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Research on the Difference of the Total Factor Productivity of Wholesale and Retail Industry in Anhui Province Based on DEA-Malmquist Model

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Abstract: Based on DEA-Malmquist Index model, this paper takes the wholesale and retail industries over quota in Anhui province as the research object, the Total factor productivity of wholesale and retail industries in Anhui Province from 2011 to 2020 were measured and compared. The results showed that among the 18 sub-industries of wholesale and retail industries, the Total factor productivity Total factor productivity of 13 industries showed an increasing trend while that of 5 industries showed a decreasing trend. And the difference between the change index of technical efficiency and the Change Index of technical progress is the main reason for the increase and decrease of Total factor productivity. There are four main reasons for the rise in Total factor productivity and two main reasons for the fall in Total factor productivity. Based on this, it is proposed to perfect the market development mechanism of wholesale and retail trade, pay attention to the brand construction of wholesale and retail enterprises, and promote the common development of network retail and physical retail, the four measures to improve the quality of workers in the wholesale and retail sectors are aimed at making up for deficiencies in this area.

Keywords: wholesale, Retail, Total factor productivity, Time series, Individual differences.

1. Introduction

As an important part of commodity circulation, the wholesale industry flourished and flourished, it plays a very important role in reducing the cost of enterprises, reducing the trade cost, improving the circulation efficiency and promoting the economic growth. Although the volume of merchandise trade in our country's wholesale trade still shows a rising trend year by year, but with the manufacturers and retailers to the integration of the value chain to speed up the pace, the healthy and sustainable development of our country's wholesale industry has also been hindered, and the whole circulation system presents the basic pattern of "Two active ends, middle atrophy". At the same time, since 2012, there have been high costs, resource monopoly, low profits, fierce market competition and scale expansion difficulties. In addition to the above difficulties, the retail industry will face a large number of stores, rental mortgage or rental renewal costs continue to rise, housing rental costs continue to rise unsteadily pressure. Wholesale and retail market competition is fierce, the future of the industry is full of uncertainties.

With the overall slowdown of economic development in our country, all industries in the national economy are accelerating the transformation of economic model, and the core of the transformation of economic development model is to improve industrial productivity. TFP and its Total factor productivity is a good measure of productivity levels and productivity changes in a country (region, industry). As far as the wholesale and retail industries are concerned, their Total factor productivity directly affect the speed and quality of the development of our circulation industry, therefore, it is very important to study the Total factor productivity of wholesale and retail trade in our country, which will determine whether our country can realize the transformation from a "Big country of circulation" to a "Big country of circulation".

2. Literature Review

Operational efficiency or Total factor productivity in the wholesale and retail sectors has always been a hot research issue. Barros & Alves empirically analyzed the productivity growth of Portuguese retail chains with the Malmquist Productivity Index, and Barros measured the efficiency of Portuguese retail enterprises, represented by hypermarkets and supermarkets, Perrigot & Barros measured the technical efficiency of French retail firms, Barros et al. . This paper analyzes the technical efficiency and distribution efficiency of French grocery retailing, Freeman et al. . Using Walmart as an example, Patel & Pande analyzes the efficiency of Indian pharmaceutical retailers, and Moreno & Carrasco calculates the technical efficiency of Spanish retailers. Liu and Wei measured the retail Total factor productivity above quota in our 31 provinces and autonomous regions between 2004 and 2008, it found that the retail Total factor productivity had improved significantly and was driven mainly by technological advances. Jiang Xiangyang and others have analyzed the operating efficiency of listed retail chain companies in our country between 2005 and 2008 and found that the Total factor productivity of retail chain companies has changed considerably, mainly due to the substantial increase in technological progress, not from increased technical efficiency. Li Xiaohui calculated the growth of the Total factor productivity of our circulation industry from 1993 to 2008 and found that the Total factor productivity, technical efficiency and rate of technological progress of the circulation industry were all increasing positively, and there are some differences in the characteristics of productivity growth in different periods. Lei Lei measured the Total factor productivity of 51 listed retail companies in China between 2001 and 2012, and found that the Total factor productivity growth of listed retail companies was mainly due to changes in technological efficiency, the Total factor productivity rate, technical efficiency and technical progress index all showed

positive growth trend.

