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Study on the Service Trade International Competitiveness and Efficiency of Foreign Trade in 31 Provinces and Cities in China

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Abstract

Based on global value chain reconstruction under the new development pattern and the DEA-Malmquist model, this paper studied the foreign trade efficiency of 31 provinces and theservice trade international competitiveness in China from 2013-2019, and the results found that: there are large differences in the foreign trade efficiency of different provinces, in general, the foreign trade efficiency of the eastern and western provinces is higher, and the foreign trade efficiency of the central region is lower, and most provinces have pure technical efficiency and scale efficiency to improve The results of the dynamic analysis of the Malmquist Index show that the total factor productivity of foreign trade in all regions of China is generally on the rise, and the spatial distribution shows that the changes in foreign trade efficiency of different provinces vary greatly.

Keywords

Global Value Chain; Service Trade International Competitiveness; Malmquist Index; Trade Efficiency.

1. Introduction

In September and October 2013, during his visits to Central Asia and Southeast Asia, General Secretary Xi Jinping proposed the idea of building a "New Silk Road Economic Belt" and a "21st Century Maritime Silk Road", or "One Belt, One Road" for short. One Belt, One Road". The "Belt and Road" initiative will not only promote the economic development of countries along the route, enhance understanding and trust between countries and economic cooperation, but will also be of strategic importance for China in the "new normal" economic situation to broaden its international market, help small and medium-sized enterprises to go abroad and promote industrial structure It is also strategically important for China to broaden its international market, help SMEs to go abroad and promote the optimisation and upgrading of its industrial structure. Since the introduction of the "Belt and Road" initiative, China's foreign trade has made a historic leap forward, with total imports and exports of goods amounting to RMB 321.55 billion in 2020, an increase of 1.9% over the previous year. Among them, exports were RMB 179.326 billion, up 4.0%; imports were RMB 142.231 billion, down 0.7%. It can be seen that foreign trade is an important force in promoting the development of the national economy, and the rapid development of foreign trade has created conditions for China's provinces and cities to make better use of foreign markets, resources, capital, technology and talents, playing an increasingly important role in promoting economic growth, expanding employment, adjusting industrial structure and optimizing industrial layout, cultivating new competitive advantages in foreign trade, and building a new pattern of all-round open economy. However, at the present stage, the regional development of China's foreign trade is seriously unbalanced, and there are large differences in the scale and efficiency of foreign trade among provinces. Domestic scholars have mainly conducted two types of studies on the efficiency of China's foreign trade: one is to adopt the stochastic frontier analysis method and study the influencing factors affecting the efficiency of China's foreign trade based on the trade inefficiency model; the other is to adopt the DEA efficiency evaluation method to evaluate the efficiency of foreign trade of different provinces and cities in China as a whole. Wang Lili (2017) studied China's export potential to countries along the "Belt and Road" and the factors affecting it, and found that infrastructure conditions in export markets, complexity of customs clearance procedures, import tariff levels, financial development levels and government efficiency are all important factors affecting trade efficiency. Through an empirical study, Ye Xiangsong and Li Susu (2018) found that the factors affecting China's foreign trade efficiency mainly include the level of tariffs, FTA, the burden of customs clearance procedures, the level of financial development, government effectiveness and the quality of infrastructure. Xia Yun and Yu Qitong (2019) found that the average international trade efficiency and total factor productivity of the provinces along the Belt and Road have a fluctuating upward trend, and the overall efficiency and scale efficiency show a "high on both sides and low in the middle" distribution in the regional distribution. The distribution characteristics are "high on both sides and low in the middle". Li Dan (2017) points out that the overall level of China's foreign trade performance is not high and there is much room for improvement, with the performance level in the eastern region being significantly higher than that in the central and western regions. By collating the relevant literature, it is found that scholars' research on China's trade efficiency mainly focuses on the influencing factors of trade efficiency and the evaluation of trade efficiency in regional provinces, while the evaluation of trade efficiency with the 31 provinces of China as the research object is less. Therefore, this paper adopts the data envelopment analysis (DEA) method to evaluate the trade efficiency of China's 31 provinces and cities from 2013-2019 from both static and dynamic perspectives. Evaluation.

