International Journal of Knowledge Management
Volume 21 • Issue 1 • January-December 2025

Internet Enables Efficient and Balanced Development of Regional Cultural and Creative Industry

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ABSTRACT

Using entropy weighting method, global DEA-EBM model, panel vector autoregressive model and β convergence test model, this study evaluates the Internet development level and cultural and creative industry efficiency in China from 2016 to 2022, evaluates whether Internet development can drive the efficient and balanced development of regional cultural and creative industry. The results show that Internet development can not only effectively improve cultural and creative industry efficiency, but also accelerate the efficient and balanced development of regional cultural and creative industry. However, Internet development has a significantly stronger effect on improving cultural and creative industry efficiency in the eastern region and the convergence rate of efficiency gaps among provinces than the central and western regions. Accordingly, this study puts forward some suggestions from optimizing the input-output structure of cultural and creative industry, increasing the investment in internet infrastructure and strengthening the deep integration of the two.

KEYWORDS

Cultural and Creative Industry, Internet Development, Efficiency Measurement, Balanced Development, Impulse Response, Convergence Test

INTRODUCTION

As a traditional belief and value passed down from generation to generation by a country, society, and nation, culture is the source of a country's social and individual identity and innovative creativity. Not only is culture a basic component of a country's high-quality economic and social development, but it also has a profound impact on a country's competitiveness (Orsini & Magnier-Watanabe, 2023; Yun et al., 2020). Since the 21st century, China has gradually shifted from an industrial economy to a knowledge economy, leading to obvious changes in the country’s economic structure. Cultural and creative industry has attracted much attention because of its high added value, high profit, high creativity, green and low-carbon practices, and positive externalities. Cultural and creative industry has seen continuous growth in national economic status, gradually becoming a national strategic and

DOI: 10.4018/IJKM.373318

national economic pillar industry while creating vast wealth for society (Aman et al., 2022; Azeem et al., 2021; Smith & Shaughnessy, 2024). It is now playing an increasingly prominent role in the industrial layout of various regions of China; this advancement has the capacity not only to effectively stimulate regional economic growth, but also to meet people's growing demand for cultural products and services. According to data released by the National Bureau of Statistics of China, from 2012 to 2021, the added value of China's cultural and creative industry has increased from 1,807.1 billion CNY to 5,238.5 billion CNY, reaching an average annual growth rate of 12.55%, which is significantly higher than the growth rate of China's GDP.

Therefore, many regions have transformed the cultural and creative industry from a regional marginal industry to a regional central industry (Tang & Xiu, 2023). The statistical bulletin on the development of culture and tourism in China shows that, during the period from 2012 to 2022, national spending on culture and tourism in China has rapidly increased from 57.918 billion CNY to 120.289 billion CNY, an increase of 107.69%. In the face of the increasing investment in cultural resources, it is particularly important to allocate resources reasonably and efficiently to ensure that the investment in cultural resources can effectively improve cultural output; this goal requires the establishment of a scientific evaluation system to accurately and objectively evaluate the efficiency of the cultural and creative industry. To this end, a large number of scholars, following the principle of letting the facts and the data speak for themselves, have actively participated in fruitful research measuring the efficiency of China's cultural and creative industry and have conducted beneficial in-depth discussions on various factors' influence on this efficiency in terms of economic development, capital investment, market demand, scientific and technological innovation, system reform and policy support (Haini et al., 2024; Huang & Jia, 2022; Qin & Lin, 2021; Qu et al., 2020; Raimo et al., 2022; Zeng et al., 2016; Zhang et al., 2022; Zhang et al., 2023; Zhang & Wei, 2024; Zhao et al., 2023).

But it should be noted that with China's general economic and societal transition into the digital age, internet development, as the transmission link and digital carrier of various digital technologies, not only has profoundly changed traditional production methods and business models, but also has spawned many new methods (Liu et al., 2023). Thus internet development is in a state of deep integration with the cultural and creative industry. Especially with the continuous and in-depth promotion of the "Broadband China" strategy, internet development has been given more policy driving force. Internet development can strengthen the development and efficient integration of cultural and creative resources and can promote profound changes in the production methods of cultural and creative industries. At the same time, internet development can also break through the time and space boundaries in the business of cultural and creative products and services, broaden consumption channels, and promote efficient matching between consumers and these products and services. This means that internet development can inject strong new momentum into the high-quality development of the cultural and creative industry and can effectively improve the efficiency of the cultural and creative industry while promoting the vertical deepening of this industry's structure. However, the existing research has seldom explored the impact of internet development on the efficiency of cultural and creative industry; the literature is especially lacking in discussion of regional differences. In addition, certain regions of China, restricted by geographical location, economic environment, resource endowment, industrial structure, and traffic conditions, suffer from obvious gaps in the levels of internet development and cultural and creative industry development (Dong et al., 2022; Haini et al., 2024).