Combining and drawing on the existing research results of the above-mentioned domestic and foreign scholars, in this paper, DEA-Malmquist index model is used to analyze the time series and individual differences of the Total factor productivity of the wholesale and retail industries over quota in Anhui province during the period of 2011-2020, in order to make up for the deficiencies in this field.

3. Research Design

3.1. Data envelopment analysis

Data Envelopment Analysis (DEA) is a non-parametric Data Envelopment Analysis to measure the relative efficiency of decision making units. Especially, it can deal with the efficiency evaluation of the decision-making unit under the complex situation of "Many inputs and many outputs". The advantage of DEA model is that it does not need to test the correlation between input and output indicators, set the weight of input and output indicators, or even build production function, the effective production front surface can be measured.

The DEA method comes from the problem of measuring production efficiency in economics. In 1978, in Measuring the Efficiency of Decision Making Units, operational scientists Charles, Cooper, and Rhodes first proposed a non-parametric method for evaluating the relative Efficiency of nonprofit organization -- the DEA method, and named the first DEA model-CCR model with their names.

In 1984, Bankers and Charnes et al discovered that the scale of production can be efficient or inefficient when the production technique is efficient. They further investigate and point out that the CCR model is a case of constant return to scale, while the BCC model is a case of variable return to scale.

3.2. Malmquist index model

The Malmquist index was first proposed in 1953 by the famous Swedish economist Sten Malmquist. In 1994, based on the DEA model, Rolf and his colleagues decomposed the Malmquist index into three major components: technical efficiency change, technical progress and scale efficiency change to measure the sources of Total factor productivity growth.

The dynamic Malmquist index model of maturity has the following expression:

$$M_D\left(\left(x^t,\ z^{t-1},\ y^t,\ z^t\right),\ \left(x^{t+1},\ z^t,\ y^{t+1},\ z^{t+1}\right)\right)$$

$$= \sqrt{\frac{\bar{D}^t\left(x^{t+1},\ z^t,\ y^{t+1},\ z^{t+1}\right)}{\bar{D}^t\left(x^t,\ z^{t-1},\ y^t,\ z^t\right)} \times \frac{\bar{D}^{t+1}\left(x^{t+1},\ z^t,\ y^{t+1},\ z^{t+1}\right)}{\bar{D}^{t+1}\left(x^t,\ z^{t-1},\ y^t,\ z^t\right)}}$$

$$= \frac{\bar{D}^{t+1}\left(x^{t+1},\ z^t,\ y^{t+1},\ z^{t+1}\right)}{\bar{D}^t\left(x^t,\ z^{t-1},\ y^t,\ z^t\right)} \times \sqrt{\frac{\bar{D}^t\left(x^t,\ z^{t-1},\ y^t,\ z^t\right)}{\bar{D}^{t+1}\left(x^t,\ z^{t-1},\ y^t,\ z^t\right)} \times \frac{\bar{D}^t\left(x^{t+1},\ z^t,\ y^{t+1},\ z^{t+1}\right)}{\bar{D}^{t+1}\left(x^{t+1},\ z^t,\ y^{t+1},\ z^{t+1}\right)}}$$

= TEC (Technical Efficiency Change)*TC (Technological Change)

= (PEC (Pure Technical Efficiency Change)*SEC (Scale Efficiency Change))

*TC (Technological Change) (1)

3.3. The selection of index and data

On the basis of effectively reflecting the subjects studied, this paper takes into account the statistical data of available years, the total assets (10,000 yuan) and the number of employees (persons) of the wholesale and retail trade above the quota in Anhui province are selected as the input indicators. The total retail sales (RMB) and main business income (RMB) of wholesale and retail trade above designated size in Anhui province are selected as output indicators.