2. Construction of the DEA-Malmquist Model

2.1. DEA Model Construction

DEA (Data Envelopment Analysis) is a non-parametric envelope method that uses linear programming to measure the relative efficiency of decision making units. It is used as a 'data-oriented' measurement method to evaluate the relative efficiency and performance of Decision Making Units (DMUs) with multiple inputs and outputs.[6] It has been used to evaluate the relative efficiency and performance of DMUs with multiple inputs and outputs.

The DEA model is mainly divided into two models, CCR and BCC, both of which are mainly based on whether the scale reward is variable. CCR is established on the premise that the scale reward is constant and is often used to measure the comprehensive efficiency; BCC model is established on the premise that the scale reward is variable, and the comprehensive efficiency in the CCR model is decomposed into two parts, part is pure technical efficiency and part is scale efficiency, and the achievement of both is integrated efficiency. Because of the diversity of indicators used to evaluate trade efficiency, the BCC input-oriented model with variable returns to scale is selected as follows.

$$\text{Min } \theta\text{-}\varepsilon\left(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+\right)$$

$$\text{s.t.}\begin{cases} \sum_{j=1}^{n} \lambda_j * x_{ij} + s_i^- = \theta * x_{i0}, \quad i = 1,2,3,\dots,m \\ \sum_{j=1}^{n} \lambda_j * y_{ij} + s_r^- = y_{r0}, \quad r = 1,2,3,\dots,s \\ \sum_{j=1}^{n} \lambda_j = 1 \\ \lambda_j, s_i^-, s_r^+ \geq 0;\ j = 1,2,3,\dots,n;\ i = 1,2,3,\dots,m;\ r = 1,2,3,\dots s \end{cases}$$

where the decision unit is denoted by j=1,2,3,...,n, the input quantity is denoted by x and the output quantity is denoted by y, for a total of m inputs and s outputs, the technical efficiency value of the decision unit is denoted by θ and the slack variable is expressed by s. If θ is equal to 1, thes^+ , ands^- are equal to 1, then the decision cell DEA is valid; if θ is equal to 1, buts^+ , ands^- If θ is equal to 1 and , is equal to 1, the decision unit is DEA-valid; if θ is equal to 1 but , is

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not zero, the decision unit is considered weakly DEA-valid; if θ is less than 1, the decision unit is non-DEA-valid. Based on the initial input and initial output of each decision unit, each efficiency value is measured.

2.2. Malmquist Index Model Construction

In order to study the dynamic production efficiency in different periods, in 1953 the famous economist Malmquist S put forward the Malmquist production index, which is also known as total factor productivity (TFP), mainly to study the dynamic changes in efficiency from period t to t+1. The index consists of two parts, the integrated efficiency change index (EC) and the technical progress change index (TC), so there is M =TFP=EC*TC,the specific formula is as follows.

$$M_0\ (x_{t+1}, y_{t+1}, x_t, y_t) = \left[\frac{d_0^t(x_{t+1}, y_{t+1})}{d_0^t(x_t, y_t)} * \frac{d_0^{t+1}(x_{t+1}, y_{t+1})}{d_0^{t+1}(x_t, y_t)}\right]^{\frac{1}{2}}$$

Where the combined efficiency can be further refined into pure technical efficiency (PCE), scale efficiency (SE), so M=TFP=EC*TC=PCE*SE*TC, so the above equation is further rewritten as

$$M_0(x_{t+1}, y_{t+1}, x_t, y_t) = \frac{d_0^{t+1}(x_{t+1}, y_{t+1}|VRS)}{d_0^t(x_t, y_t|VRS)} * \left(\frac{d_0^{t+1}(x_{t+1}, y_{t+1}|CRS)}{d_0^{t+1}(x_{t+1}, y_{t+1}|VRS)} * \frac{d_0^t(x_t, y_t|VRS)}{d_0^t(x_t, y_t|CRS)}\right) * \left(\frac{d_0^t(x_{t+1}, y_{t+1})}{d_0^{t+1}(x_{t+1}, y_{t+1})} * \frac{d_0^t(x_t, y_t)}{d_0^{t+1}(x_t, y_t)}\right)$$

