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Performance Evaluation and Empirical Study of the E-commerce Service Industry: A Case Study of the Yangtze River Delta in China

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Abstract:

The e-commerce service industry is an emerging industry with the development of e-commerce. In this paper, the DEA method is used to evaluate the performance of the e-commerce service industry in the Yangtze River Delta region, and then the Tobit regression model is adopted to evaluate the correlation between the e-commerce service industry and various factors. The study shows that the indicator GDP per capita as an economic factor and value added of the tertiary sector, post and telecommunications volume, the R&D investments as comprehensive factors as influencing factors positively with the level of the e-commerce service industry. Among them, economic factors have a deeper impact on the development of the e-commerce service industry.

Keywords*: E-commerce, DEA-Tobit, Performance Evaluation.*

I. INTRODUCTION

E-commerce service industry provides specialized and derivative service for e-commerce [1-2]. With the development of e-commerce, the e-commerce service industry has also developed rapidly, and its composition has been continuously enriched. The composition of e-commerce service industry mainly includes: e-commerce platform service industry, e-commerce agent operation service industry, e-commerce logistics service industry, e-commerce credit service industry, e-commerce consulting service industry, e-commerce education and training service industry, e-commerce Data-based service industry, e-commerce financial service industry, etc.

As an important part of the e-commerce or e-sales ecosystem [3-4], e-commerce service industry emerges and develops rapidly along with technological progress and changes. The development of the e-commerce service industry is conducive to reducing social transaction costs, promoting social division of labor and collaboration, and at the same time effectively alleviating employment pressure, expanding domestic demand, promoting the common development of various regions, encouraging social innovation, and increasing the efficiency of social resource allocation. It has provided a powerful impetus for the

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economic development of the Yangtze River Delta region and the promotion of economic structural transformation, after decades of development.

Thus, the e-commerce service industry becomes a primary part of modern service sector, which can influence the economy and society a lot. Meanwhile, how to evaluate the efficiency in different areas is still arguable. The paper describes the development of the e-commerce service industry and discusses the evaluation problem based on two-stage analysis(aka. DEA-Tobit method).

The rest of the paper is organized as follows: in the next section, The conceptual background and empirical approach are proposed; and following that, the performance is evaluated with DEA model; Then the affecting factors are discussed; And in the final section, the paper discusses the results and outlooks the prospects of the industry.

II. RESEARCH PROBLEMS AND METHODS

As a strategically emerging industry with unlimited potential, the e-commerce service industry plays an irreplaceable role in economic development. The level of development of the e-commerce service industry in the Yangtze River Delta is at the forefront in China, which has greatly promoted regional economic development. However, the development of the e-commerce service industry in the cities in the Yangtze River Delta is unbalanced and there is a large gap. In order to better promote the development of the e-commerce service industry in the Yangtze River Delta region, it is necessary to evaluate the performance of the e-commerce service industry to put forward corresponding countermeasures and suggestions.

The paper tends to analyze the current state of development of the e-commerce service industry by reviewing the relevant theories of industrial performance, applying related models to discover the performance problems, and examining appropriate solutions for sustainable and solid development of the industry. A mature method is used to address the problem in 2 stages [5-6]. Stage 1 is using nonparametric DEA to calculate performance, and Stage 2 uses regression to relate performance values to factors that affect efficiency.

2.1 The DEA Model

Preferred tools for analyzing the performance of different cities in the Yangtze River Delta include Data Envelopment Analysis (DEA) and other closely related instruments such as Malmquist indices and distance functions for analysis. DEA was immediately recognized as a useful tool for measuring performance, since Charnes, Cooper, and Rhodes (1978) introduced DEA as a tool for measuring the efficiency and productivity of decision-making unit [7]. In recent years, the number of publications on the theory and applications of DEA has increased exponentially.

