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Measurement and Evaluation of Digital Economy Efficiency in RCEP Member Countries

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Abstract: The FTA represented by RCEP is the frontier highland for RCEP member countries to implement the strategy of free trade test area enhancement. The rapid development of digital economy has brought new opportunities for RCEP to deepen investment and trade and promote regional synergistic development. Based on the digital economy input-output data of RCEP countries from 2011 to 2020, this paper quantitatively analyzes and evaluates the digital economy efficiency of RCEP countries using three-stage DEA model and Malmquist index. The results show that: the digital economy efficiency of RCEP countries is low and there is a "digital divide"; scale efficiency is the main factor affecting the low digital economy efficiency; external environmental variables and random errors have some influence on the digital economy efficiency, and the digital economy efficiency of RCEP countries decreases after excluding the external influence. China has obvious advantages in digital economy efficiency and has spillover effects on neighboring countries and China's trade partners.

Keywords: digital economy efficiency; RCEP; three-stage DEA

JEL Classification: R12; O11; O33

1. Introduction

The world economic recovery is sluggish due to the combination of the epidemic of the century and the century-old changes. The reconstruction of international economic and trade rules accelerated. Free trade zones have become an important "stage" for driving global economic change. On January 1, 2022, the Regional Comprehensive Economic Partnership Agreement (RCEP) entered into force. As the world's largest FTA, RCEP covers 29.98% of the world's population, 29.76% of its GDP and 29.51% of its goods import and export trade. RCEP is comprehensive, modern, high quality and mutually beneficial. The entry into force of RCEP has become a bridge and a link between China's domestic and international cycles. It also makes digital trade the focus of competition in the new round of international trade rules. This has far-reaching significance for realizing the high-quality development of China's digital economy and the construction of digital economy in RCEP region.

The digital economy is driving a global technological revolution in the post-epidemic era, becoming a new competitive advantage in international cooperation and changing the landscape of international trade (Han et al., 2019). The impact of "data" on a country's politics, economy and culture is growing (Shen et al., 2022). However, in recent years, most countries around the world have not shown the expected increase in economic development brought about by the digital economy, and the efficiency of the digital economy has become a concern. There is a growing debate about whether a "new Solow paradox" has emerged: the digital economy is everywhere but not captured in macroeconomic statistics (Xu & Zhang, 2020). This means that in the new global supply chain dominated by digital business rules, the existing statistical methods of digital economy utilization efficiency cannot fully cover the problems caused by the digital economy. The issue of digital economy efficiency in each country is becoming a compelling focus, and the measurement of digital utilization efficiency needs to be urgently addressed. In this context, it is important to investigate the digital economy efficiency of RCEP member countries in order to judge the economic situation of RCEP FTA and regulate the development of digital industry in FTA. It is also important for the high-quality development of digital economy in China.

2. Literature Review

The research closely related to this paper mainly focuses on the measurement of digital economy scale and the measurement of digital economy efficiency. In the research on the measurement of the scale of the digital economy, scholars from various countries have different research perspectives. Chinese scholars focus on practical application based on theoretical measurement, while scholars from other countries focus on the measurement methods of the digital economy and theoretical research on the compilation of relevant indexes. The research of scholars from various countries mainly carries out from the following three perspectives, one is the research on the national accounting method of the scale of the digital economy and the compilation of related indexes, Barefoot et al. (2019) discussed methods such as data capitalization in the United States and the data value of the digital economy, Ahmad and Ribarsky (2020) the problems existing in the data accounting process of the traditional national accounting system are analyzed, and relevant suggestions are put forward for the data accounting scheme; In terms of measuring the added value of the digital economy, the US Bureau of Economic Analysis BEA used the supply and use table to explain the scope of the US digital economy and measure the added value of the US digital economy. In addition, in terms of index compilation, the United Nations International Telecommunication Union (ITU) has published the ICT Development Index (IDI) and multiple editions of the "Measuring the Information Society Report" since 2009, the European Commission has released the "Digital Economy and Society Index", and the US Bureau of Economic Analysis (BEA) measures the development level of digital economy in multiple dimensions. Qu et al. (2022) constructed a carbon emission measurement framework for China's digital economy; Xu and Zhang (2020) constructed an accounting framework for the scale of the digital economy, and systematically tested the development scale and structure of China's digital economy. Guan et al. (2020) proposed a statistical classification of China's digital economy industry, including specific categories such as digital equipment manufacturing and digital information transmission, and compared and analyzed it with existing international indicators. Cai and Niu (2021) measured the indicative comparative advantage index and technology content level of China's ICT manufacturing and ICT service industries based on export value-added accounting. Wang et al. (2021) conducted research on the digital economy development index of China's provinces and regions through the entropy value method, and Mu and Ma (2021) took rural agriculture as the starting perspective. To measure the digital economy development index of China's eight major regions, some scholars from the urban agglomeration (Zhang & Li, 2022), the Yellow River Basin (Li, 2022), and the international perspective (Qi & Ren, 2020) to start a discussion.