M measures the total factor productivity (TFP) from period t to t+1, if M>1, it indicates an upward trend in TFP, if M=1, it indicates no change in TFP, if M< 1, it indicates a downward trend in TFP. TC measures the change in production technology from period t to t+1, if TC>1, it indicates technological progress, and vice versa, regression; EC measures the change in management level from period t to t+1, if EC> 1, it indicates an increase in management level, and vice versa, where PCE indicates the influence of management level on the overall efficiency, if PCE> 1, it indicates an increase in the overall efficiency, and vice versa, it indicates its decrease; SE indicates the influence of production scale on the efficiency value, if SE> 1, it indicates an increase in the overall efficiency, and Conversely, it is not conducive to the increase of overall efficiency[7] SE indicates the influence of production scale on efficiency values.

(a) Advantages of the DEA model.

One is that the variables of the DEA are the weights of the inputs and outputs of the decision unit, such that the variables are selected so that the analytical model will be evaluated in the light most favourable to the decision unit and avoid the need to determine the weights of the indicators in a preferred sense.

(b) Secondly, if each input is associated with one or more outputs during the model analysis and there is some definite relationship between each input and output, then the expression for this relationship does not need to be shown definitively using DEA analysis.

Thirdly, one of the most significant advantages of the DEA model is that it does not require any assumptions about the weights. The weights of all inputs and outputs do not depend on the assumptions and determinations of the evaluator, but on the optimal weights derived from the actual data of the decision unit. As a result, the DEA model is highly scientific and objective, as it eliminates many subjective factors from the analysis process.[8] The DEA model is highly scientific and objective as it excludes many subjective factors from the analysis process.

3. Empirical Study and Analysis of Results

3.1. Data Sources

The research object of this paper is the 31 provinces, cities and autonomous regions of China, and the DEA-Malmquist method is used to evaluate the international trade efficiency of the above-mentioned provinces. Data are obtained from the China Statistical Yearbook, the National Bureau of Statistics, and the statistical yearbooks of provinces and municipalities.

3.2. Selection of Variables

For the measurement of trade efficiency, the first step is to determine the output variables of the input variables of the measurement model. Combining the research results of previous scholars, in terms of output indicators, this paper selects two indicators of trade openness and trade competitive advantage as the output variables of trade efficiency. (1) Degree of trade openness. The degree of international trade openness is to reflect the degree of openness to the outside world in terms of stable commodity imports and exports, and refers to the proportion of total regional foreign trade imports and exports to the local gross national product, reflecting the extent to which total local international trade promotes local economic development. (2) Trade Competitive Advantage, or TC Index. This index is a common indicator used to measure the competitiveness of international trade, the index excludes the influence of macroeconomic factors such as inflation, refers to the ratio between the difference between import and export trade and the total import and export trade, the specific formula expressed as trade competitive advantage = (total exports - total imports) / (total exports + total imports)[4] . Many domestic scholars have used the trade inefficiency model to conduct an in-depth analysis of the factors affecting China's international trade efficiency, and have generally reached relatively similar conclusions. Wang Lili studied China's export potential to countries along the Belt and Road and the factors affecting it, and found that infrastructure conditions in export markets, complexity of customs clearance procedures, import tariff levels, financial development levels and government efficiency are all important factors affecting trade efficiency. Ye Xiangsong and Li Susu found that the factors affecting China's foreign trade efficiency mainly include tariff level, FTA, the burden of customs clearance procedures, the level of financial development, government effectiveness and the quality of infrastructure through an empirical study. Xia Yun and Yu Qitong construct efficiency evaluation models in terms of regional economic development level, human capital and infrastructure level. Integrating the research results of relevant scholars, this paper takes the level of economic development, fixed asset investment, foreign direct investment, human capital and infrastructure level as input indicators of international trade efficiency. The paper uses regional gross domestic product per capita to measure the level of local economic development; the proportion of the total population with high school and above education to the total population to reflect the level of local human capital; and the turnover of goods as a measure of the level of regional infrastructure.