The data sources of this paper are the statistical indicators of wholesale and retail trade over quota in Anhui statistical yearbook from 2011 to 2020. According to the national economic sectors, which can be divided into nine categories.

4. Time Series Analysis of Total Factor Productivity

4.1. Wholesale industry

From Table 1, the average value of TFP of wholesale trade above quota in Anhui province showed an increasing trend from 2011 to 2020, with an average increase of 4%. This shows that enterprises have appropriate decision-making and management capabilities, the industrial structure conforms to comprehensive benefits and maximizes social and economic benefits. Although the SEC's average is rising, by an average of 0.5%, this suggests an optimization of company size. However, the average value of PEC decreased by 0.7%, which indicates that the enterprises may have low management efficiency or lack of experience. So that the negative effect of a fall in PEC was greater than the positive effect of a rise in the SEC, resulting in an average decline in TEC of 0.2%, which suggests that under conditions of constant returns to scale and free allocation of factors, the effective frontier is less sustainable if it is backward in the direction of less positive output and more negative output. However, the average value of TC showed an increasing trend with an average increase of 4.2%, indicating that enterprises have made innovative progress in technology, keeping pace with the times. Therefore, the positive effect of rising TC is greater than the negative effect of falling TEC Index, which further promotes the rise of TFP.

Then from the specific years to analyze the interval, mainly including the following four cases:

(1) In 2011-2012 , 2016-2017and 2017-2018, TEC showed a decreasing trend, the decrease is 32.9% , 12.5% and 12.5% respectively, which shows that the effective frontier of enterprises is backward in the direction of less positive output and more negative output under the condition of constant returns to scale and free allocation of factors, less sustainable. However, due to the increasing trend of TC, which increased by 106.6%, 14.9% and 20.7% respectively, it shows that enterprises have made innovative progress in technology, keeping pace with the times. As a result, the positive effect of rising TC was greater than that of Falling Tec, which contributed to the increase of TFP by 38.7%, 0.5% and 5.6%, respectively.

(2) There was a decreasing trend in TC in 2013-2014, 2014-2015 and 2018-2019, they fell by 3.2 per cent, 1.6 per cent and 14.5 per cent respectively, suggesting that companies may be in a state of technological decline or stagnation, failing to keep pace with the times. However, TEC increased by 7.3%, 4.2% and 27.1%, respectively, which shows that under the

condition of constant returns to scale and free allocation of factors, the improvement of effective frontier is more positive output and less negative output, which is consistent with long-term sustainable development. As a result, the positive effect of TEC increase was greater than the negative effect of TC decrease, which contributed to the increase of TFP by 3.8%, 2.5% and 8.7%, respectively.

(3) TEC increased by 44.5% in 2012-2013and by 5.1% in 2015-2016 , this shows that under the condition of constant returns to scale and free allocation of factors, the improvement of effective frontier is more positive output and less negative output, which is consistent with long-term sustainable development. However, since TC declined by 36.9% and 9.5% respectively, this indicates that enterprises may be in a state of technological decline or stagnation, not keeping pace with the progress of the times. So that the negative effect of TC decrease was greater than the positive effect of TEC increase, which resulted in the decrease of TFP by 8.8% and 4.9%, respectively.

(4) In the year 2019-2020, TC showed an increasing trend, up 9.1%, which shows that enterprises have made innovative progress in technology, keeping up with the pace of the times. However, due to the decreasing trend of TEC, the value of TEC decreased by 11.7%, which shows that under the condition of constant returns to scale and free allocation of factors, the effective frontier is facing the direction of less positive output and more negative output, less sustainable. As a result, the negative effect of TEC decrease was greater than the positive effect of TC increase, resulting in a 3.6% decrease in TFP.