Scholars' calculation of the digital economy mainly starts from two aspects, and the calculation method still mainly adopts data envelopment analysis. The first is to explore the efficiency of digital economy development at the regional level, such as measuring the whole of China (Qi, 2022) and the Yangtze River Economic Belt (Liu et al., 2022), and the second is to use the digital economy International comparison, Zhao and Wang (2022) on the comparative analysis of the digital economy efficiency of China and the United States, Liu et al. (2021) with the "Belt and Road" The perspective is the starting point to analyze the digital economy efficiency of countries along the Belt and Road. In addition, there are other methods used to measure the efficiency of the digital economy, mainly including the undesired output method considering the transpose and distance functions, and the super efficiency method considering the relaxation variable, such as Ahmad and Schreyer (2016) and McKinsey (2017).

There have been many studies on the theoretical connotation and development measurement of digital economy in the past. However, few studies have been conducted on the measurement of the regional and international digital economy development level of emerging FTAs, mainly focusing on the digital economy efficiency of some domestic and international regions in China. Moreover, the measurement of digital economy efficiency is mostly based on a single DEA analysis, which fails to solve the radial and perspective problems in traditional models. Therefore, this paper includes environmental factors into the scope and is based on a three-stage DEA measurement method to measure the digital economy efficiency of RCEP countries in a more scientific way. This is to provide a reference for the construction of RCEP FTA and the development of digital economy in RCEP countries.

3. Research Method and Index System Construction

3.1 Three-stage DEA Model

The traditional DEA analysis method has been widely used to evaluate efficiency indicators because it can handle multiple inputs and outputs and does not require the construction of a production function for parameter estimation, but Fried et al. (2002) argue that environmental factors, stochastic disturbances and management inefficiency affect the traditional DEA efficiency analysis, resulting in biased results. The model is more accurate in measuring the efficiency of digital economy (Ting et al., 2022). The specific idea of the model is as follows.

DEA-BCC model. In the first stage, this paper uses the traditional DEA-BCC model to evaluate the efficiency of digital economy in 15 countries of RCEP. The model is:

$$\min[\sigma - \varepsilon(e_1^T s_i^- + e_2^T s_r^+)]$$
$$s.t. \sum_{j=1}^{n} \lambda_j x_j + s_i^- = \sigma x_0$$
$$\sum_{j=1}^{n} \lambda_j y_j - s_r^+ = y_0 \quad (1)$$
$$\sum_{j=1}^{n} \lambda_f = 1, \lambda^f \geq 0, j = 1,2,\cdots n$$
$$s_r^+ \geq 0, s_i^- \geq 0,$$

where θ is the efficiency value of RCEP countries, and for input and output relaxation variables, $s_i^- s_r^+ \varepsilon$ is non-Archimedean infinitesimals, and identity vector spaces, and input, output, and weights for country j. $e_1^T e_2^T x_j y_j \lambda_j$ If $\theta = 1$, and, $s_i^- = s_r^+ = 0$DMU is valid for DEA; If $\theta = 1$, $s_i^- = 0$ or $s_r^+ = 0$, then DMU is valid for weak DEA. If so, DMU$\theta < 1$ is valid for non-DEA.