3.3. Data Pre-processing

DEA model requires that input and output variables cannot have negative values, so when inputting input and output indicators data to the model, it is necessary to carry out non-negative processing of the data in advance, so that the variable values are in the positive interval of [0.1,1], which is in line with the requirements of DEA model, and the converted values do not change the meaning of the original data and have no substantial impact on the analysis and research of the later calculation results[9] , the specific treatment is as follows.

$$x_{ij}=0.1+\frac{x_{ij}-\min(x_j)}{\max(x_j)-\min(x_j)}*0.9$$

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4. Analysis of the Empirical Results

4.1. Static Analysis of the DEA Model

Table 1. Average annual international trade efficiency values for the 31 provinces, 2013-2019

Province	Integrated efficiency	Pure technical efficiency	Scale efficiency
Beijing	1	1	1
Tianjin	1	1	1
Hebei	0.608	0.999	0.608
Shanxi	0.343	0.692	0.495
Inner Mongolia	0.368	1	0.368
Liaoning	0.705	0.999	0.706
Jilin	0.583	0.987	0.591
Heilongjiang	0.739	1	0.739
Shanghai	1	1	1
Jiangsu	0.813	0.999	0.814
Zhejiang	0.953	1	0.953
Anhui	0.427	0.647	0.66
Fujian	0.84	1	0.84
Jiangxi	0.54	0.602	0.897
Shandong	0.618	0.93	0.664
Henan	0.604	0.95	0.636
Hubei	0.666	1	0.666
Hunan	0.62	1	0.62
Guangdong	1	1	1
Guangxi	0.759	1	0.759
Hainan	0.818	0.829	0.987
Chongqing	0.849	1	0.849
Sichuan	0.7	1	0.7
Guizhou	1	1	1
Yunnan	0.658	1	0.658
Tibet	1	1	1
Shaanxi	0.514	0.976	0.527
Gansu	0.781	1	0.781
Qinghai	0.578	0.978	0.591
Ningxia	0.771	0.971	0.794
Xinjiang	0.882	1	0.882
Average value	0.733	0.953	0.767

The following results are obtained based on the DEA-BCC model measurement, as can be seen from Table 1, there are six of the 31 provinces in China with comprehensive efficiency from 2013-2019, namely Beijing, Tianjin, Shanghai, Guangdong, Guizhou and Tibet, and the pure technical efficiency and scale efficiency of the above provinces are also effective, and the provinces with lower comprehensive efficiency values are the central and western provinces such as Shanxi and Inner Mongolia, whose comprehensive efficiency The provinces with lower overall efficiency values are the central and western provinces such as Shanxi and Inner Mongolia, whose overall efficiency values are all below 0.4. From the perspective of pure technical efficiency, all provinces except Shanxi, Anhui and the three central provinces of Jiangxi have pure technical efficiency values above 0.8, with an overall high level of technical efficiency. Overall, scale efficiency varies widely between regions, with provinces with high scale efficiency mainly being developed eastern provinces such as Beijing, Shanghai, Guangdong and Tibet or western coastal provinces, while inland provinces such as Shanxi and Inner Mongolia have lower scale efficiency. By region, among the 11 provinces and cities in the eastern region, except for Hebei and Shandong, all the other provinces and cities maintained their comprehensive efficiency above 0.8, and their pure technical efficiency and scale efficiency also remained at a very high level; the comprehensive efficiency values of the six central provinces were all below 0.7, and the overall level was not high, among which Anhui and Shanxi were the lowest; the comprehensive efficiency among the 12 western provinces and cities showed a large difference, among which, Inner Mongolia, Shaanxi and Qinghai are lower, while the rest of the provinces have higher levels of comprehensive efficiency. It is worth noting that the two border provinces of Xinjiang and Tibet have higher levels of comprehensive efficiency, pure technical efficiency and scale efficiency; among the three provinces in the northeast, the two provinces with higher comprehensive efficiency and scale efficiency are Heilongjiang and Liaoning, while Jilin, which is in the middle, has a lower level of efficiency. Overall, the distribution of overall and scale efficiency is characterised by "high on both sides and low in the middle", probably because Guangdong, Fujian, Zhejiang, Jiangsu, Shanghai and other eastern coastal provinces and cities have excellent geographical location advantages and good transportation conditions such as marine vessels, while enterprises located in coastal areas can easily introduce advanced western industrial technology and production models and take over industrial transfer. Although the western region has a weak economic base, imperfect infrastructure, lack of capital and technology and other shortcomings in the development of foreign trade, the western border areas have many advantages such as location conditions, natural resources, ethnic culture, factor costs and historical opportunities, and with the implementation of regional strategies such as the National Western Development, the advantages of the western provinces will gradually emerge.

