construct the collaborative agglomeration index of manufacturing and producer services through location entropy, and at the same time established variables representing labor flow, capital flow and technology diffusion, and estimated the relationship between variables through differential GMM.In the selected years, the degree of initial synergistic agglomeration will affect the degree of subsequent industrial synergistic agglomeration, labor mobility and technology diffusion will promote the degree of synergistic agglomeration, and capital flow will have a negative impact on synergistic agglomeration. Mingsheng Zhou(2020) introduced the element of social trust into the model of vertical association of free capital and investigated the internal mechanism of social trust acting on industrial collaborative agglomeration by constructing a theoretical model. Research and analysis showed that the higher the level of social trust, the higher the degree of industrial collaborative agglomeration, and the greater the contribution to economic development.Xi Chen(2018) analyzed the influencing factors of synergistic agglomeration between manufacturing industries on the basis of measuring the synergistic agglomeration index and industrial correlation degree between different subsectors in China's manufacturing industry. It is found that the two manufacturing subsectors are spatially adjacent due to industrial association, and the stronger the industrial association is, the higher the degree of inter-industry collaborative agglomeration is. In addition, the smaller the differences in labor demand, energy demand and technology input intensity are, the more likely inter-industry collaborative agglomeration is to occur. Manqi Jiang(2014) pointed out that in order to reduce the cost of search, agreement, contract, supervision and default in the

process of manufacturing sertization, producer services of information, business and science and technology and technology-intensive manufacturing showed a highly correlated spatial synergy degree.Some input-output intensity low added-value industries show spatial dispersion because industrial association cannot produce strong aggregation economic benefits. Sanliang Jiang et al. (2021), based on panel data of 280 prefecture-level cities in China from 2008 to 2017, adopted SEM model to explore the impact of transportation infrastructure on the collaborative agglomeration of producer services and manufacturing and its spatial spillover effect. It is found that transportation infrastructure has a positive spillover effect on the industrial agglomeration in the neighboring area. There is an obvious substitution relationship between communication infrastructure and transportation infrastructure on the spatial spillover effect of industrial synergy agglomeration. In essence, industrial collaborative agglomeration is a common agglomeration of industries with some related relations, such as input-output correlation and technology correlation. In short, we should pay attention to the international factors that affect the formation of industrial collaborative agglomeration while investigating the domestic factors. At present, there are mainly market creation mode and capital transfer mode in domestic industrial synergy agglomeration, among which capital transfer mode plays a pivotal role, and FDI plays a driving role. Therefore, the service will be opened up with industrial agglomeration theory, combining building contains elements of the international model, from the perspective of service sectors review the formation mechanism of industry collaboration agglomeration, not only enriches industry collaborative cluster theory, the most important thing is, for our country's strategy of "two-wheel driven" also provide constructive proposals.

The structure of this paper is as follows: The second part is a literature review about the opening up of service industry to the outside world and industrial collaborative agglomeration; The third part is the theoretical model; The fourth part is empirical test; Finally, the conclusion and policy suggestions are given.

3. Model Setting, Variable Selection and Data Description

Empirical Model Setting 3.1.

Firstly, the following panel fixed effect model is constructed to test the relationship between them:

$$r_{i,t} = \alpha_0 + \alpha_1 sfdi_{i,t} + \alpha_2 hc_{i,t} + \alpha_3 tra_{i,t} + \alpha_4 lng_{i,t} + \alpha_6 pdensity_{i,t} + \alpha_7 inf_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

Where, $r_{i,t}$ is the collaborative agglomeration index of producer services and manufacturing in province I in t, Sfdi is the openness index of service industry ;Hc is the level of human capital, Tra is the level of transportation infrastructure; Lng is government science and technology input, Pdensity is city scale, Inf is information water.

Variable Selection 3.2.