Thus, we have identified a significant question: can internet development effectively increase the efficiency of cultural and creative industry? If so, is there any inter-regional and intra-regional difference in the increasing effect? If there are inter-regional differences, will internet development widen or narrow the gap of cultural and creative industry efficiency between regions? If there are intra-regional differences, will internet development widen or narrow the gap of cultural and creative industry efficiency among provinces within the region? Answering these questions will have important theoretical value and practical significance for building China into a well-rounded digital and cultural

power. In view of this significance, this study establishes a quantitative evaluation system of internet development and cultural and creative industry efficiency in line with China's national conditions. On the basis of scientific evaluation and measurement of the level of internet development and cultural and creative industry efficiency in China, and by using an entropy weighting method and a global DEA-EBM model, this study builds a panel vector autoregressive model to analyze the dynamic impact of internet development on the efficiency of cultural and creative industry. In addition, this study also builds a β convergence model to test the convergence of China's cultural and creative industry efficiency and the impact of internet development on this convergence, fully investigating regional differences.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Theoretically, the rapid growth of internet development can effectively break time and space constraints (Gao, 2025). With the continuous improvement of internet development, the platform effect is becoming more and more powerful. In this context, the cultural and creative industry is undergoing profound changes. On the one hand, the rapid progress of internet development can transform the transformation of various links in the cultural and creative industry into data form, thus expanding the flow range of cultural production factors. On this basis, the communication and coordination capacity of each subject in the cultural and creative industry chain will be effectively strengthened, and they can seek multi-faceted support and cooperation by sharing information anywhere and at any time (Ibujés-Villacís, 2025; Meglin et al., 2022; Williams, 2021), thus breaking through the mismatch of factors caused by time and space constraints and improving the efficiency of cultural and creative industry.

On the other hand, relying on the digital network platform, internet development can also break the boundary between knowledge and technology that exists in the original cultural and creative industry (Wu et al., 2021). Innovative knowledge and technology can flow at a high speed in digital space with data as the carrier and can be traded, circulated, spread, and shared among the subjects in the cultural and creative industry chain through coding and decoding technology. Thus, knowledge technology can be diffused, spilled, and transferred efficiently in the upstream and downstream division of labor in the cultural and creative industry (Chen et al., 2021), so that each subject can create more value-added space and form a complementary and open collaborative system (Gawer & Cosumano, 2014), which will further promote the improvement of cultural and creative industry efficiency.

In addition, the digital transformation of the cultural and creative industry also makes it easier for government departments to obtain more industrial information (Shah et al., 2024) so as to timely perceive off-track behaviors such as imbalance between supply and demand and mismatch of resources in the cultural market and to quickly formulate appropriate intervention policies to make feedback adjustments and thus ensure the efficient operation of the cultural and creative industry (Liang & Li, 2023; Proksch et al., 2024). Thus, internet development has the capacity not only to strengthen the synergy between the upstream and downstream of the cultural and creative industry chain and of production, supply, and marketing, but also to promote the application and development of new scenes and the innovation of new business patterns in the cultural and creative industry and to strengthen market supervision, thus empowering the whole process of manufacturing, dissemination, promotion, consumption experience, and related activities in the cultural and creative industry, and ultimately improving cultural and creative industry efficiency. According to the above analysis, the following hypothesis is proposed:

Hypothesis 1: Internet development can effectively improve cultural and creative industry efficiency.

At the same time, thanks to the characteristics of high added value, strong liquidity, and deep penetration, the rapid progress of internet development can break through the institutional barriers to ensure the smooth flow of cultural resources between regions (Xu et al., 2023), thus

optimizing the spatial layout of cultural resources (Martha & Stefano, 2018) and eliminating the barriers to regional cultural resources. This means that internet development can mitigate the polarization effect caused by the concentration of cultural resources in high-efficiency and strong regions; at the same time, it can effectively make up for the resource endowment disadvantage of low-efficiency and weak regions, help them to accelerate their integration into the cultural and creative industry value chain (Edward, 2016), and ultimately promote their industrial scale development and narrow the regional efficiency gap in the cultural and creative industry.

Of course, the rapid progress of internet development can also build an accurate cross-regional docking mechanism for cultural resources (Deng et al., 2023). For example, internet development can help to guide cultural resources to freely flow across regions with a view to maximizing value and can create more convenient conditions for efficient interregional cooperation in cultural production. Another benefit is the enhancement of the spatial spillover effect of regional cultural production activities and expanding the spillover scope (Chen & Li, 2023). The layout of regional cultural resources can also be promoted to better match the needs of local industries. These advancements will all contribute to forming a situation of common development in cultural industry between high-efficiency and low-efficiency regions, thus narrowing the regional gap in cultural and creative industry efficiency.