Table 1. Time series changes in the Total factor productivity of wholesale industry above quota in Anhui province (2011-2020)

Year Range	TEC	TC	PEC	SEC	TFP
2011-2012	0.671	2.066	0.888	0.755	1.387
2012-2013	1.445	0.631	1.020	1.418	0.912
2013-2014	1.073	0.968	1.029	1.043	1.038
2014-2015	1.042	0.984	1.005	1.036	1.025
2015-2016	1.051	0.905	1.125	0.934	0.951
2016-2017	0.875	1.149	0.929	0.942	1.005
2017-2018	0.875	1.207	0.951	0.919	1.056
2018-2019	1.271	0.855	1.104	1.152	1.087
2019-2020	0.883	1.091	0.910	0.970	0.964
Mean	0.998	1.042	0.993	1.005	1.040

(Source: calculated by DEAP Version 2.1 software)

4.2. Retail industry

As can be seen from table 2, the average TFP of the nine above-quota retail industries in Anhui province showed an increasing trend from 2011 to 2020, with an average increase of 4.6%. This shows that enterprises have appropriate decision-making and management capabilities, the industrial structure conforms to comprehensive benefits and maximizes social and economic benefits. Although the average value of PEC showed an increasing trend with an average increase of 2.2%, which indicated that there might be an improvement in management efficiency and accumulation of experience in enterprises, the average value of PEC decreased by 4.4% due to the decreasing trend of the average value of SEC, this shows that the size of the enterprise needs to be further optimized. So that the negative effect of the SEC's decline was greater than the positive effect of the PEC's rise, resulting in an average TEC decline of 2.3%, which suggests that under conditions of constant returns to scale and free allocation of factors, the effective frontier is less sustainable if it is backward in the direction of less positive output and more negative output. However, the average value of TC showed an increasing trend, with an average increase of 7.1%, indicating that enterprises have made innovative progress in technology, keeping pace with the times. Therefore, the positive effect of rising TC is greater than the negative effect of falling TEC, which further promotes the rise of TFP.

Then from the specific years to analyze the interval, mainly including the following four cases:

(1) TEC showed a decreasing trend in 2011-2012, 2015-2016 and 2018-2019, the decline was 18.8%, 14.1% and 17.1%, respectively. This shows that the effective frontier of enterprises is backward in the direction of less positive output and more negative output under the condition of constant returns to scale and free allocation of factors, less sustainable. However, the increase of TC was 42.3%, 27.1% and 21.4% respectively, which indicated that the enterprises had made innovative progress in technology and kept pace with the times. As a result, the positive effect of rising TC was greater than the negative effect of falling TEC, which pushed up TFP by 15.5%, 9.2% and 0.7%, respectively.

(2) There was a decreasing trend in TC in 2013-2014 , 2014-2015and 2016-2017, they fell by 7.4 per cent, 4.3 per cent and 6 per cent respectively, suggesting that companies may be in a state of technological decline or stagnation, failing to keep pace with the times. However, TEC increased by 17.7%, 11% and 17.4% respectively, which shows that under the condition of constant returns to scale and free allocation of factors, the improvement of effective frontier is more positive output and less negative output, which is consistent with long-term sustainable development. As a result, the positive effect of TEC increase was greater than the negative effect of TC decrease, which contributed to the increase of TFP by 9%, 6.2% and 13.2%, respectively.

(3) TC increased by 4.4% and 19.3% in 2012-2013 and 2019-2020, this shows that enterprises have made innovative progress in technology, keeping up with the pace of the times. However, TEC declined by 8.6% and 17.3%, respectively, which showed that the enterprises should keep the same returns to scale and allocate the factors freely, the effective frontier is less sustainable if it is backward in the direction of less positive output and more negative output. The negative effect of TEC decrease was larger than the positive effect of TC increase, which resulted in the decrease of TFP by 4.6% and 1.4%, respectively.