4.2. Dynamic Analysis of the Malmquist Index

4.2.1. Analysis of Overall Efficiency Changes

The average value of China's total factor productivity index for foreign trade by region from 2013-2019 was 1.028, with a general upward trend. During the study period, the total factor productivity index was greater than 1 for all years except 2014-2015, with little overall change. From the decomposition results of the Total Factor Productivity Malmquist Index, technical efficiency increased by 3.5 percentage points and technological progress decreased by 0.6 percentage points, indicating that the increase in total factor productivity mainly came from the improvement in the efficiency of the allocation of various input resources and management level. By year, in the 2013-2016 time period, the technical efficiency index is greater than 1 and the technical progress index is less than 1. The increase in total factor productivity of foreign trade in this period mainly comes from technical efficiency; in the 2016-2018 time period, the technical efficiency index and the technical progress index are both greater than 1, but the impact of technical efficiency on total factor productivity is greater; in the 2018-2019 period the technical The technical efficiency index was 0.982 and the technical progress index was 1.054, reflecting that the technical progress index made the main contribution to the increase in total factor productivity of China's foreign trade by region. between 2013-2019, the pure technical efficiency index of China's foreign trade by province was 1.006 and the scale efficiency index was 1.029, both of which were greater than 1, showing an upward trend, and among the years, only the scale efficiency index in 2018-2019 was smaller than 1. The scale efficiency index was less than 1 during 2019, and the decline in scale efficiency in that year led to a downward trend in technical efficiency as well.

From Figure 1 below, it can be seen that the changes in the efficiency of foreign trade in the 31 provinces from 2013 to 2019 show the following characteristics: in 2014 and before, technical efficiency and total factor productivity maintain the same downward trend, while the index of technical progress in this period shows an upward trend, which indicates that the decline in total factor productivity in this period is mainly caused by the decline in technical efficiency; in 2015 and after, total factor productivity maintained the same slow upward trend as technical progress, while the technical efficiency index showed a downward trend during this period, indicating that the rise in total factor productivity during this period was mainly caused by the rise in technical progress.

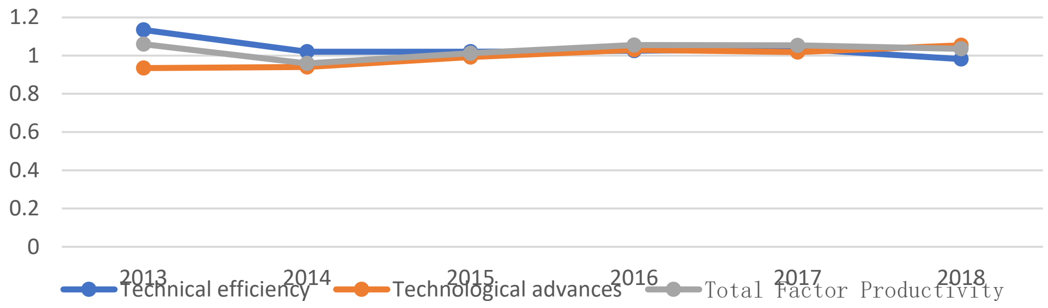

Figure 1. Trends in total factor external trade efficiency in 31 provinces, 2013-2019