Moreover, it is worth mentioning that the rapid growth of internet development, based on the modern information network, also enables government departments and cultural subjects in low-efficiency and weak regions to more quickly gain familiarity with the cultural and creative industry policies and models of high-efficiency and strong regions. This potential progress will strengthen the sense of urgency for the development of low-efficiency and weak regions, thus forming competitive efficiency (Peter et al., 2023), effectively stimulating government departments and cultural subjects to quickly introduce incentive policies and adopt innovative production strategies, and finally promoting the rapid development of cultural industries in low-efficiency and weak regions and narrowing the gap of regional cultural and creative industry efficiency. According to the above analysis, the following hypothesis is proposed:

Hypothesis 2: Internet development can effectively narrow the gap of cultural and creative industry efficiency between regions.

However, it also should be noted that both the level of internet development and the scale of cultural and creative industry are in a leading position in the eastern region compared with the central and western regions (Zhao et al., 2024) and that internet development is likely to have obviously different influence from one region to another on cultural and creative industry efficiency and on the efficiency gap between provinces within the region. According to the above analysis, the following hypotheses are proposed:

Hypothesis 3a: Internet development has regionally different influences on promoting cultural and creative industry efficiency.

Hypothesis 3b: Internet development has different influences on the gap of cultural and creative industry efficiency among provinces within a region.

RESEARCH METHODOLOGY

Research Objects Selection

Cultural and Creative Industry Efficiency

In order to make the measurement results more objective and accurate, it is necessary to ensure that the radial model such as DEA-CCR does not overestimate the real efficiency and also that the non-radial model such as DEA-SBM does not underestimate the real efficiency; the measurement results must have intertemporal comparability. In this study, the non-angle global DEA-EBM model with variable returns to scale is used to measure the cultural and creative industry efficiency of

China. The DEA-EBM model can assign weights to various input and output indicators of the cultural and creative industry through the PCA method and can integrate radial and non-radial indicators into the same statistical framework to ensure the accuracy of the measured efficiency values of the cultural and creative industry (Gao, 2025). With reference to the existing research (Qin & Lin, 2021; Qu et al., 2020; Zeng et al., 2016; Zhang et al., 2022; Zhang & Wei, 2024) and taking the representativeness and accessibility of the data into account, this study selects the number of employees and total assets of enterprises above the scale of cultural and creative industry as input indicators and selects the operating income and added value of enterprises above the scale of cultural and creative industry as output indicators.

Internet Development

In order to make the evaluation results more objective and comprehensive and to avoid a subjective and one-sided evaluation of the development level like that would result from the single indicator method, this study uses the entropy weighting method to make an objective and comprehensive evaluation of the internet development level in China from three dimensions: digital resource input, digital access status, and digital business output. For the selection of specific indicators, referring to existing research (Chen et al., 2023; Peter et al., 2023; Zhao et al., 2023), and taking the representativeness and accessibility of data into account, this study selects the length of optical cable lines, the number of internet broadband access ports, the number of domain names, the number of web pages, and the number of employees in information transmission, software, and information technology services as proxy indicators of digital resources input, selects the number of internet broadband access users and mobile phone users as proxy indicators of digital access status, and selects the total number of telecommunications services as proxy indicators of digital service output.

Empirical Model Setting

Vector Autoregressive Model

In order to dynamically evaluate the empowering effect of internet development on cultural and creative industry efficiency, this study builds the panel vector autoregressive (PVAR) model to analyze the impulse response. In order to ensure the stationarity of the data, both internet development and cultural and creative industry efficiency variables are logarithmically processed in this study. The unit root test results of ADF, PP and LLC all show that the variables, after taking the logarithm, have reached the stationary state, and that the PVAR model can be directly established. In addition, the AIC, HQ and SC information criteria and stability test results show that the second-order lag is the optimal lag order for the PVAR models of the whole country and of each region. To this end, this study sets the PVAR models as shown in Equations 1 and 2:

$$lnEFF_{i,t} = \alpha_1 + \sum_{j=1}^{2} A_j * lnEFF_{i,t-j} + \sum_{j=1}^{2} B_j * lnSCO_{i,t-j} + \mu_{i,t} \quad (1)$$

$$lnSCO_{i,t} = \alpha_2 + \sum_{j=1}^{2} C_j * lnEFF_{i,t-j} + \sum_{j=1}^{2} D_j * lnSCO_{i,t-j} + \epsilon_{i,t} \quad (2)$$

In the above formula, $lnEFF_{i,t}$ and $lnSCO_{i,t}$ respectively represent the cultural and creative industry efficiency and internet development level in the t year of province i. A_j, B_j, C_j and D_j represent the coefficients to be estimated before the lag variables. α_1 and α_2 represent the constant terms. $\mu_{i,t}$ and $\epsilon_{i,t}$ represent the random perturbation terms.