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The paper uses DEA model to evaluate the performance of different cities in the Yangtze River Delta. For applications, the BCC model is transformed through the extension of the CCR model. If efficiency of DMUs is measured by the BCC model, technology is characterized by variable returns to scale [8]. By reducing the constraints of assumptions, technical efficiency (TE) is converted into two-part specific analysis of pure technical efficiency (PTE) and scale technical efficiency (SE), i.e., TE=PTE*SE. The specific representation of the BCC model is as follows:

$$\left\{\begin{array}{c} Min\ \mathrm{TE_k} \\ s.t.\ \sum_{j=1}^{n}\lambda_j x_{ij} + S^- = TE_k x_{ik} \\ \sum_{j=1}^{n}\lambda_j y_{rj} - S^+ = y_{rk} \\ \sum_{j=1}^{n}\lambda_j = 1 \\ \lambda_j \geq 0, k = 1,2,\cdots,\mathrm{n}; \mathrm{r} = 1,2,\cdots,\mathrm{n} \\ \mathrm{i} = 1,2,\cdots,\mathrm{m}; \mathrm{j} = 1,2,\cdots,\mathrm{n} \\ S^+ \geq 0, S^- \geq 0 \end{array}\right\} \quad (1)$$

2.2 Tobit Regression Model

To better understand the factors influencing the input and output of the e-commerce service industry, the paper performs a regression analysis on overall efficiency. Not only can the Tobit model determine the specific influence of each indicator on the performance value, but the results obtained are also impartial and consistent. The TE, PTE, and SE obtained from the DEA analysis are all in the range 0 to 1. In addition, the Tobit model is suitable for situations where the dependent variable is limited. The specific characteristics of the Tobit model are as follows:

$$\left\{\begin{array}{c} y_i^* = \beta' x_i + \varepsilon, \varepsilon \sim N(0,\sigma^2) \\ Y = 0, \text{if } y_i^* \leq 0 \\ Y = y_i^*, \text{if } y_i^* > 0 \end{array}\right\} \quad (2)$$

Where ε is the residual term, independent and obeys normal distribution, $\varepsilon \sim N(0,\sigma^2)$, β is the regression parameter vector, x_i is the explanatory variable vector, $y_i^*$is the latent dependent variable vector, and Y stands for the scale efficiency value vector.

III. PERFORMANCE EVALUATION OF E-COMMERCE SERVICE INDUSTRY

3.1 Static Analysis of DEA Model Results

The paper selects some of the cities from the perspective of the maturity of the e-commerce service industry in the Yangtze River Delta. The selection of the initial input-output indicators corresponds to the

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relevant principles of performance measurement of the DEA and a factor analysis of the initial input-output indicators is carried out and finally three input indicators and two output indicators are retained. Each indicator is listed in Table 1. The data of each indicator comes from the official statistics of each city.

Table 1. Input-output indicators and explanations

Primary indicator	Secondary indicator	Unit	Description	Label
Input indicator	Number of employees in the e-commerce service industry	ten thousand persons	Input indicator	X_1
	Average salary of employees in e-commerce service industry	ten thousand CNY	Input indicator	X_2
	Number of Internet Broadband Access	ten thousand households	Input indicator	X_3
Output indicator	E-commerce service industry output value	hundred million CNY	output indicator	Y_1
	E-commerce transaction volume	hundred million CNY	output indicator	Y_2

In order to maintain the technical efficiency, pure technical efficiency, and scale efficiency of the e-commerce service industry in the Yangtze River Delta, each city's need to be calculated using the BBC model. The results are shown in Table 2. In the scale effect column, irs stands for increasing returns to scale, drs for diminishing returns to scale, and "-" for constant returns to scale.

Table 2. E-commerce service industry efficiency analysis in some cities in the Yangtze River Delta

firm	crste	vrste	Scale	scale effect
Shanghai	1	1	1	-
Nanjing	0.430	0.572	0.752	irs
Suzhou	0.805	0.808	0.997	drs
Wuxi	0.413	0.640	0.645	irs
Changzhou	1	1	1	-
Wuhu	0.609	1	0.609	irs
Jinhua	0.182	0.749	0.243	irs
Jiaxing	0.980	1	0.980	irs
Hangzhou	1	1	1	-

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Ningbo	0. 395	0. 620	0. 638	irs
Wenzhou	1	1	1	-
Xuzhou	0. 263	0. 776	0. 339	irs
Hefei	0. 624	1	0. 624	irs
Taizhou	0. 828	1	0. 828	irs
mean	0. 681	0. 869	0. 761	

According to Table 2, the performance of the 14 cities in the Yangtze Delta can be divided into 2 categories.