(1)Explained variable: industrial synergy agglomeration. The e-G common agglomeration index is adopted to measure the level of industrial collaborative agglomeration, and the calculation formula is as follows:

$$r_{ij} = 1 - \frac{|S_{mi} - S_{mj}|}{|S_{mi} + S_{mj}|} + (S_{mi} + S_{mj})$$

(2)Core explanatory variable: the service industry is open to the outside world, and the index of foreign investment in service industry is selected.

(3)Control variable: human capital level (hc), measured by the proportion of the number of urban college students in the total population of each province (ten thousand); Transport infrastructure (tra), measured by road network density, which is the length of road divided by the urban area of the region; Government science and technology input (lng) is represented by government science and technology expenditure; The level of government expenditure (gov) is constructed using government expenditure as a percentage of GDP.Urban size (pdensity) was represented by the ratio of total population to regional area at the end of the year. The level of informationization (inf) is expressed as the proportion of the total amount of post and telecommunications services in provinces to the average amount of posts and telecommunications services in cities nationwide.

3.3. **Data Description**

In this paper, panel data of Chinese provinces are selected to test the impact of opening up of service industry on industrial collaborative agglomeration. The data are mainly from China Statistical Yearbook and provincial statistical yearbooks, and some missing data are supplemented by interpolation method.As countries to the definition of producer services is not the same, this article refers to producer services mainly include transportation, warehousing and postal service ", "" wholesale and retail" information transmission, computer services and software industry "" accommodation and catering industry" "finance, leasing and commercial service" "scientific research, technical services and geological prospecting industry".

4. Empirical Results and Related Tests

4.1. **Baseline Regression Analysis**

In the estimation of panel data model, we first need to confirm whether to use random effects model or fixed effects model.Stata15 was used to conduct Hausman test, and the results showed that the P value was less than 0.01, which rejected the null hypothesis of random effects. Therefore, the fixed-effects panel model was more appropriate.

The specific regression results are shown in Table 1: the coefficient of the opening up of the core explanatory variable service industry is positive, indicating that the level of industrial collaborative agglomeration changes exponentially with the development of the opening up of the service industry, and the opening up of the service industry has a significant role in promoting industrial collaborative agglomeration. Among the control variables, the coefficient of human capital level indicator (hc) is positive, and the P value is less than 0.01, which is significant at 1% significance level. This shows that the improvement of human capital will promote the improvement of the level of industrial synergy agglomeration. The city size index (pdensity) was significantly negative. This shows that the impact of city size on industrial agglomeration is very important. The coefficient of transport infrastructure index is positive (tra), P value is less than 0.01, significant at 1% significance level. It shows that with the improvement of transportation infrastructure, the level of China's industrial synergy will continue to improve. The coefficient of government science and technology investment index (lng) is positive, P value is less than 0.05, significant at 5% significance level. This shows that in the context of the national innovation-driven development strategy, the continuous expansion of government investment in science and technology has attracted a large number of large key high-tech enterprises, promoted the optimization and upgrading of industrial structure, and then maximized the spatial layout to promote the collaborative agglomeration of manufacturing and producer services. The influence coefficient of INFORMATION level (inf) is not significantly positive, perhaps because there is a gap in the development level of information technology in different regions of China.The influence coefficient of government expenditure index (gov) is not significant and is positive, indicating that the influence of local governments on industrial agglomeration through the formulation and implementation of industrial policies can not be ignored.

0	1
	(1)
variable	Fixed effects
sfdi	0.201***
	(0.030)
hc	0.012***
	(0.004)
lng2	0.137**
	(0.066)
tra	0.041***
	(0.014)
gov	1.032
	(0.804)
pdensity	-0.353*
	(0.191)
inf	-0.118**
	(0.056)
Constant	1.489***
	(0.306)
Number of id	23