4.2.2. Comparison of Efficiency Changes by Province

From Tables 2 and 3, it can be seen that: except for six provinces, namely Guangdong, Hainan, Guizhou, Yunnan, Tibet and Gansu, whose total factor productivity index for foreign trade was less than one in 2013-2019, the total factor productivity index for the other 25 provinces was greater than one, reflecting the increasing efficiency of foreign trade in the majority of provinces in China. The decomposition of the total factor productivity index shows that the technical efficiency index and the technological progress index of Beijing, Tianjin, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Hubei, Hunan, Guangxi, Chongqing, Sichuan and Shaanxi are all greater than one, and the improvement of technical efficiency and technological progress have contributed to the improvement of overall efficiency, but the extent of their respective contributions differs . Among them, the technical progress index is greater than the technical efficiency index in Tianjin, Shanghai, Jiangsu, Zhejiang and Fujian, indicating that the improvement of regional foreign trade efficiency mainly comes from technical progress; the technical efficiency index is greater than the technical progress index in Beijing, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shandong, Hubei, Hunan, Guangxi, Chongqing, Sichuan and Shaanxi, indicating that technical efficiency contributes mainly to the improvement of overall foreign trade efficiency. This indicates that technical efficiency is a major contributor to the improvement of the overall efficiency of foreign trade. The scale efficiency index is greater than the pure technical efficiency index in most of China's provinces, indicating that the improvement in technical efficiency of foreign trade mainly comes from the increase in scale efficiency.

4.2.3. Comparison of Regional Efficiency Differences

Table 2. Results of total factor productivity Malmquist index decomposition for 31 provinces, 2013-2019

Year	Technical efficiency	Technological advances	Pure technical efficiency	Scale efficiency	Total Factor Productivity
2013-2014	1.134	0.935	1.011	1.121	1.06
2014-2015	1.02	0.94	1.005	1.016	0.959
2015-2016	1.02	0.992	1.011	1.009	1.012
2016-2017	1.025	1.03	1.012	1.013	1.055
2017-2018	1.035	1.018	1	1.035	1.053

2018-2019	0.982	1.054	0.994	0.988	1.035
Average value	1.035	0.994	1.006	1.029	1.028

Table 3. Results of Malmquist Index decomposition for 31 provinces

Province	Technical efficiency	Technological advances	Pure technical efficiency	Scale efficiency	Total Factor Productivity
Beijing	1	1	1	1	1
Tianjin	1	1.02	1	1	1.02
Hebei	1.067	0.99	1	1.067	1.056
Shanxi	1.179	0.934	1.055	1.117	1.101
Inner Mongolia	1.064	1.02	1	1.064	1.086
Liaoning	1.06	1.001	1	1.06	1.061
Jilin	1.042	1.015	1.002	1.039	1.057
Heilongjiang	1.052	1.003	1	1.052	1.054
Shanghai	1	1.034	1	1	1.034
Jiangsu	1.008	1.029	1	1.008	1.037
Zhejiang	1.008	1.04	1	1.008	1.049
Anhui	1.068	0.949	1.008	1.06	1.014
Fujian	1.008	1.019	1	1.008	1.027
Jiangxi	1.086	0.95	1.08	1.005	1.032
Shandong	1.042	1.008	0.998	1.044	1.05
Henan	1.05	0.998	0.996	1.054	1.048
Hubei	1.031	1.011	1	1.031	1.042
Hunan	1.068	1.012	1	1.068	1.08
Guangdong	1	0.992	1	1	0.992
Guangxi	1.047	1.014	1	1.047	1.062
Hainan	1.01	0.978	1.032	0.979	0.988
Chongqing	1.028	1.009	1	1.028	1.037
Sichuan	1.023	1.003	1	1.023	1.026
Guizhou	1	0.953	1	1	0.953
Yunnan	1.005	0.96	1	1.005	0.965
Tibet	1	0.963	1	1	0.963
Shaanxi	1.053	1.018	0.999	1.054	1.071
Gansu	1.026	0.947	1	1.026	0.971
Qinghai	1.038	0.973	1.002	1.036	1.01
Ningxia	1.022	0.981	1.002	1.019	1.002
Xinjiang	1.021	0.991	1	1.021	1.012
East	1.014	1.011	1.003	1.011	1.025
Central	1.079	0.975	1.023	1.055	1.052
Western	1.027	0.986	1	1.027	1.012
North East	1.051	1.006	1.001	1.05	1.057
National average	1.035	0.994	1.006	1.029	1.028