The first category represents efficient cities, namely Shanghai, Changzhou, Hangzhou and Wenzhou. The efficiency values of these four cities are all 1. The second category represents inefficient cities. In this category, it can be further divided into two types, using the overall average efficiency of 0.681 as the dividing point. Among them, when the value is greater than 0.681 and less than 1, the performance is relatively good. These cities are Jiaxing, Taizhou, and Suzhou. The other type is greater than 0 and less than 0.681. There are 6 cities including Hefei, Wuhu, Nanjing, Wuxi, Nanjing and Jinhua. It is inefficient and the level of performance is relatively low compared to the previous category of cities. Particular attention needs to be paid to improving the performance of these types of cities.

There're 2 scenarios for inefficient cities. One scenario is that pure technical efficiency is effective but scale efficiency is ineffective, including Jiaxing, Taizhou, Hefei, and Wuhu. The ratio of input-output is reasonable and effective, which means there is no insufficient output or redundant input. Besides, if the technical efficiency is to be effective, it is only necessary to improve the scale efficiency of the corresponding city. As can be seen from table 2, returns to scale of Jiaxing, Taizhou, Hefei, and Wuhu are all increasing. Therefore, it is necessary to expand the scale of their e-commerce service industries to achieve effective scale efficiency, to achieve effective technical efficiency, and then accordingly increase the overall performance of e-commerce services in the Yangtze River Delta. The intensity of scale expansion can be implemented according to the size of scale efficiency. The size of scale efficiency reflects the degree of influence of scale expansion on scale efficiency. The larger the scale efficiency, the greater the influence of scale expansion on scale efficiency. However, if a city wants to expand the scale of its e-commerce service industry, the intensity of expansion and other factors need to be taken into consideration.

Another scenario is that both technical efficiency and economies of scale are ineffective, suggesting that the input to output ratio is inadequate. In other words, there is insufficient output and redundant input, and scaling needs to be improved. The DEA method can calculate the ideal input-output value of the invalid DMUs and can show the expected input-output values of each city to be realized and maintained. The specific values are shown in Table 3 and Table 4.

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Table 3. Actual output, ideal output and insufficient output analysis

City	Actual output		Ideal output		Insufficient output	
	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
Nanjing	9856	339. 37	9856	481. 87		142. 5
Suzhou	9000	824. 56	9030. 456	824. 56	30. 456	
Wuxi	4985	195. 15	4985	271. 759		76. 609
Jinhua	621	176. 88	621	272. 207		95. 327
Ningbo	8497	516. 45	8497	538. 233		21. 783
Xuzhou	1523. 69	186. 35	1523. 69	221. 414		35. 064

As can be seen from the tables, Suzhou has insufficient output on Y1, Nanjing, Wuxi, Jinhua, Ningbo, and Xuzhou have insufficient output on Y2 ,while 6 cities have redundant input on X1, X2, and X3. In order to achieve technical efficiency , the 6 cities need to solve the problem of redundant input and insufficient output. Suzhou's scale efficiency is in a state of declining, indicating that the scale of the city's e-commerce service industry needs to be reduced to make the scale efficiency effective, while the scale efficiency of the other five cities are all increasing, indicating that the scale of the city's e-commerce service industry needs to be expanded to make the scale efficiency effective. In this way, pure technical efficiency and scale efficiency are effective at the same time to achieve effective technical efficiency and accordingly increase the performance level of the e-commerce service industry in each city in the Yangtze River Delta.

Table 4. Actual input, ideal input and insufficient input analysis

City	Actual input			Ideal input			Redundant input		
	X_1	X_2	X_3	X_1	X_2	X_3	X_1	X_2	X_3
Shanghai	146.35	14.89	709.51	146.35	14.89	709.51			
Nanjing	29.85	23.69	339.14	11.774	13.541	193.853	18.076	10.149	145.287
Suzhou	12.59	20.69	465.23	10.169	16.339	272.065	2.421	4.351	193.165
Wuxi	13.25	18.54	275.47	7.442	11.874	176.432	5.808	6.666	99.038
Changzhou	2.95	16.98	210.3	2.95	16.980	210.3			
Wuhu	6.12	17.45	45.85	6.12	17.45	45.85			

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Jinhua	13.25	15.26	206.61	4.23	11.432	154.788	9.02	3.828	51.822
Jiaxing	4.25	8.89	214.35	4.25	8.89	214.35			
Hangzhou	30.21	14.56	443.55	30.21	14.56	443.55			
Ningbo	23.78	20.16	341	10.933	12.495	211.354	12.847	7.665	129.646
Wenzhou	10.02	15.23	118.5	10.02	15.23	118.5			
Xuzhou	9.52	16.52	164.11	4.765	12.816	127.317	4.755	3.704	36.793
Hefei	3.89	14.15	88.25	3.89	14.15	88.25			
Taizhou	2.1	16.98	208.46	2.1	16.98	208.46			