(4) In the year 2017-2018, TEC showed an increasing trend, up 17.4%, which shows that under the condition of constant returns to scale and free allocation of factors, the improvement of effective frontier is more positive output and

less negative output, which is consistent with long-term sustainable development. However, due to the declining trend of TC, the decline of 18.6%, which indicates that enterprises may be in a state of technological decline or stagnation, did not keep pace with the progress of the times. As a result, the negative effect of TC decrease was greater than the positive effect of TEC increase, resulting in a 4.4% decrease in TFP.

Table 2. Time series changes in the Total factor productivity of retail industry above quota in Anhui province (2011-2020)

Year Range	TEC	TC	PEC	SEC	TFP
2011-2012	0.812	1.423	0.942	0.862	1.155
2012-2013	0.914	1.044	0.945	0.967	0.954
2013-2014	1.177	0.926	1.015	1.160	1.090
2014-2015	1.110	0.957	0.997	1.113	1.062
2015-2016	0.859	1.271	0.979	0.877	1.092
2016-2017	1.205	0.940	1.257	0.958	1.132
2017-2018	1.174	0.814	1.080	1.087	0.956
2018-2019	0.829	1.214	1.023	0.811	1.007
2019-2020	0.827	1.193	0.989	0.836	0.986
Mean	0.977	1.071	1.022	0.956	1.046

(Source: calculated by DEAP Version 2.1 software)

5. Individual Differences Analysis of Total Factor Productivity

5.1. Wholesale industry

From Table 3, the average value of TFP in the nine sub-industries of wholesale above quota in Anhui showed an increasing trend from 2011 to 2020, with an average increase of 4%. This shows that enterprises have appropriate decision-making and management capabilities, the industrial structure conforms to comprehensive benefits and maximizes social and economic benefits. Although the SEC's average is rising, by an average of 0.5%, this suggests an optimization of company size. However, the average value of PEC decreased by 0.7%, which indicates that the enterprises may have low management efficiency or lack of experience. So that the negative effect of a fall in PEC was greater than the positive effect of a rise in the SEC, resulting in an average decline in TEC of 0.2%, which suggests that under conditions of constant returns to scale and free allocation of factors, the effective frontier is less sustainable if it is backward in the direction of less positive output and more negative output. However, the average value of TC showed an increasing trend with an average increase of 4.2%, indicating that enterprises have made innovative progress in technology, keeping pace with the times. Therefore, the positive effect of rising TC is greater than the negative effect of falling TEC, which further promotes the rise of TFP.

Then from the specific industry to analyze, mainly including the following four cases:

(1) Agriculture, forestry and animal husbandry wholesale, Culture, sports goods and equipment wholesale, TEC and TC increased by 8.1% and 4.1%, 7.2% and 1.7%, 2.7% and 5.5%, respectively, this shows that under the condition of constant returns to scale and free allocation of factors, the improvement of the effective frontier is in line with long-term sustainable development. At the same time, enterprises in technology has also made innovative progress, keeping pace with the times. So that the positive effect of TEC rise and the positive effect of TC rise together contributed to the increase of TFP by 12.5%, 9% and 8.4%, respectively.

(2) TEC in the minerals, building materials and chemicals wholesale sector remained unchanged (PEC and SEC were unchanged), indicating that the positive and negative output trends were flat. However, TC showed an increasing trend, up 9.3%, which shows that enterprises have made innovative progress in technology, keeping pace with the times. So that the rise of Tc became the main driving force for the rise of TFP, an increase of 9.3%.

(3) Textiles, clothing and household goods wholesale, TEC declined by 5.7% and 2.1% , respectively, in Machinery and equipment, electrical and electronic equipment and wholesale, this shows that under the condition of constant returns to scale and free allocation of factors, the effective frontier is backward in the direction of less positive output and more negative output, which means poor sustainability. However, TC showed an increasing trend, rising by 7.2% and 2.8% respectively, which shows that enterprises have made innovative progress in technology, keeping pace with the times. Thus, the positive effect of rising TC was greater than the negative effect of falling TEC, which further pushed up TFP by 1.1% and 0.7%, respectively.