As can be seen from Table 3: During the period 2013-2019, the average values of the foreign trade efficiency indices of the eastern, central, western and northeastern regions of China were 1.025, 1.052, 1.012 and 1.057 respectively, with an overall ranking of: northeastern region >

central region > eastern region > western region. In terms of the technological progress index, the eastern region has the highest technological progress index at 1.011, indicating that the technological level in the eastern region has improved faster in recent years, contributing greatly to the improvement of the region's foreign trade efficiency; the central and western regions have a lower technological progress index at 0.975 and 0.986 respectively, indicating that the technological development in the central and western regions has lagged behind in recent years, which has played a role in the improvement of the region's foreign trade efficiency. The reason for this may be that there are gaps between the central and western regions and the eastern region in terms of industrial agglomeration level, construction of infrastructure facilities and government policy support, and the technological level should be improved faster. In terms of the technical efficiency index, the pure technical efficiency index of the eastern and northeastern regions is lower but on an upward trend, which indicates that while giving full play to their technological advantages, the eastern and northeastern regions should improve the management level and allocation efficiency of various input resources and accelerate the growth of pure technical efficiency, so as to better play the leading role of the eastern region in promoting the development of foreign trade.

5. Conclusion

This paper draws the following conclusions from an empirical study of the foreign trade efficiency of 31 provinces in China from 2013-2019: Based on the DEA-BCC model measurement it can be seen that there are large differences in the foreign trade efficiency of different provinces, in general, the foreign trade efficiency of the eastern and western provinces is higher, and the foreign trade efficiency of the central region is lower, most provinces have pure technical efficiency and scale efficiency There is room for improvement of pure technical efficiency and scale efficiency in most provinces. . A dynamic analysis based on the Malmquist Index shows that the average value of China's total factor productivity index for foreign trade in each region from 2013 to 2019 is 1.028, with an overall upward trend, and the improvement of technical efficiency plays a major role in the overall efficiency. The efficiency of foreign trade in the vast majority of China's provinces is increasing, but the driving factors differ across regions, with the increase in total factor productivity of foreign trade in the eastern provinces mainly stemming from technological progress, while the increase in efficiency of foreign trade in the central and western provinces mainly stems from the increase in technical efficiency. In terms of spatial distribution, the changes in the efficiency of foreign trade in different provinces vary considerably, in terms of efficiency growth: northeast > central > east > west. Each region should take targeted measures according to the constraints to effectively improve the efficiency of foreign trade in each region.

The eastern coastal provinces and cities have excellent geographical location advantages, good transportation conditions such as marine vessels, and at the same time, enterprises located in coastal areas are also convenient for introducing advanced western industrial technology and production models and undertaking industrial transfer, and have good industrial agglomeration advantages, industrial development bases and broad market demand; the eastern regions should give full play to the above advantages and speed up technological innovation while improving technical efficiency; although Although the western region has a weak economic foundation, imperfect infrastructure and lack of capital and technology in developing foreign trade, the western border region has many advantages such as location conditions, natural resources, ethnic culture, factor costs and historical opportunities, etc. The central and western provinces and cities in China should take advantage of the national "Rise of Central China" "At the same time, they should strengthen their industrial ties with developed eastern coastal provinces and cities, and make use of the technological, human resources and

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management advantages of the eastern region to promote the technological progress of the region, thereby enhancing the efficiency of foreign trade.

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