SFA regression model. The SFA regression model was used to eliminate the influence of external environmental factors, random interference and management inefficiency. The constructed SFA regression model is $s_{ij} = f(Z_j; B_j) + v_{ij} + \mu_{ij}$ where is the s_{ij} relaxation value; is the Z_j environmental variable, B_j is the effect Z_j of the pair s_{ij}, is $v_{ij} + \mu_{ij}$ the mixing error; $\mu \sim N(0, \sigma_\mu^2)$ for management inefficiency, that is, the impact of management factors on input relaxation variables. Therefore, management inefficiency is estimated to be $E(\mu_i|\varepsilon_i) = \frac{\lambda\sigma}{1+\lambda^2}[\frac{\varphi(\varepsilon_i)}{\phi}]$. Further estimate of the random error condition: $E(v_i|\varepsilon_i) = s_{ij} - f(Z_j; B_j) - E(\mu_i|\varepsilon_i)$. Based on the DEA effective RCEP countries, the input variables of RCEP countries during the study period were adjusted as follows $x_{ij}^* = x_{ij} + [\max\{f(Z_j; B_j)\} - f(Z_j; B_j)] + [\max\{v_{ij}\} - v_{ij}]$. Among them, it is the x_{ij}^* adjusted input, which is the $[\max\{f(Z_j; B_j)\} - f(Z_j; B_j)]$ adjustment of the external environment, and $[\max\{v_{ij}\} - v_{ij}]$ it is to put all DMUs at the same level.

Adjusted DEA model. After adjusting for the second stage of SFA, the DEA-BCC model is used again to measure the digital economy efficiency of RCEP countries, and the final efficiency value obtained.

3.2 Indicator Selection and Data Sources

By combing the existing literature and research results on digital economy efficiency, this paper takes 15 RCEP countries from 2011 to 2020 as research samples, and draws on the research results of Liu et al. (2021) based on the three dimensions of digital economy efficiency: input, output and environment, to construct RCEP National digital economy efficiency measurement index system (see Table 1). The data were obtained from the World Bank database, where missing data were interpolated using proximate elements and mean values.

Table 1. Indicator system

Dimension	Index	Specific indicators	Unit
Input indicators	Talent investment	Spending on education	percentage
	Digital infrastructure	Number of Internet links	piece
	Market activity	The volume of broad money as a percentage of GDP	percentage
Output indicators	Expected output	ICT industry merchandise exports	USD
		High-tech exports as a percentage of manufactured goods	percentage
	Undesired output	CO2 emissions per capita	kg/m³
Environment variable	Business environment	Level of urbanization	Person
	Innovation environment	Number of scientific papers	Piece

Human capital investment and physical capital investment are the main input indicators of digital economy efficiency. Given the availability of data and the positive correlation between the intensity of education investment and the improvement of talent quality (Wang & Wu, 2022) this paper selects the intensity of education investment as the human capital investment indicator for each country. In terms of physical capital investment, this paper selects the number of Internet links and the share of broad money volume in GDP for characterization. First, because digital infrastructure construction is the foundation of digital economy development in RCEP countries; second, the increase of market activity helps to stimulate the development of digital economy.

The output of digital economy efficiency is mainly measured by desired and undesired outputs. The ICT industry plays an important role in driving the development of the global digital economy. In terms of undesired outputs, traditional industries contribute to carbon emissions in the production process, while the digital economy can reduce urban carbon emissions and increase total factor carbon productivity in cities, which will enable a low-carbon urban productivity (Zhang et al., 2022).

In the dimension of environmental variables, the business environment can directly reflect the operation of a country's market economy, cultivate the survival and development of market players, and its optimization will help shape new advantages in the digital economy. The innovation environment helps to improve the efficiency of the digital economy in all countries, which in turn is a new engine for innovation and development.

4. Empirical analysis

4.1 Empirical Analysis of the Phase I DEA-BCC Model

In the first stage, the DEA-BCC model is applied to measure the digital economy efficiency of RCEP countries from 2011 to 2020. The results show that the overall efficiency, pure technical efficiency and scale efficiency of the digital economy of the 15 RCEP member countries are 0.778, 0.885 and 0.864, respectively. the scale efficiency and pure technical efficiency values are high, but the scale efficiency may be the main factor that causes the digital economy efficiency of RCEP member countries not to reach the DEA validity in comparison. The changes in efficiency during the sample period are analyzed in conjunction with Figure 1. During the examination period, digital economy efficiency shows a fluctuating upward trend, rising from 0.765 in 2011 to 0.785 in 2020, with the highest value point in 2015, which reflects the improvement of the adequacy of digital economy development utilization in RCEP countries. However, the above analysis does not exclude the effects of environmental variables and random perturbations, and cannot reflect the true digital economy efficiency of RCEP member countries. The following section will explain how environmental variables and stochastic factors affect the efficiency results through the second stage of SFA regression.