β Convergence Test Model

In order to test whether internet development can promote the efficient and balanced development of regional cultural and creative industry, this study builds the absolute β convergence model and the

conditional β convergence model to analyze the impact of internet development on the regional cultural and creative industry efficiency gap. Referring to the practice of Zhou et al. (2023), the measurement models of absolute β coefficient and conditional β coefficient are set as shown in Equations 3 and 4:

$$\left(lnEFF_{i,0+T} - lnEFF_{i,0}\right)/T = F_1 + \beta_1 * lnEFF_{i,0} + \varepsilon_{i,t} \quad (3)$$

$$\left(lnEFF_{i,0+T} - lnEFF_{i,0}\right)/T = F_2 + \beta_2 * lnEFF_{i,0} + \theta * lnSCO_{i,t} + \varphi_{i,t} \quad (4)$$

In the above formula, $lnEFF_{i,0}$ and $lnEFF_{i,0+T}$ respectively represent the natural logarithm values of the cultural and creative industry efficiency of province i in 2016 and t years from 2016. T represents the length of time. F_1 and F_2 represent constant terms. β_1 and β_2 respectively represent the absolute β coefficient value and conditional β coefficient value to be measured. If $\beta_1<0$ is significant, it shows that the cultural and creative industry efficiency in this region has the absolute β convergence property. Even without considering any other external factors, the cultural and creative industry efficiency gap among provinces in this region will narrow spontaneously with time, and the convergence rate is $v_1 = -\ln(1+\beta_1)/T$. If $\beta_2<0$ is significant and the numerical value is $<\beta_1$, it shows that the cultural and creative industry efficiency in this region has the conditional β convergence property. That is, with the improvement of internet development, the cultural and creative industry efficiency gap among provinces in this region is accelerating and narrowing and tends to converge at a faster speed, the convergence rate is $v_2 = -\ln(1+\beta_2)/T$. $lnSCO_{i,t}$ represents the internet development in the t year of province i. $\varepsilon_{i,t}$ and $\varphi_{i,t}$ represent the random error terms.

Data Source and Description

The data of this study are all from the *Statistical Yearbook of China*, *Statistical Yearbook of Culture and Related Industries of China* and *Statistical Yearbook of Science and Technology of China*, covering all the data needed to evaluate the internet development and measure cultural and creative industry efficiency of 31 provinces in China. However, in view of the fact that the input and output data of cultural industries in the provinces of China were systematically released for the first time in 2016, and only updated until 2022, this study set the research time as 2016 to 2022 and divided the 31 provinces into the eastern region and the central and western regions according to the regional classification standards of the Chinese National Bureau of Statistics. There was a total of 217 samples.

EMPIRICAL ANALYSIS AND RESULTS

Descriptive Statistical Analysis

Measurement Results of Cultural and Creative Industry Efficiency

On the basis of the non-angle global DEA-EBM model with variable returns to scale, this study measures the cultural and creative industry efficiency values of 31 provinces in China from 2016 to 2022, as shown in Table 1 and draws Figure 1 according to the regional division standard.

