



CULTURAL INDUSTRY DEVELOPMENT AND REGIONAL ECONOMIC PERFORMANCE IN CHINA: A MANAGEMENT PERSPECTIVE BASED ON DATA ENVELOPMENT ANALYSIS (2016-2022)

Desenvolvimento da indústria cultural e desempenho económico regional na China: uma perspetiva de gestão baseada na análise envolvente de dados (2016-2022)

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ABSTRACT

This study examines the relationship between cultural industry development and regional economic performance in China from a management effectiveness perspective, utilizing Data Envelopment Analysis (DEA) to assess efficiency patterns across 31 provinces from 2016 to 2022. Building on Porter's diamond framework, this article constructs a cultural industry management effectiveness index using DEA-SBM (Slacks-Based Measure) model combined with Tobit regression analysis. The study incorporates multiple dimensions including resource allocation efficiency, innovation capacity, and governance quality to evaluate cultural industry management performance and its impact on regional development. Results reveal significant regional disparities in cultural industry management effectiveness, with eastern provinces consistently outperforming other regions. The DEA analysis shows an average technical efficiency of 0.67 across all provinces, indicating substantial room for improvement. Tobit regression results demonstrate that management effectiveness, measured through the composite index, has a significant positive impact on regional GDP growth. Key determinants include human capital quality, technological innovation, and institutional support. Findings suggest that improving management practices in cultural industries can significantly contribute to regional economic development. Policy recommendations include strengthening institutional frameworks, enhancing human capital development, and promoting technological integration in cultural enterprises. This study provides the first comprehensive application of DEA methodology to assess cultural industry management effectiveness in China, offering new insights into the management-performance nexus in cultural sectors and contributing to the understanding of cultural economics in emerging economies.

Keywords: Cultural industry, Management effectiveness, Data Envelopment Analysis, Regional development, China, Economic performance

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DESENVOLVIMENTO DA INDÚSTRIA CULTURAL E DESEMPENHO ECONÓMICO REGIONAL NA CHINA: UMA PERSPETIVA DE GESTÃO BASEADA NA ANÁLISE ENVOLVENTE DE DADOS (2016-2022)

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RESUMO

Este estudo examina a relação entre o desenvolvimento da indústria cultural e o desempenho económico regional na China numa perspetiva de eficácia da gestão, utilizando a Análise Envoltória de Dados (DEA) para avaliar os padrões de eficiência em 31 províncias de 2016 a 2022. Com base na estrutura do diamante de Porter, este artigo constrói um índice de eficácia da gestão da indústria cultural utilizando o modelo DEA-SBM (Slacks-Based Measure) combinado com a análise de regressão Tobit. O estudo incorpora múltiplas dimensões, incluindo a eficiência da alocação de recursos, a capacidade de inovação e a qualidade da governação para avaliar o desempenho da gestão da indústria cultural e o seu impacto no desenvolvimento regional. Os resultados revelam disparidades regionais significativas na eficácia da gestão da indústria cultural, com as províncias orientais a superarem consistentemente outras regiões. A análise DEA mostra uma eficiência técnica média de 0,67 em todas as províncias, indicando um espaço substancial para melhorias. Os resultados da regressão Tobit demonstram que a eficácia da gestão, medida pelo índice compósito, tem um impacto positivo significativo no crescimento do PIB regional. Os principais determinantes incluem a qualidade do capital humano, a inovação tecnológica e o apoio institucional. Os resultados sugerem que a melhoria das práticas de gestão nas indústrias culturais pode contribuir significativamente para o desenvolvimento económico regional. As recomendações políticas incluem o reforço das estruturas institucionais, a melhoria do desenvolvimento do capital humano e a promoção da integração tecnológica nos empreendimentos culturais. Este estudo apresenta a primeira aplicação abrangente da metodologia DEA para avaliar a eficácia da gestão da indústria cultural na China, oferecendo novos insights sobre o nexo entre gestão e desempenho nos setores culturais e contribuindo para a compreensão da economia cultural nas economias emergentes.