(4) Food, beverage and tobacco wholesale, Medicine and medical equipment wholesale, Trade brokerage and agency, the three industries showed a declining TFP trend, respectively, down 1.6%, 2.2% and 0.1%. This is due to the fact that TC in all three industries is on an upward trend, rising by 2.5%, 4% and 1.3% respectively, indicating that enterprises have made innovative technological progress and kept pace with the times. However, TEC declined by 3.9%, 5.9% and 1.4% respectively, which shows that under the condition of constant returns to scale and free allocation of factors, the effective frontier is less sustainable if it is backward in the direction of less positive output and more negative output. So that the negative effect of TEC decline is greater than the positive effect of TC Rise, which leads to the decline of TFP.

Table 3. Individual differences of the Total factor productivity of wholesale industry above quota in Anhui province (2011-2020)

Industry	TEC	TC	PEC	SEC	TFP
Wholesale of agriculture, forestry and animal husbandry	1.081	1.041	1.086	0.996	1.125
Wholesale of food, beverage and tobacco products	0.961	1.025	0.975	0.985	0.984
Wholesale of textiles, clothing and household goods	0.943	1.072	0.947	0.996	1.011
Cultural, sporting goods and equipment wholesale	1.072	1.017	1.008	1.064	1.090
Wholesale of medicine and medical equipment	0.941	1.040	0.941	1.000	0.978
Wholesale of mineral products, building materials and chemical products	1.000	1.093	1.000	1.000	1.093
Machinery and equipment, hardware, electrical and electronic supplies wholesale	0.979	1.028	0.985	0.994	1.007
Trade brokers and agents	0.986	1.013	1.000	0.986	0.999
Other wholesale	1.027	1.055	1.000	1.027	1.084
Mean	0.998	1.042	0.993	1.005	1.040

(Source: calculated by DEAP Version 2.1 software)

5.2. Retail industry

From table 4, the average value of TFP in the nine above-quota retail industries in Anhui province showed an increasing trend from 2011 to 2020, with an average increase of 4.6%. This shows that enterprises have appropriate decision-making and management capabilities, the industrial structure conforms to comprehensive benefits and maximizes social and economic benefits. Although the average value of PEC showed an increasing trend with an average increase of 2.2%, which indicated that there might be an improvement in management efficiency and accumulation of experience in enterprises, the average value of PEC decreased by 4.4% due to the decreasing trend of the average value of SEC, this shows that the size of the enterprise needs to be further optimized. So that the negative effect of the SEC's decline was greater than the positive effect of the PEC's rise, resulting in an average TEC decline of 2.3%, which suggests that under conditions of constant returns to scale and free allocation of factors, the effective frontier is less sustainable if it is backward in the direction of less positive output and more negative output. However, the average value of TC showed an increasing trend, with an average increase of 7.1%, indicating that enterprises have made innovative progress in technology, keeping pace with the times. Therefore, the positive effect of rising TC is greater than the negative effect of falling TEC, which further promotes the rise of TFP.

Then from the specific industry to analyze, mainly including the following three cases:

(1) Retail sales of food, beverage and tobacco products, the TEC and TC in the stall, No-shop and other retail sector showed an upward trend, rising 3.3% and 6.3%, 7.9% and 6.1% respectively, this shows that under the condition of constant returns to scale and free allocation of factors, the improvement of the effective frontier is in line with long-term sustainable development. At the same time, enterprises in technology has also made innovative progress, keeping pace with the times. So that the positive effect of TEC rise and the positive effect of TC rise together contributed to the increase of TFP by 9.8% and 14.5%, respectively.