3.2 Dynamic Evaluation Based on Malmquist Index

The previous analysis is a measurement of the relative effectiveness of e-commerce service performance in the Yangtze River Delta in 2016. It is expressed by the Efficiency Score, which is a static and horizontal analysis. This static and horizontal performance assessment can hide the performance improvement or regression of these cities and so the results of the analysis can be biased. The Malmquist Index can evaluate the performance of e-commerce services from a vertical dimension using panel data and dynamically measure the results of the time series regression.

During the longitudinal evaluation of the performance evaluation of the e-commerce service industry in the Yangtze River Delta, the data from 2011 to 2016 are selected taking into account data availability and accessibility. The results analyzed by DEAP2.1 are shown in Table 5.

Table 5. Malmquist index of e-commerce services with panel data

City	Technological Change (Effch)	Technical Efficiency Change (Techch)	Pure Technical Efficiency Change (Pech)	Scale Efficiency Change (Sech)	Total Factor Productivity Change (Tfpch)
Shanghai	1.068	1.062	1	1.068	1.134
Nanjing	0.976	0.989	0.995	0.981	0.966
Suzhou	1.033	1.041	1.069	0.967	1.076
Wuxi	0.994	1.031	1	0.994	1.024
Changzhou	1	1.017	1	1	1.017
Wuhu	1	0.963	1	1	0.963
Jinhua	0.897	1.038	0.948	0.947	0.932

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Jiaxing	0.979	1.268	0.982	0.997	1.240
Hangzhou	1	1.124	1	1	1.124
Ningbo	0.975	1.041	0.979	0.996	1.015
Wenzhou	1	1.009	1	1	1.009
Xuzhou	0.927	1.021	0.929	0.997	0.964
Hefei	0.896	1.007	1	0.896	0.964
Taizhou	0.95	0.999	1.069	0.888	0.949
mean	0.977	1.046	0.997	0.98	1.022

According to the overall analysis of total factor productivity as shown in Table 5, the total factor productivity index is 1.022 and the indices of most cities are above 1 with the exception of 6 cities. For Wuhu, the technical efficiency change is 0.963, which plays a key role in the decline in total factor productivity. For Hefei, the change in economies of scale is 0.896, resulting in a decrease in total factor productivity. For Nanjing, Jinhua, Xuzhou and Taizhou with a total factor productivity index of less than 1, 2 or 3 or 4 indices of the combination of technological change, technical efficiency change, pure technical efficiency change or change in economies of scale leads to a decrease in the total factor productivity.

Table 6. Changes and decomposition of the Malmquist index of e-commerce services

City	2011-2012			2012-2013			2013-2014			2014-2015			2015-2016		
	effch	techch	tfpch	effch	techch	tfpch	effch	techch	tfpch	effch	techch	tfpch	effch	techch	tfpch
Shanghai	0.985	1.286	1.267	0.951	1.278	1.215	0.802	1.427	1.145	1.254	1.086	1.363	0.952	1.285	1.224
Nanjing	1	0.856	0.856	1	1.101	1.101	1	0.855	0.855	0.958	1.029	0.986	0.927	1.141	1.057
Suzhou	1.077	1.104	1.189	0.891	1.066	0.95	1.28	0.867	1.11	1.045	1.046	1.094	0.918	1.147	1.052
Wuxi	1.086	1.123	1.22	1	0.988	0.988	1	0.955	0.955	1	1.005	1.005	0.892	1.093	0.975
Changzhou	1	1.989	0.989	1	1.02	1.02	1	1	1	1	1.013	1.013	1	1.066	1.066
Wuhu	1	0.757	0.757	1	0.82	0.82	1	0.966	0.966	1	0.909	0.909	1	1.517	1.517
Jinhua	1	1.326	1.326	0.707	0.834	0.59	0.938	0.942	0.884	0.98	1.009	0.989	0.895	1.148	1.027
Jiaxing	0.669	1.159	0.775	1.056	0.993	1.049	1.45	0.967	1.403	0.854	1.03	0.88	1.588	1.179	1.871
Hangzhou	1	1.098	1.098	1	1.137	1.137	1	1.302	1.302	1	1.034	1.034	1	1.07	1.07