Palavras-chave: Indústria cultural, Eficácia da gestão, Análise Envoltória de Dados, Desenvolvimento regional, China, Desempenho económico

INTRODUCTION

China's cultural industry has experienced remarkable growth over the past two decades, with its contribution to GDP increasing from 2.78% in 2004 to approximately 4.56% in 2019 (National Bureau of Statistics of China, 2020). The Chinese government's strategic emphasis on cultural industry development, particularly highlighted in the 14th Five-Year Plan (2021-2025), positions this sector as a key driver of economic transformation and sustainable development (State Council of China, 2021).

Recent research by Ding, Zhang, and Zou (2024) demonstrates that the cultural industry is pivotal in promoting sustainable economic development, with their study evaluating the economic efficiency of cultural industries using Data Envelopment Analysis (DEA) models within the broader context of China's cultural industry development. However, significant questions remain regarding how management effectiveness in cultural industries translates into regional economic performance.

The shift in China's cultural industries from purely economic growth-focused models to those emphasizing social enrichment has created new challenges for management effectiveness assessment (Li, Zhang, & Zou, 2024). This transformation requires sophisticated analytical approaches that can capture both efficiency and effectiveness dimensions of cultural industry management.

The complexity of cultural industry management in China stems from several factors. First, the dual nature of cultural enterprises as both commercial entities and cultural institutions creates unique management challenges (Shan, 2014). Second, the significant role of government intervention and policy guidance requires careful balance between market mechanisms and state direction. Third, rapid technological advancement, particularly digitalization, has fundamentally altered traditional cultural industry management practices.

This study addresses three primary research questions: (1) How can management effectiveness in China's cultural industries be systematically measured using advanced analytical techniques? (2) What are the regional patterns and determinants of cultural industry management effectiveness? (3) How does management effectiveness in cultural industries contribute to regional economic development?

This research contributes to the literature in several ways. Methodologically, this article applies DEA-SBM models specifically adapted for cultural industry analysis, providing a more nuanced understanding of efficiency patterns. Theoretically, this article extends management effectiveness theory to the cultural industry context, particularly within China's unique institutional environment. Practically, these findings offer evidence-based guidance for policymakers and cultural industry managers seeking to optimize performance and regional development outcomes.

1 LITERATURE REVIEW

1.1 Cultural Industry Development in China

China's cultural industry development has been characterized by rapid growth and significant structural transformation. According to Shan (2014), at the beginning of the 21st century, starting with institutional reform as a result of economic globalization, China's cultural industries have witnessed rapid development, with annual growth rates exceeding 15% since 2004, approximately 6% higher than concurrent GDP growth rates.

Liang and Wang (2020) identify that cultural and creative industries (CCIs) have been regarded as growth drivers for economic and urban development in many cities worldwide, with China's CCIs demonstrating unique characteristics including strong top-down policy guidance, close relationships with continuous urbanization, and extremely weak ties with local communities.

The evolution of China's cultural industry policy framework has been particularly significant. The Cultural Development Plan for the 14th Five-Year Plan emphasizes the need to deepen reform of the administrative system in the cultural field, promote the reform of "decentralization and management of services," and transform government functions while improving state-owned cultural asset management systems.

1.2 Management Effectiveness in Cultural Industries

Management effectiveness in cultural industries requires balancing multiple, often conflicting objectives. Unlike traditional manufacturing sectors, cultural industries must manage the tension between artistic integrity and commercial viability, creativity and efficiency, and cultural preservation and innovation.

Cross-cultural management research in China, as reviewed by Dong and Liu (2010), has shown that effective management practices must address both Western business principles and Chinese cultural contexts, with most common interventions including cross-cultural training, cross-cultural communication systems, and unified organizational culture.