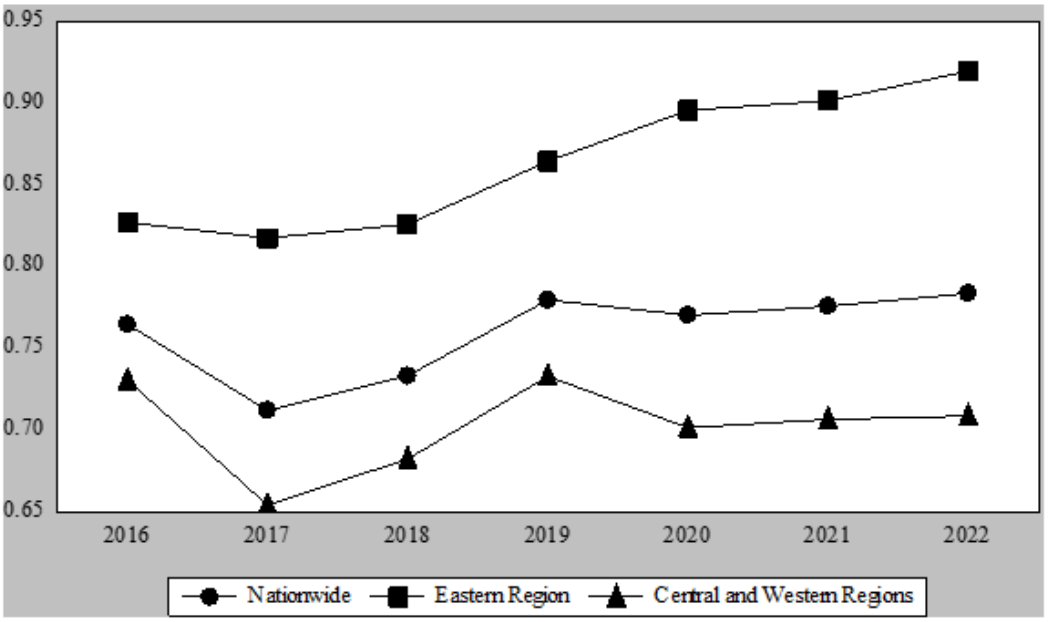
Table 1. Evaluation and measurement results of cultural and creative industry efficiency and internet development

Year	Cultural and creative industry efficiency			Internet development		
	Nationwide	Eastern Region	Central and Western Regions	Nationwide	Eastern Region	Central and Western Regions
2016	0.7647	0.8271	0.7305	0.1413	0.2364	0.0889
2017	0.7120	0.8176	0.6539	0.1578	0.2604	0.1015
2018	0.7333	0.8260	0.6823	0.1833	0.2906	0.1243
2019	0.7798	0.8647	0.7330	0.2112	0.3227	0.1499
2020	0.7704	0.8958	0.7014	0.2228	0.3315	0.1630
2021	0.7758	0.9016	0.7065	0.2482	0.3641	0.1845
2022	0.7837	0.9200	0.7086	0.2698	0.3893	0.2042
Average	0.7600	0.8647	0.7023	0.2049	0.3136	0.1452

Note. The eastern region includes Beijing, Fujian, Guangdong, Hebei, Hainan, Jiangsu, Liaoning, Shanghai, Shandong, Tianjin, and Zhejiang, with a total of 11 provincial administrative regions. The central and western regions include Anhui, Chongqing, Guangxi, Gansu, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Inner Mongolia, Jilin, Jiangxi, Ningxia, Qinghai, Shanxi, Sichuan, Shaanxi, Tibet, Xinjiang, and Yunnan, with a total of 20 provincial administrative regions.

The results show that the nationwide average cultural and creative industry efficiency of China in the period from 2016 to 2022 is only 0.7600, that the efficiency value has not increased effectively during this period, and that the numerical value has only fluctuated from 0.7647 to 0.7837, still indicating a relatively inefficient status on the whole. In addition, there are obvious differences in cultural and creative industry efficiency between regions. Specifically, the average cultural and creative industry efficiency of the eastern region in the period from 2016 to 2022 is 0.8647, which is significantly higher than the nationwide average efficiency and reaches a relatively efficient status and that the efficiency value shows a slight and steady upward trend during this period, with an increase of 11.23% from 0.8271 in 2016 to 0.9200 in 2022. However, the average cultural and creative industry efficiency of the central and western regions in the period from 2016 to 2022 is only 0.7023, which is significantly lower than the nationwide average and indicates a relatively ineffective status, and that the efficiency value fluctuates slightly during this period, with a decrease of 3.00% from 0.7305 in 2016 to 0.7086 in 2022.

Figure 1. Changing trends of cultural and creative industry efficiency



In order to explore the reasons for the relatively low efficiency of cultural and creative industry in China, this study further projects the above efficiency measurement results, as shown in Table 2. The results show that there are problems of over-input and under-output in China's nationwide and regional cultural industries, and over-input is the main reason why cultural and creative industry efficiency cannot achieve effective growth and is in a relatively inefficient status for a long time, especially in the central and western regions.