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Ningbo	1	1.017	1.017	1	0.986	0.986	1	1.066	1.066	1	1.023	1.023	0.88	1.118	0.984
Wenzhou	1	1.386	1.386	1	0.9	0.9	1	0.822	0.822	1	0.915	0.915	1	1.117	1.117
Xuzhou	0.994	1	0.995	1.006	1.072	1.078	0.993	0.95	0.944	0.97	0.986	0.956	0.71	1.107	0.785
Hefei	1.037	0.939	0.973	0.971	0.998	0.968	0.716	1.212	0.868	0.929	1.113	1.034	0.861	1.146	0.986
Taizhou	0.87	1.012	0.88	0.988	1.033	1.021	1.056	0.925	0.977	0.874	1.031	0.901	0.974	1	0.974
mean	0.974	1.062	1.034	0.956	1.01	0.975	1.003	1.006	1.009	0.987	1.015	1.001	0.957	1.147	1.097

As illustrated in Table 6, the Malmquist index of e-commerce services can be further analyzed by technological change (effch) and technical efficiency change (techch). The technological changes at the five time-intervals are 0.974, 0.956, 1.003, 0.987 and 0.957 respectively, with a falling, rising and then falling trend of change. During the development process of e-commerce service industry, market needs are not properly met and resource allocation may not be reasonable. As seen from Table 6, the technical efficiency change at the five time-intervals are 1.062, 1.01, 1.006, 1.015 and 1.147 respectively, which means e-commerce services have considerable development potential in technological innovation.

IV. EXPLAINING VARIATIONS IN PERFORMANCE

There are many factors affecting the performance of e-commerce service industry from micro perspective, such as technological and entrepreneurial efficacy [9], perceived price [10], financial leverage [11] and customer loyalty [12]. On the other hand, few studies are carried out from macro perspective, such as technological, institutional, and cultural factors [13], marketing factors [14], and social factors [15].

Based on the actual situation of 14 cities in the Yangtze River Delta, this paper uses the four dimensions economic level, industrial level, R&D environment, and talent environment as influencing factors of the e-commerce service industry with reference to relevant articles. In order to fully analyze the factors influencing the performance of the e-commerce services industry, when choosing input and output indicators, comprehensively analyze and use various controllable factors that influence the e-commerce services industry from different angles. Tobit model is adopted for further investigation of influencing factors. Based on the relevant literature, combined with the current situation, Table 7 shows the specific indicators of the efficiency influencing factors.

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Table 7. Indicators and descriptions of performance influencing factors

Dimension	Indicator	Unit	Description	Label
Economic level	GDP per capita	Ten thousand RMB	Economic development level	Y_1
Industrial level	Added value of tertiary industry	100 million RMB	Development level of tertiary industry	Y_2
	The added value of the service industry as a proportion of GDP	%	Development speed in the service industry	Y_3
R &D environment	R&D investment	100 million RMB	Degree of R&D	Y_4
	Post and telecommunications business volume	100 million RMB	Information level	Y_5
Talent environment	Number of college students	Ten thousand people	Talent pool	Y_6
	Education expenditure	100 million RMB	Talent investment	Y_7

The factor analysis method is used to obtain two common factors, and the contribution rate of the two common factors is 89.166%. This result shows that the analysis results of the two factors can be used to replace the original seven indicators for explanation.

Then the maximum variance method of factor rotation is performed and the factor loading matrix can be obtained. It can be seen that F_1 has relatively large loads on Y_2, Y_3, Y_4, Y_5 and Y_7. This finding shows that the overall impact of industry, scientific research, and education spending on performance is influenced by multiple factors, so the three factors are renamed Comprehensive Factors. While F_2 has the greatest load on Y_1, the result indicates that the level of economic development has an impact on the level of performance, and it can be described as economic factor.

Taking a comprehensive look at the overall level of development of the e-commerce service industry in the Yangtze River Delta, and based on the previous analysis and determination of the factors influencing

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the performance of the e-commerce service industry, the following assumptions are first made.

Hypothesis 1: There is a positive correlation between firm size and e-commerce efficiency.

Hypothesis 2: There is a positive correlation between establishment time and e-commerce efficiency.