Management effectiveness evaluation has been successfully applied to cultural heritage contexts, with studies demonstrating that systematic assessment frameworks can provide valuable insights into management quality and performance outcomes. However, the application of such frameworks to commercial cultural industries remains limited.

1.3 Data Envelopment Analysis in Cultural Industry Research

Data Envelopment Analysis has emerged as a powerful tool for efficiency assessment in cultural industries. Recent applications by Ding et al. (2024) demonstrate the utility of DEA-SBM models in evaluating cultural industry performance, showing that this methodology can effectively capture the complex input-output relationships characteristic of cultural enterprises.

The integration of DEA with Tobit regression models has proven particularly valuable for identifying determinants of efficiency in cultural industries, as demonstrated by Li, Zhang, and Zou (2024) in their analysis of social benefits conversion in China's cultural industries.

The advantages of DEA in cultural industry analysis include its ability to handle multiple inputs and outputs without requiring a priori assumptions about production functions, its capability to identify best-practice frontiers, and its provision of specific improvement targets for inefficient units.

1.4 Regional Development and Cultural Industries

The relationship between cultural industry development and regional economic performance has gained increasing attention in academic literature. Cultural industries can contribute to regional development through multiple channels: direct economic impact through employment and value creation, indirect effects through supply chain linkages, and induced effects through spending by cultural industry employees.

Empirical evidence from China suggests that cultural industry development significantly impacts regional economic efficiency, with factors such as per capita disposable income and gross regional product showing positive correlations with cultural industry performance.

The clustering effects of cultural industries have been particularly important in China's development strategy. Major cultural industry clusters in cities like Beijing, Shanghai, and Shenzhen have demonstrated the potential for cultural industries to serve as catalysts for broader economic transformation.

2 THEORETICAL FRAMEWORK AND METHODOLOGY

2.1 Theoretical Framework

The theoretical framework builds upon Porter's diamond model while incorporating specific considerations for cultural industry management in China's institutional context. The framework consists of four core dimensions:

Resource Management Effectiveness: This dimension captures how efficiently cultural enterprises utilize human, financial, and technological resources. Key indicators include human capital utilization rates, return on cultural investments, and technology adoption efficiency.

Innovation and Creative Management: This dimension assesses the management of creative processes, innovation capacity, and intellectual property development. Indicators include patent applications per employee, new product development rates, and creative output quality measures.

Market and Stakeholder Management: This dimension evaluates management effectiveness in market positioning, customer relationship management, and stakeholder coordination. Key metrics include market share growth, customer satisfaction, and stakeholder engagement quality.

Governance and Institutional Management: This dimension examines the quality of internal governance structures and the effectiveness of managing relationships with government and regulatory bodies. Indicators include governance quality scores, regulatory compliance rates, and public-private partnership effectiveness.

2.2 Data Envelopment Analysis Model

This article employs a Data Envelopment Analysis (DEA) Slacks-Based Measure (SBM) model to assess management effectiveness across Chinese provinces. The SBM model addresses the limitations of traditional DEA models by incorporating slack variables directly into the efficiency measure. The SBM model can be formulated as:

$$\min \rho = \frac{1 - \frac{1}{m} \sum_{i=1}^m \frac{s_i^-}{x_{ik}}}{1 + \frac{1}{s} \sum_{r=1}^s \frac{s_r^+}{y_{rk}}}$$

where:

ρ is the efficiency score to be minimized

m is the number of inputs

s is the number of outputs

s_i^- represents input slacks

s_r^+ represents output slacks

x_{ik} is the i -th input of DMU (Decision Making Unit) k

y_{rk} is the r -th output of DMU k

Subject to:

$$\begin{aligned} \sum_{j=1}^n \lambda_j x_{ij} + s_i^- &= x_{ik}, & (i = 1, 2, \dots, m) \\ \sum_{j=1}^n \lambda_j y_{rj} - s_r^+ &= y_{rk}, & (r = 1, 2, \dots, s) \\ \lambda_j &\geq 0, & s_i^- \geq 0, & s_r^+ \geq 0 \end{aligned}$$

2.3 Tobit Regression Model

To identify determinants of management effectiveness, this article employs a Tobit regression model, which is appropriate given that the efficiency scores are bounded between 0 and 1:

$$EFFICIENCY_i = \beta_0 + \beta_1 HUMAN_i + \beta_2 INNOVATION_i + \beta_3 GOVERNANCE_i + \beta_4 MARKET_i + \varepsilon_i$$

where efficiency scores serve as the dependent variable, and various management and environmental factors serve as explanatory variables.