Table 2. Projection analysis results

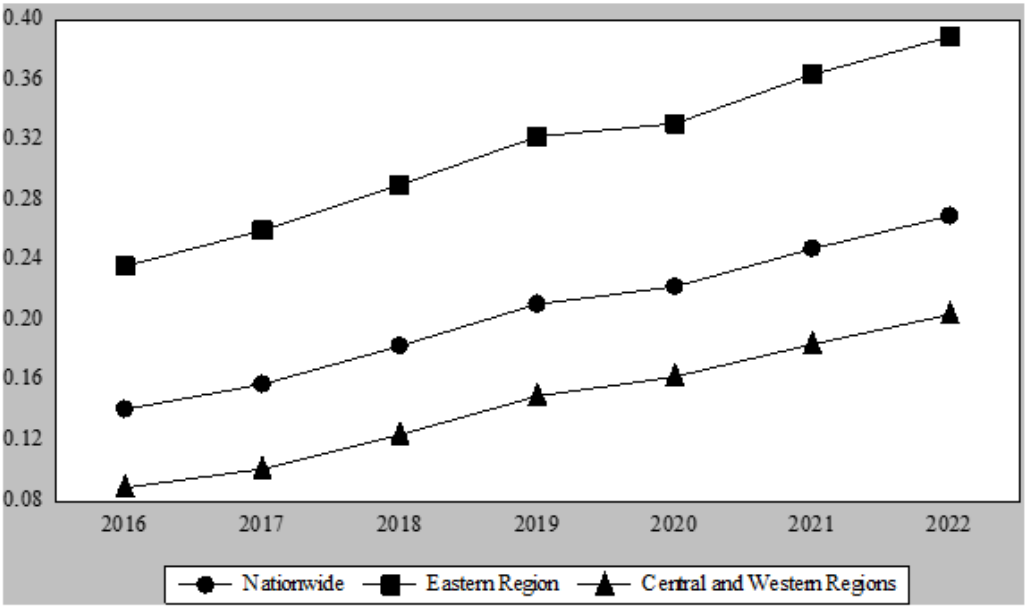
Region	Over-Input Rate (%)		Under-Output Rate (%)	
	X_1	X_2	Y_1	Y_2
Nationwide	22.22	21.53	6.68	7.93
Eastern Region	15.71	14.10	2.16	3.25
Central and Western Regions	25.80	25.61	9.16	10.50

Evaluation Results of Internet Development

On the basis of the entropy weight method, the weights of the three dimensions of internet resource input, internet access status, and internet business industry are calculated to be 0.7309, 0.1487, and 0.1204 respectively. On this basis, in this study, the weighted sum of the above weights and the standardized data can be used to evaluate the internet development level of 31 provinces in China in the period from 2016 to 2022, as shown in Table 1, and the evaluation results are shown in Figure 2 according to the regional division standard. The results show that the nationwide internet development in China shows a high-speed growth trend from 2016 to 2022 and that the numerical value has rapidly increased from 0.1413 to 0.2698. However, it should be noted that there is an obvious gap in the

internet development level among regions. Specifically, the average internet development level in the eastern region is 0.3136, while that in the central and western regions is only 0.1452.