According to the indicators and assumptions selected above, the multiple linear regression model of the factors influencing the performance of the e-commerce service industry based on the Tobit model looks like this:

$$Y = \beta_0 + \beta_1 F_1 + \beta_2 F_2 + \varepsilon \quad (3)$$

Among them, Y is the comprehensive efficiency obtained by the DEA method, β_0 is the constant term of the regression formula, β_1, β_2 are the regression coefficients of each variable, and ε is the random perturbation term. F_1 is a Comprehensive Factor, and F_2 is an economic factor.

The data source comes from the statistical yearbooks of various cities and public reports. The dependent variable is the comprehensive technical efficiency value calculated above. Using EVIEWS 8.0 to perform a Tobit regression on the overall efficiency of the e-commerce service industry in each city and the impact factor values mentioned above, the results are shown in Table 8.

Table 8. Analysis of factors affecting e-commerce services industry performance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Y_1	1.197180	5.363004	0.223229	0.8234
Y_2	11.78190	15.07984	0.781301	0.4346
C	0.543720	0.102753	5.291524	0.0000

The regression analysis of the Tobit model is as follows.

The comprehensive factor is positively related to the performance of the e-commerce service industry. That is, when the value of the comprehensive factor is larger, the level of performance of the e-commerce service industry is relatively higher and the performance is better. The indicators represented by the comprehensive factors are factors Y_2, Y_3, Y_4, Y_5, Y_7.

Forest Chemicals Review
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There is a significantly positive correlation between economic factors and the performance of the e-commerce service industry. In other words, when the value of the economic factor is larger, the level of performance of the e-commerce service industry is better. The economic factor is expressed by Y_2. When a city's economic level develops rapidly, it is beneficial for the development of the e-commerce service industry and has a significant positive impact.

In summary, there is a significantly positive correlation between comprehensive factors, economic factors and the performance of the e-commerce service industry, and the degree of influence is judged by the size of the coefficients, followed by economic factors, comprehensive factor. All the investment contributed to the improvement of overall efficiency and promoted the improvement of the performance level of the urban e-commerce service industry in the Yangtze River Delta.

V. CONCLUSIONS AND MANAGEMENT IMPLICATIONS

The paper uses the DEA model to measure the performance of the e-commerce services industry in the Yangtze River Delta. The research shows that the overall performance of the e-commerce service industry in the Yangtze River Delta is not high, and the scale of insufficient investment, lack of adequate planning and investment in property, plant and equipment and human resources inadequacies, and other phenomena have affected the level of performance of the e-commerce service industry. (1) Shanghai, Changzhou, Hangzhou, and Wenzhou are the cities with good performance. (2) The returns to scale of Jiaxing, Taizhou, Hefei and Wuhu are all increasing. Hence, they need to expand the size of the urban e-commerce service industry to achieve effective economies of scale to achieve overall efficiency and effectiveness. (3) Nanjing, Wuxi, Jinhua, Ningbo, and Xuzhou are underperforming in terms of e-commerce transaction volume. (4) Six cities have redundant investment in e-commerce service industry employees, average employee salaries, and broadband Internet access. In order to achieve technical effectiveness, the six cities have to solve the problems of redundant input and insufficient output. (5) Suzhou's scale efficiency is decreasing, suggesting that the scale of the city's e-commerce service industry needs to be reduced in order to make the scale efficiency effective, while the scale efficiency of the other five cities is all increasing, suggesting that the scale needs to be expanded. In this way, technical efficiency and economies of scale work simultaneously to achieve overall efficiency and effectiveness and to increase the level of performance of the e-commerce service industry in various cities in the Yangtze River Delta.

The e-commerce service industry is a strategically emerging industry. In the process of development, companies should focus on communication when developing the e-commerce service industry and always pay attention to the development trends at home and abroad. In order for the e-commerce service industry in the Yangtze River Delta region to develop rapidly, the relevant government agencies must take into account the conditions of each region and pay attention to the rational arrangement of the e-commerce industrial parks. The added value of the tertiary sector, the added value of the service sector as a percentage of GDP, investments in R&D technology, the business volume in the postal and

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telecommunications sector and overall efficiency show a significantly positive correlation. The performance level of the e-commerce service industry can be improved by expanding the scope of the tertiary sector, improving the economic level, increasing scientific research investment and focusing on industrial performance, thereby improving the performance level of the whole e-commerce service industry in the Yangtze Delta.

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