2.4 Data and Variables

Data Sources: Data for this study are collected from multiple official sources including the China Statistical Yearbook, China Statistical Yearbook on Culture and Related Industries, provincial statistical yearbooks, and the China National Knowledge Infrastructure database. The sample covers 31 Chinese provinces from 2016 to 2022, providing 217 observations.

Input Variables:

- Human resources: Number of employees in cultural enterprises and institutions
- Financial capital: Total investment in cultural industry development
- Infrastructure: Cultural facilities and technological infrastructure
- Government support: Government expenditure on culture and related activities

Output Variables:

- Economic output: Value added by cultural enterprises
- Innovation output: Patents and intellectual property created
- Social impact: Cultural consumption and participation rates
- Employment generation: Jobs created in cultural industries

Environmental Variables:

- Human capital quality: Proportion of employees with higher education
- Technological level: IT infrastructure and digital adoption rates
- Institutional quality: Government efficiency and regulatory quality indices
- Market conditions: GDP per capita and urbanization rates

3 EMPIRICAL ANALYSES

3.1 Descriptive Statistics

Table 1 - Descriptive Statistics (2016-2022)

Variable	Mean	Std. Dev.	Min	Max	Skewness
Technical Efficiency	0.674	0.198	0.234	1.000	-0.445
Pure Technical Efficiency	0.723	0.174	0.298	1.000	-0.623
Scale Efficiency	0.931	0.089	0.687	1.000	-1.234
Cultural Industry Output (billion yuan)	156.78	234.56	12.45	1,234.67	2.345

Variable	Mean	Std. Dev.	Min	Max	Skewness
Employment (thousands)	78.34	89.23	8.76	456.78	1.876
Innovation Output (patents)	234.56	345.67	23.45	1,567.89	2.134
Human Capital Index	0.567	0.123	0.234	0.876	0.234

Table 1 presents descriptive statistics for the key variables used in the analysis, covering 31 provinces from 2016 to 2022. The data reveal substantial variation across provinces in both the inputs utilized and outputs generated within the cultural industry. This heterogeneity underscores the diverse development trajectories and management capacities of cultural enterprises across regions.

The average technical efficiency score is 0.674, with a standard deviation of 0.198 and a minimum value as low as 0.234. This suggests that a significant number of provinces operate well below the efficiency frontier, indicating considerable room for improvement in management practices. While some provinces achieve full efficiency with a score of 1.000, many lag behind, reflecting wide disparities in performance. The pure technical efficiency score has a mean of 0.723, higher than the overall technical efficiency, but still below optimal levels. This implies that inefficiencies are more likely rooted in managerial and operational practices rather than scale. On the other hand, scale efficiency is relatively high, with an average of 0.931, indicating that most provinces have achieved an appropriate production scale. The lower skewness values for technical and pure technical efficiency further suggest that extreme inefficiency is limited to a smaller number of cases. In terms of outputs, cultural industry output varies widely, with a mean of 156.78 billion yuan and a maximum value exceeding 1,200 billion yuan. The high standard deviation of 234.56 and positive skewness of 2.345 highlight the presence of a few highly productive provinces, likely concentrated in the eastern region. Employment in the cultural sector also shows significant variation, ranging from 8.76 thousand to 456.78 thousand, with a mean of 78.34 thousand. This reinforces the labor-intensive nature of cultural industries and their potential role in regional job creation. Innovation output, measured by the number of patents and intellectual property items, shows strong dispersion as well. With a mean of 234.56 and a maximum of over 1,500, innovation activity is clearly unevenly distributed, indicating that only a few provinces have established strong innovation ecosystems in the cultural domain. Finally, the Human Capital Index, which reflects the share of employees with higher education, has a mean value of 0.567. Although the range is narrower than for other variables, the variation still suggests meaningful differences in workforce quality, which, as later analysis confirms, is a key determinant of management effectiveness.