4.2 Analysis of SFA Regression Results in the Second Stage

To explain the degree of influence of environmental factors, stochastic factors and managerial inefficiency on the efficiency of inputs in the digital economy, SFA regression analysis was conducted using frontier4.1. The results of the second stage SFA regression for the most recent year of the study period, 2020, were selected and are shown in Table 3. The one-sided generalized likelihood ratio test of the regression results is significant at the 1% level, rejecting the original hypothesis that there is no inefficiency term, i.e., the SFA model is reasonably set up (Table 2). The regression results for each input slack variable with aγ values are all 1, which are significant at the 1% level, indicating that management factors dominate in the efficiency values and each external environmental variable has a significant impact on the efficiency of the digital economy. Specifically, as shown in Table 2.

Table 2. SFA results

variable	Slack variables					
	Education expenditure inputs Slack variables	T value	Number of internet connections Put in the relaxation variable	T value	Broad monetary volume put in the relaxation variable	T value
Constant terms	-59,934.489***	-59,934.034	-2.038	-0.946	-23,709.74***	-6,019.58
Level of urbanization	1,206.732***	-1,180.870	0.618***	18.158	347.62*	1.10
Number of scientific papers	1.990*	1.368	0.0001***	10.461	-0.020	-0.05
σ^2	31,387,960,000.0	31,387,960,000.0	2,001.391	1,995.438	165,088,990.0	165,088,990.0
γ	1.000	23,406.256	1.000	620,384.770	1.00	2.54
LR test of the one-sided error	6.923		4.712		6.493	

The first is the level of urbanization. The calculation results show that the regression coefficient of urbanization level is significantly negative with the slack variable of education expenditure and significantly positive with the slack variables of the number of Internet connections and the share of broad money. This implies that an increase in urbanization level can effectively reduce the redundancy of education expenditures and help improve the efficiency of the country's digital economy. Next is the number of scientific and technical papers. The calculated results show that the regression coefficients of the number of scientific and technical papers and the three input slack variables are positive. This means that the higher the number of scientific and technical publications is not conducive to the improvement of digital economy efficiency in RCEP countries, and it is a "burden" to the improvement of digital economy efficiency. Although the publication of scientific and technical papers can reflect the level of science and technology in each country to a certain extent, science and technology will lead to uneven progress in different regions. This phenomenon is particularly evident in countries with uneven economic development, which leads to a less efficient digital economy.

4.3 Empirical Snalysis of the Third Stage DEA-BCC Model

According to the results of the second-stage SFA regression excluding the influence of environmental and random factors, adjusting each input variable and re-calculating the efficiency values of the model, the specific results are shown in Table 3. the mean values of the real digital economy efficiency, pure technical efficiency, and scale efficiency of RCEP countries from 2011 to 2020 are 0.688, 0.983, and 0.699, respectively, which are lower than the efficiency values of the first stage. This indicates that the third stage efficiency value effectively corrects the overestimation of the first stage efficiency value, and from 2014 to 2016, the digital economy technical efficiency of RCEP countries increased from 0.677 to 0.823 and then to 0.694, and the main reason for the obvious increase in efficiency is the increase in scale efficiency. The possible reason is that the World Bank used the concept of "digital dividend" in the World Development Report in 2016, and the role of the digital economy in driving innovation has become a new hot spot in the global economy. highlighted, with developing countries accounting for more than 2/3 of the RCEP countries, while the volume and scale of the digital economy in developing countries are somewhat different from those in developed countries, and the conversion efficiency of resource utilization is poor. This is followed by a higher value to 2020, which is similar to the trend of pure technical efficiency. Throughout the study period, the change trend of digital economy technical efficiency of RCEP countries is similar to the change trend of scale efficiency.