Table 1. Regression results of panel model

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

4.2. Robustness Test

Table 2. Regression results of robustness test

	(1)	(2)
variable	the east	The Midwest
sfdi	0.246***	0.120
	(0.021)	(2.629)
hc	0.015	-0.002
	(0.009)	(0.009)
lng2	0.101	0.108
	(0.109)	(0.071)
tra	0.191	0.017
	(0.143)	(0.088)
gov	1.090	0.214
	(2.021)	(1.143)
pdensity	-1.977	0.685
	(1.585)	(7.738)
inf	-0.122*	0.126
	(0.060)	(0.291)
Constant	1.886**	1.665**
	(0.768)	(0.657)
Number of id	9	14

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

The robustness test of regional regression was carried out, and the sample range was changed from the whole country to the eastern and central and western regions, and then the model was estimated. The estimation results are shown in Table 2. It is found that the coefficient symbols, significance and relative sizes of the main variables differ little from the benchmark regression results, indicating that the benchmark regression results are robust.

4.3. Discussion on Endogeneity

The main causes of endogeneity problems are missing variables, measurement errors and twoway interaction. This paper selects a possible number of factors affecting industrial synergy agglomeration in order to alleviate the endogenous problems caused by omitted variables. For the endogeneity problems caused by other reasons, this paper selected the lag period of the explanatory variable of the service industry opening index as the instrumental variable, and applied the fixed effect model instrumental variable method to re-estimate the model. The estimation results are shown in Table 3.

Table 5. Regression results of endogeneity test	
	(1)
	FE+IV
sfdi	0.301***
	(0.049)
hc	0.012**
	(0.004)
lng2	0.156**
	(0.074)
tra	0.038**
	(0.014)
gov	1.005
	(0.854)
pdensity	-0.314
	(0.186)
inf	-0.110*
	(0.056)
Number of id	23

Table 3. Regression results of endogeneity test

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

5. Research Conclusion and Policy Implications

This paper focuses on the relationship between the opening up of service industry and industrial collaborative agglomeration and makes an empirical analysis of the impact of opening up of service industry on industrial collaborative agglomeration. It is found that the opening up of service industry has a positive impact on industrial agglomeration, and the results are still stable after regression by region.

In order to further improve the level of collaborative agglomeration of producer services and manufacturing industries and promote the integrated development of the two industries, it is necessary to make policies to favor the opening-up of the service industry.We will lower the threshold for foreign investment in the service sector and simplify the approval process.We will improve the development and management of pilot opening-up zones in the service sector, including the China (Shanghai) Pilot Free Trade Zone, to speed up The integration of the

Chinese economy into the world economy. We will further raise standards for international economic and trade rules, raise the level of institutional openness, and create a sound business environment.We will establish a sound negative list system for cross-border trade in services, and implement policies to liberalize and facilitate trade in services with both market access and business access as the basic features.We will conduct stress tests at the Hainan Free Trade Port to enhance its ability to adapt to high-standard international economic and trade rules. We will implement national treatment for foreign investment after establishing market access, deepen reform to delegate power, improve regulation and services, and simplify the approval process.We will strengthen anti-monopoly and anti-unfair competition regulations and improve the efficiency of resource allocation. Secondly, we should pay attention to the accumulation of human capital and establish a sound talent flow mechanism. Create a quality entrepreneurial environment to improve social productivity. Only in this way, can we ensure the healthy and rapid development of producer services in China by making efforts to improve the level of human resources through inclusive learning. Finally, explore the development of digital trade and accelerate the transformation and upgrading of trade in services. We will develop modern digital information infrastructure such as 5G and the Internet of Things, build an efficient information network system, and promote the development of new forms of business such as cross-border e-commerce and overseas warehouses. We will speed up the building of digital trade demonstration zones, proactively align ourselves with high-level digital trade agreements such as the Comprehensive and Progressive Trans-Pacific Partnership agreement (CPTPP) and The Digital Economy Partnership Agreement (DEPA), and further promote high-level opening-up.We will introduce digital trading enterprises with international influence and actively foster new growth areas for cooperation. We will focus on preventing risks that may arise from cross-border data flows, guard the bottom line of security, safeguard national data security, and improve digital trade governance.

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