(2) General retail, Textile, clothing and commodity retail, Retail sales of culture, sporting goods and equipment, Pharmaceuticals and medical devices, TEC declined by 2.4% , 3% , 5.1% , 2.6% and 3.3% in the auto, motorcycle, fuel and parts retail (PEC unchanged and SEC down 3.3%) , this shows that under the condition of constant returns to scale and free allocation of factors, the effective frontier is backward in the direction of less positive output and more negative output, which means poor sustainability. However, TC increased by 11.5%, 8.2%, 7%, 4.8% and 10.2% respectively, which shows that enterprises have made innovative progress in technology and keep pace with the times. As a result, the positive effect of rising TC was greater than the negative effect of falling TEC, which further increased TFP by 8.9%, 4.9%, 1.5%, 2.1% and 6.5%, respectively.

(3) Home appliances and electronics retail, Hardware, furniture and interior decoration materials retail, these two industries TFP showed a decreasing trend, they fell by 1.2% and 4.3%, respectively. This is due to the fact that although the TC in all three industries is on an increasing trend, rising by 4.2% and 5.8% respectively, it shows that enterprises have made innovative progress in technology, keeping pace with the times. However, the TEC declined by 5.2% and 9.6% respectively, which showed that the effective frontier was backward in the direction of less positive output and more negative output under the condition of constant returns to scale and free allocation of factors, less sustainable. So that the negative effect of TEC decline is greater than the positive effect of TC Rise, which leads to the decline of TFP.

Table 4. Individual differences of the Total factor productivity of retail industry above quota in Anhui province (2011-2020)

Industry	TEC	TC	PEC	SEC	TFP
Integrated Retail	0.976	1.115	0.994	0.982	1.089
Retail of food, beverage and tobacco products	1.033	1.063	1.071	0.964	1.098
Retail of textiles, clothing and daily necessities	0.970	1.082	1.000	0.970	1.049
Cultural, sporting goods and equipment retail	0.949	1.070	1.088	0.872	1.015
Retail of medicine and medical equipment	0.974	1.048	1.047	0.931	1.021
Auto, motorcycle, fuel and spare parts retail	0.967	1.102	1.000	0.967	1.065
Retail of household electrical and electronic products	0.948	1.042	1.001	0.948	0.988
Hardware, furniture and interior decoration materials retail	0.904	1.058	1.000	0.904	0.957
Stalls, no shops and other retail outlets	1.079	1.061	1.000	1.079	1.145
Mean	0.977	1.071	1.022	0.956	1.046

6. Conclusions and Recommendations

This article applies the DEAP Version 2.1 software developed by Tim Coelli, based on the DEA-Malmquist Index model, this paper analyzes the time series and individual differences of the above-quota wholesale and retail Total factor productivity in Anhui province from 2011 to 2020, and draws the following conclusions:

(1) The reasons for the increase in Total factor productivity in the nine sub-sectors of the wholesale and retail industries above designated size in Anhui province during the period 2011-2020 include the following:

a. The positive effect of TEC rise and the positive effect of TC rise promote the rise of TFP

b. TEC remained unchanged, and the rise of Tc became the main driving force for the rise of TFP

c. The positive effect of TEC rise was greater than the negative effect of TC decline, which promoted the rise of TFP

d. The positive effect of TC Rise is greater than the negative effect of TEC decline, which further promotes the rise of TFP.

(2) The main reasons for the decline in the Total factor productivity of the nine sub-sectors of the wholesale and retail industries above quota in Anhui province between 2011 and 2020 include the following:

The negative effect of 1TEC decrease is greater than the positive effect of TC increase, which leads to the decrease of TFP

The negative effect of 2TC decrease is greater than the positive effect of TEC increase, which leads to the decrease of TFP.

In the light of the above findings, this paper puts forward the following four suggestions for improving the Total factor productivity of enterprises in various sub-sectors of the wholesale and retail industries in Anhui province:

(1) To improve the market development mechanism of the wholesale and retail trade the internal trend of consumption in our country is accelerating its expansion, which is contained in the huge potential of private consumption, and accelerating the process of urbanization will create new investment and consumption needs; These will be turned into powerful engines of economic growth. In addition, increased capacity for scientific and technological innovation and investment in human capital will also provide new drivers for economic growth. Given the enormous challenges of enterprise transformation and upgrading, this is the time to promote technological transformation and the modernization of Enterprise Management. At present, every province and city is developing transformation and modernization strategies, and the wholesale and retail industries in Anhui province should also seize the opportunities behind the challenges and foster and improve the innovation mechanism of enterprises.