In terms of the efficiency values for each country, the ones that are always DEA efficient in the digital economy during the study period are Brunei and Singapore. China, Korea, Australia, Philippines, and Malaysia have DEA effective status during the study period. Among them, Korea and Malaysia's DEA efficiency values remain above 0.95, showing a stable and good trend. Australia and the Philippines had small fluctuations in efficiency values from 2011-2015, followed by a stable DEA validity. Fluctuations in scale efficiency make China's efficiency values more volatile in 2015-2020. New Zealand, Laos and Vietnam have fluctuating and increasing efficiency values, while Japan shows a stable development and maintains an average level of around 0.6. The efficiency values of Myanmar, Cambodia and Indonesia never exceed 0.3, with Myanmar having the lowest digital economy efficiency value. Most of the countries' digital economy efficiency values fluctuated significantly from 2014-2016, due to the changes in the global digital economy in that year, with a slow development trend of fluctuations slowing down after 2017.

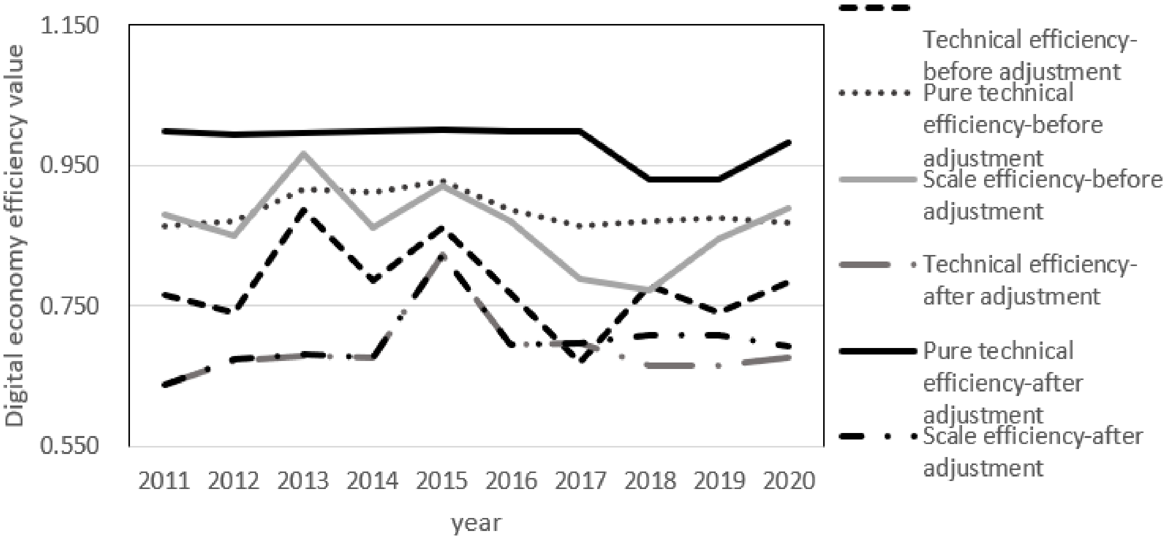

Figure 1. Comparison of digital economy efficiency in RCEP countries in the first and third phases

And according to the study, the level of pure technical efficiency of digital economy in RCEP countries in the third stage has improved compared to the first stage, and the number of countries with efficiency values less than 1 has decreased year by year. The presence of insufficient output or redundant funding is significantly improved after the exclusion of environmental variables and random effects. The study also shows that the lower efficiency values of the digital economy due to scale efficiency are more widespread, as increasing or decreasing returns to scale make the scale efficiency values deviate from the effective value of 1. Low scale efficiency is the main reason for the low efficiency values of the digital economy in RCEP countries.