Figure 2. Changing trends of internet development

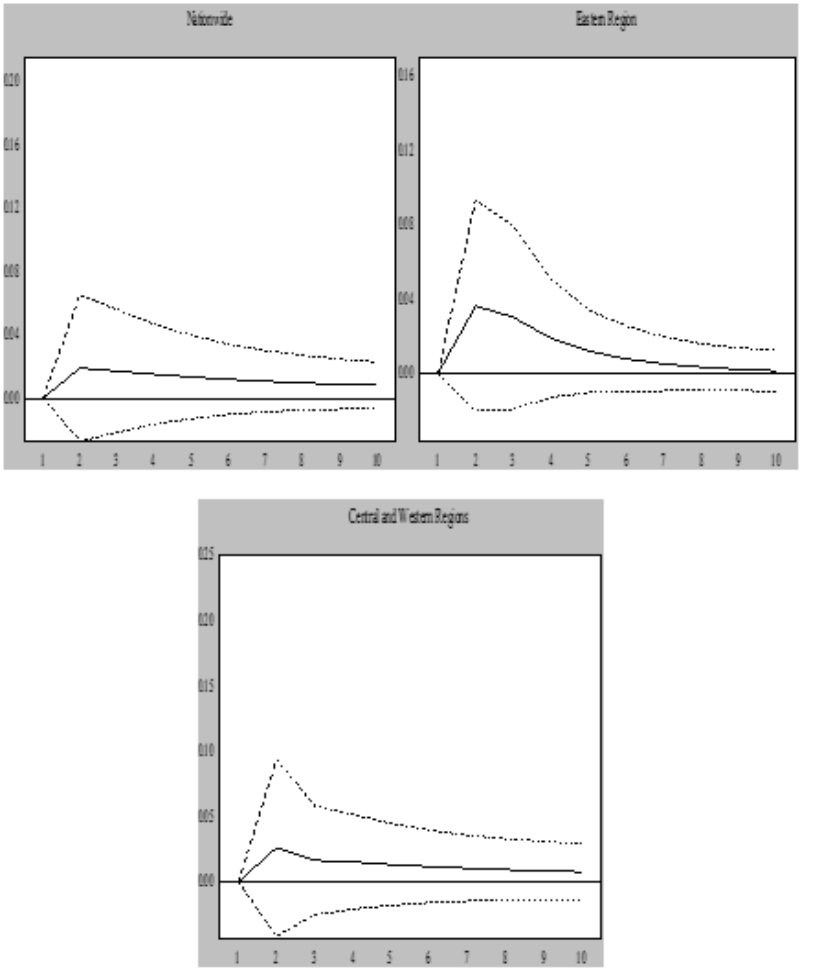


Impulse Response Analysis

Figure 3 reports the response of cultural and creative industry efficiency to the impact of internet development in the nationwide China, the eastern region, and the central and western regions, from left to right. The results show that, from the nationwide perspective, the response of cultural and creative industry efficiency lags in the short term after being impacted by internet development; it will not make any response in the first phase, but then it presents a rapid growth positive response and quickly reaches its peak in the second phase. Although its response then turns into a slow downward trend, from high to low, and gradually converges to 0, it always shows a positive response, which verifies hypothesis 1.

In terms of regions, the cultural and creative industry efficiency in the eastern region and the central and western regions both have a short-term lag similar to China as a whole after being impacted by a standard deviation innovation of internet development. It will not respond in the first phase, and then it will show a positive response of rapid growth, and both will reach the peak in the second phase. However, the peak response of cultural and creative industry efficiency in the eastern region to the impact of internet development is significantly higher than that in the central and western regions, which verifies the hypothesis 3a. The above analysis shows that internet development can positively promote the cultural and creative industry efficiency but that the effect lags behind and that there are obvious regional differences. The promotion effect of internet development on the cultural and creative industry efficiency in the eastern region is obviously stronger than that in the central and western regions.

Figure 3. Response of cultural and creative industry efficiency to the impact of internet development



Convergence Test Analysis

Table 3 reports the β convergence test results of cultural and creative industry efficiency. The results show that the absolute β coefficient values of cultural and creative industry efficiency in China as a whole and in different regions are all significantly less than 0 and that they all have the absolute β convergence property. This means that even if no other factors are considered, the cultural and creative industry efficiency gap among the provinces in China, the provinces in the east region and the provinces in the central and western regions will tend to be eliminated at a convergence rate of 4.89%, 6.27%, and 5.49% respectively. After the introduction of internet development variable, compared with the absolute β coefficient value, the conditional β coefficient value in China as a whole is obviously smaller, and its convergence speed is increased to 6.05%, which indicates that the convergence speed of cultural and creative industry efficiency gap among provinces in China is further improved under the impact of internet development, which verifies Hypothesis 2.

These results show that internet development is an important convergence mechanism for the efficient and balanced development of regional cultural and creative industry. On the one hand, internet development can directly promote cultural and creative industry efficiency. On the other hand, internet development can also effectively drive the regional cultural and creative industry to achieve

efficient and balanced development, accelerate the convergence of regional cultural and creative industry efficiency, and thus narrowing the regional cultural and creative industry efficiency gap. However, it should be noted that compared with the central and western regions, internet development has a significantly stronger driving effect on the cultural and creative industry efficiency in the eastern region. Specifically, under the impact of internet development, the convergence rate of the cultural and creative industry efficiency gap among the provinces in the eastern region has increased to 7.55%, while the convergence rate in the central and western regions has only increased to 5.56%. Compared with before the introduction of the internet development variable, the convergence rate of the cultural and creative industry efficiency gap among the provinces in the eastern region has increased by 20.41%, while the convergence rate of the cultural and creative industry efficiency gap among the provinces in the central and western regions has only increased by 1.28%, which verifies the hypothesis 3b.

Table 3. β Convergence test results of cultural and creative industry efficiency

Convergence coefficient	Nationwide		Eastern Region		Central and Western Regions	
	Absolute	Conditional	Absolute	Conditional	Absolute	Conditional
β	-0.1776*** (0.0327)	-0.2150*** (0.0326)	-0.2218*** (0.0342)	-0.2608*** (0.0415)	-0.1972*** (0.0446)	-0.1995*** (0.0431)
Internet development	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
Constant term	-0.0617*** (0.0132)	0.0038 (0.0207)	-0.0338** (0.0113)	-0.0129 (0.0175)	-0.0902*** (0.0196)	-0.0034 (0.0368)
Convergence rate	4.89%	6.05%	6.27%	7.55%	5.49%	5.56%
N	186	186	66	66	120	120

Note. * * * and * * respectively represent 0.1% and 1% significance level. The figures in brackets are standard errors.