(2) Pay attention to the brand construction of wholesale and retail enterprises. To a large extent, the problem of unsalable products of small and medium-sized enterprises, individual businesses and so on has been solved by stars carrying goods and cadres' live broadcasts. Enterprises or farmers in Anhui province should consciously establish brand image, provide high-quality products to consumers, constantly improve the level of organization, and pay attention to the brand construction of products and services, create a global brand. We should encourage some large wholesale and retail enterprises, especially state-owned enterprises, to ensure the

(Source: calculated by DEAP Version 2.1 software)

supply of strategic materials and the daily demand for household goods and price stability. And, strengthen the scientific guidance of overcapacity industry, and play a leading role in circulation.

(3) Promoting the common development of e-retail and physical retail. The covid-19 pandemic has been a test for domestic retailers, few of which have been able to get out of the covid-19 business trap, but some are accelerating. Among them, supermarket chain, fresh e-commerce as the main representative of large-scale retail enterprises, whether to the store pick-up business or home delivery business has achieved explosive growth. Therefore, the retail enterprises in Anhui province should not only develop physical comprehensive retail focusing on personal experience and comprehensive service, but also develop new online retail to meet the demand. Taking new technology, new logistics and new finance as the core, forming automatic management based on big data, and strengthening technological innovation of circulation enterprises by means of artificial intelligence, cloud computing, Internet of things, etc. , the consumer market to adopt a two-pronged strategy to jointly promote online retail and physical retail.

(4) To improve the quality of the wholesale and retail trade employees the service attitude of the domestic wholesale and retail trade employees in our country is mostly on the low side, and is far from that of the developed countries such as Europe, , Japan and South Korea, there are even regional differences, as if the service attitude of Southern cities is much better than that of northern cities, second-and third-tier cities are less enthusiastic, service attitude is generally not high. For circulation service enterprises such as wholesale retailers, the personnel of circulation industry in Anhui province should develop in an all-round way at a high level to further improve the overall quality of the personnel of circulation industry, we should increase the knowledge reserve of the existing employees, cultivate the advantages of talent accumulation, and give full play to the role of human capital in enterprise value-added.

7. Conclusion

From the perspective of time series and individual differences, the Total factor productivity of wholesale and retail industries in Anhui province showed an increasing trend from 2011 to 2020, rising by 4% and 4.6% respectively, this reflects the general trend of industrial reform and market consumption upgrading in Anhui province. Clearly, retail Total factor productivity more than wholesale Total factor productivity. On the one hand, this is due to the continuous rise in the level of household consumption, such as the wholesale and retail trade in the circulation of goods and services links, the traditional wholesale industry, which is represented by large-batch, few-batch and standardization, has been in trouble. It is facing the fierce challenge of retail industry, which is represented by small-batch, multi-batch and individuation. Apart from force majeure factors such as the covid-19 pandemic, the protection of consumer daily necessities is not affected in any way, so there is no need to make centralized purchases on specific holidays, but according to one's own needs, the convenience and randomness of buying at any time and place makes retail more accessible to the market than wholesale and more responsive to customer needs. On the other hand, the production sector has also encountered new changes, only fine, specialized

process produced under the product can win the favor of consumers. In the whole supply chain, the main body of production and manufacturing in the upper reaches of the chain is more inclined to directly connect with the retail enterprises in the lower reaches or even to provide services directly to the consumers, which can reduce the bullwhip effect, ease the Information asymmetry, but also improve the efficiency of the circulation of goods, rapid and agile response to meet the needs of consumers with a variety of personality.

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