Table 3. Results of the third stage measurement of digital economy efficiency in RCEP countries

Country	In 2011			In 2014			In 2017			In 2020		
	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE
China	1.000	1.000	1.000	0.918	1.000	0.918	0.817	0.97	0.843	0.727	0.811	0.896
Japan	0.682	1.000	0.682	0.701	0.998	0.702	0.628	0.999	0.628	0.665	0.956	0.696
Korea	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Australia	0.939	1.000	0.939	1.000	1.000	1.000	0.931	1.000	0.932	1.000	1.000	1.000
New Zealand	0.402	0.999	0.403	0.466	0.999	0.467	0.409	0.999	0.41	0.506	0.985	0.514
Indonesia	0.297	0.997	0.298	0.217	1.000	0.218	0.279	1.000	0.279	0.256	1.000	0.256
Malaysia	1.000	1.000	1.000	1.000	1.000	1.000	0.952	1.000	0.952	1.000	1.000	1.000
Philippines	0.929	1.000	0.929	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Thailand	0.529	0.999	0.53	0.546	0.999	0.547	0.494	1.000	0.494	0.49	0.981	0.499
Singapore	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Brunei	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Cambodia	0.028	1.000	0.028	0.037	1.000	0.037	0.08	1.000	0.08	0.078	0.996	0.078
Laos	0.234	1.000	0.234	0.517	1.000	0.517	0.757	1.000	0.757	0.46	1.000	0.46
Myanmar	0.013	1.000	0.013	0.026	1.000	0.026	0.143	1.000	0.143	0.077	1.000	0.077
Vietnam	0.500	1.000	0.5	0.729	1.000	0.729	0.95	1.000	0.95	0.896	0.998	0.898
mean	0.637	1.000	0.637	0.677	1.000	0.677	0.696	0.998	0.698	0.677	0.982	0.692

To further analyze the dynamic evolutionary characteristics of the efficiency of the digital economy in RCEP countries, Figure 2 shows the results of the estimated Kernel density of the third stage of the digital economy in RCEP countries from 2011 to 2020. It is found that the center of the Kernel density distribution curve of the digital economy of RCEP countries gradually fluctuates to the right from 2011 to 2020, which indicates that the level of digital economy development of RCEP countries is fluctuating and slowly growing during the period under examination. The main peak wave from 2011 to 2020 shows a rising trend and then decreasing trend, and the width gradually narrows, which indicates that the efficiency of digital economy development of RCEP countries the fluctuating and uneven nature of the wave shows a significant increase. It is further observed that, unlike the first stage, the curve shows a multi-peak distribution phenomenon, but the side peaks have smaller peaks and larger widths. This further indicates that the development of digital economy in RCEP countries always shows multipolar phenomenon and has certain gradient characteristics.

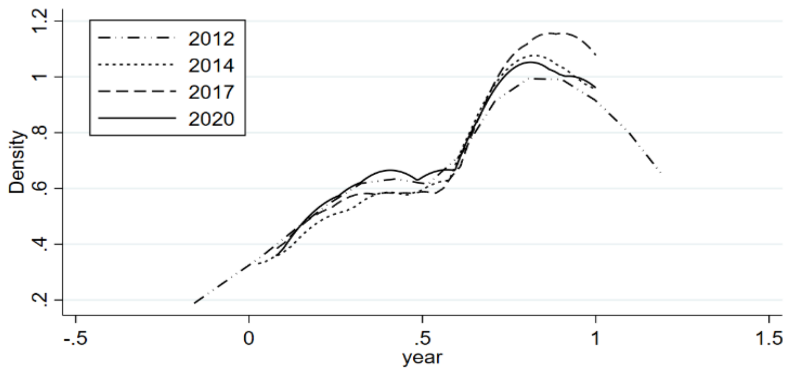

Figure 2. Kernel density estimation results of the third stage

To further delve into the efficiency of the digital economy in RCEP countries, the input variables and raw outputs excluding external environment and stochastic factors are brought into the Malmquist Productivity Index model for measurement. In order to supplement the above results from a dynamic perspective. The specific measurement results are shown in Table 4. Overall, the digital economy efficiency values of RCEP countries fluctuate and level off during the study period, developing at a high rate between 2012 and 2015, reaching an increase of 54.38% between 2014 and 2015. It then shows a more stable development, but shows a small decrease between 2019 and 2020. From the decomposition of efficiency changes in the digital economy, the comprehensive efficiency changes continue to develop between 2011 and 2014, and then show a trend of "decline - rise - decline", and reach a higher value between 2019 and 2020, with a clear sign of improvement compared with the previous measurement period. For pure technical efficiency changes, it basically remains at the measurement level of 1.000 and increases significantly during 2018-2020; the changes in scale efficiency are similar to the changes in the overall efficiency of digital economy. Overall, the change in scale efficiency is the main factor leading to the change in the value of integrated efficiency of the digital economy. This is consistent with the findings of the static analysis.