DISCUSSION

This study takes China as the example. The entropy weighting method and global DEA-EBM model are used to scientifically evaluate and measure China's internet development level and cultural and creative industry efficiency. Consistent with the research conclusions of Dong et al. (2022), Huang and Jia (2022), Shah et al. (2024) and Tang and Xiu (2023), China's internet development is currently in a high-speed growth trend, but China's cultural and creative industry is operating relatively inefficiently, mainly owing to the inefficient use of cultural and creative industry input resources. On this basis, this study also uses the PVAR model and the β convergence model to quantitatively test whether internet development can promote the efficient and balanced development of regional cultural and creative industry. The study found that internet development has the capacity not only to effectively empower the production, dissemination, and consumption processes of the cultural and creative industry, thereby promoting the improvement of cultural and creative industry efficiency, but also to break through the restrictions on the cross-regional flow of cultural resources, promote the accelerated integration of inefficient cultural and creative industry regions into the cultural and creative industry value chain, and generate a competitive effect, thereby narrowing the cultural and creative industry efficiency gap among regions. However, because of the differences in the development levels of internet and cultural and creative industry, the driving effect of internet development on regional cultural and creative industry efficiency in the eastern region is significantly stronger than in the central and western regions.

In summary, this study quantitatively tests the relationship between internet development and cultural and creative industry efficiency from an empirical perspective, further enriching existing theories. However, this study also has some shortcomings. For example, existing research has fully explored the impact of economic development, capital investment, market demand, scientific and technological innovation, system reform, and policy support on cultural and creative industry efficiency. Will the above influencing factors have a significant moderating effect on the relationship between internet development and cultural and creative industry efficiency? If there is a significant moderating effect, will it be positive or negative? Answering these questions has important theoretical value and practical significance for the construction of a cultural power in the context of the digital age. Therefore, when conducting more in-depth research on the relationship between internet development and cultural and creative industry efficiency in the future, we will focus on which influencing factors will significantly moderate the relationship between internet development and cultural and creative industry efficiency.

CONCLUSION AND RECOMMENDATIONS

In this study, the entropy weighting method and the global DEA-EBM model were used to evaluate the internet development level and the cultural and creative industry efficiency in China in the period from 2016 to 2022. On this basis, the PVAR model was used to dynamically evaluate the empowering effect of internet development on cultural and creative industry efficiency, the β convergence model was constructed to test whether internet development can effectively drive the efficient and balanced development of regional cultural and creative industry, and the regional differences were fully considered. The conclusions are as follows:

- China's internet development shows a rapid growth trend during this period, but there is still much room for improvement, and the gap between regions is obvious. Compared to the central and western regions, internet development in the eastern region is obviously higher. However, China's cultural and creative industry efficiency has not achieved effective growth during this period, and it is still in a relatively inefficient state. Compared with insufficient output, excessive input is the main reason for the relatively low cultural and creative industry efficiency, which is more prominent in the central and western regions.
- Internet development can effectively promote the improvement of cultural and creative industry efficiency, but the effect has a short-term lag, and the improving effect on the eastern region is obviously stronger than that in the central and western regions.
- Internet development can accelerate the efficient and balanced development of regional cultural and creative industry in China. Although the efficiency gap among provinces in China is gradually narrowing and tends to converge, the convergence speed can be further improved under the impact of internet development. However, compared with the central and western regions, internet development has a significantly stronger impact on improving the convergence rate of the efficiency gap among provinces in the eastern region.

The above conclusions have obvious policy implications. First, the government departments in China should optimize the input–output structure of cultural and creative industry, not only to improve the input of cultural resources according to local conditions to reduce redundant input, but also to encourage the output of cultural resources in a classified way to make the output scale bigger and stronger so as to effectively improve the efficiency of the use of cultural resources. Second, government departments in China should increase investment in digital infrastructure, seize the opportunity of "new infrastructure," strengthen the research and development intensity of core technologies in digital fields, and at the same time strengthen the construction of underlying digital technologies so as to expand the digital coverage, effectively tap the technical dividend of internet development,

and give full play to the empowering effect of internet development on the efficient and balanced development of cultural industries. Third, the government departments in China should strengthen the deep integration of internet development and cultural and creative industry, not only to accelerate the digital transformation of cultural and creative industry, but also to blend digital technologies into the production, dissemination, and consumption of cultural and creative industry so as to promote the high-speed circulation of cultural elements, and to focus on local market demand and combine their own advantages to ensure the heterogeneity and standardization of cultural and creative industry.

COMPETING INTERESTS

The author of this publication declares there are no competing interests.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. Funding for this research was covered by the authors of the article.

PROCESS DATES

Received: 01/09/2025, Revision: 03/06/2025, Accepted: 03/14/2025

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