Table 4. Malmquist efficiency value of digital economy in RCEP countries and its decomposition

year	effch	techch	pech	sech	tfpch
2011-2012	1.169	0.495	0.995	1.174	0.578
2012-2013	0.961	0.980	1.002	0.959	0.942
2013-2014	1.028	5.899	1.003	1.025	6.066
2014-2015	1.586	0.111	1.000	1.585	0.176
2015-2016	0.759	0.485	1.000	0.759	0.368
2016-2017	0.998	1.402	0.998	1.000	1.399
2017-2018	0.893	5.361	0.913	0.977	4.785
2018-2019	1.000	0.053	1.013	0.987	0.053
2019-2020	0.929	2.002	1.059	0.877	1.861
mean	1.016	0.792	0.998	1.018	0.804

4. Discussion

Based on the digital economy-related input data, output data and environmental variable data of RCEP countries from 2011 to 2020, this paper uses a three-stage DEA model to calculate and analyze the digital economy efficiency, and finally obtains the following conclusions:

1. The digital economy efficiency of each RCEP country is influenced by environmental factors. The level of urbanization has a significant positive impact on education expenditure, which can effectively reduce the redundancy of education expenditure. The horsepower effect makes the local technology level increase the input redundancy, thus making it a "burden" to the digital economy efficiency.
2. Scale efficiency is the main reason for the low efficiency of the digital economy in RCEP countries. Compared with the results of the first stage, the results of the third stage show that the overall technical efficiency value of RCEP countries is fluctuating upward, the average value of overall technical efficiency is decreasing, the average value of scale efficiency is also decreasing, and the average value of pure technical efficiency is increasing. It shows that the low efficiency of digital economy in RCEP countries is mainly caused by low scale efficiency rather than pure technical efficiency.
3. The "digital divide" among RCEP countries persists. The digital economy efficiency values of Brunei and Singapore are always DEA effective, while those of Korea, China, Australia, Malaysia and the Philippines are always above 0.9, and the lowest digital economy efficiency values are in Cambodia and Indonesia. China's booming digital economy has spillover effects on RCEP partner countries and is particularly beneficial to neighboring countries and China's trading partners.

However, some scholars still investigate this issue from other perspectives, for example, Jiang et al. (2022) also explores the efficiency of the core and support industries of China's digital economy from the perspective of input-output tables and investigates their impact mechanisms. The study finds that macroeconomic variables are not the key to enhancing the efficiency of the core industries of the digital economy. The focus of enhancing the efficiency of digital economy industries is to emphasize the wide application of information technology tools in manufacturing and the deep penetration in the real economy in the areas of production, exchange, circulation and distribution. Wang (2022) explores RCEP as an example to conclude that the level of digital economy development of trade subjects has a positive contribution to bilateral trade and trade efficiency, and Liang and Jiao (2022) systematically analyze the current situation and trend of digital economy development in RCEP member countries and construct a digital economy enhancement path from digital trade rules, digital trade facilities and global value chain, which also side by side supports the This paper also supports the necessity of measuring the efficiency of digital economy of RCEP member countries, and lays the foundation for enhancing the development of digital economy in RCEP region and subsequently exploring the path of digital economy enhancement of RCEP member countries. It is important to study the digital economy issues of RCEP countries and how to make the digital economy work for economic development and digital trade cooperation, which is our future research direction to explore in this area.

5. Conclusion

The obtained research results can help improve the efficiency of digital economy in RCEP member countries, and the following recommendations are related to our research: firstly, we should accelerate the construction of digital economy infrastructure and promote the digital economy cooperation among RCEP member countries. The new infrastructure represented by digital infrastructure can effectively break the boundaries of information, knowledge and industry, and provide the preliminary foundation for the deep application of digitalization in the future. The gap between countries will be the gap in innovation capacity supported by technological revolution, the gap in digitalization process, and the gap in digital finance and digital economy supported by digital technology. Countries should seek common ground, promote economic cooperation, and work together to bring sustainable solutions to the multiple complexities of the Internet and explore the opportunities it presents.

Conflict of interest: none

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