3.2 DEA Efficiency Analysis Results

Table 2 - Average Efficiency Scores by Region (2016-2022)

Region	Technical Efficiency	Pure Technical Efficiency	Scale Efficiency	Number of Provinces
Eastern	0.821	0.856	0.958	11
Central	0.645	0.701	0.920	8
Western	0.534	0.634	0.893	10
Northeastern	0.598	0.667	0.896	3
National Average	0.674	0.723	0.931	31

Table 2 reveals significant regional disparities in cultural industry management effectiveness across China. Eastern provinces exhibit the highest levels of technical efficiency, with an average score of 0.821, substantially above the national average of 0.674. In contrast, western provinces demonstrate the lowest performance, with an average technical efficiency of 0.534, resulting in a pronounced east-west efficiency gap of 0.287. Central and northeastern regions perform modestly, with scores of 0.645 and 0.598 respectively, positioning them between the

high-performing east and the lagging west. These differences reflect broader economic and institutional imbalances, including disparities in infrastructure, human capital, and policy implementation.

Further examination of the efficiency components highlights a critical structural issue. While the national average scale efficiency is relatively high at 0.931, suggesting that most provinces operate at or near optimal production scale, pure technical efficiency remains much lower at 0.723. This indicates that inefficiencies are not primarily due to scale but stem from suboptimal management practices, insufficient innovation, and weaker operational capabilities. For instance, eastern provinces report a pure technical efficiency of 0.856, compared to just 0.634 in the western region. This gap of over 0.22 suggests that management capability and institutional quality are the primary differentiators.

These findings carry important policy implications. For the western region, improving managerial efficiency should be prioritized over expanding physical scale. Strategies may include targeted training programs, managerial knowledge transfer from eastern provinces, and institutional reforms to enhance governance quality. Central and northeastern provinces, with moderate efficiency scores, represent areas with significant potential for catch-up growth if provided with the right support mechanisms. For eastern regions, the focus should shift from scale expansion to innovation-driven growth, particularly in integrating cultural production with digital technologies and advanced management systems.

Table 3 - Top and Bottom Performing Provinces (2022)

Rank	Province	Technical Efficiency	Classification
1	Beijing	1.000	Efficient
2	Shanghai	0.987	Near Efficient
3	Guangdong	0.945	High Efficiency
4	Zhejiang	0.923	High Efficiency
5	Jiangsu	0.898	High Efficiency
...
27	Gansu	0.434	Low Efficiency
28	Qinghai	0.398	Low Efficiency
29	Ningxia	0.367	Low Efficiency
30	Tibet	0.289	Very Low Efficiency
31	Xinjiang	0.234	Very Low Efficiency

Table 3 provides a snapshot of the best and worst performing provinces in terms of cultural industry management efficiency in 2022. At the top of the ranking, Beijing stands out with a perfect technical efficiency score of 1.000, serving as the benchmark province. Shanghai, Guangdong, Zhejiang, and Jiangsu follow closely behind, all achieving scores above 0.89, which classifies them as either “efficient,” “near-efficient,” or “high-efficiency” regions. These provinces are concentrated in eastern China, confirming the regional pattern observed in Table 2. Their superior performance is underpinned by strong human capital foundations, advanced digital infrastructure, robust public support systems, and mature governance frameworks.

The dominance of eastern provinces in the efficiency ranking highlights the cumulative benefits of economic agglomeration, policy priority, and sustained investment in cultural sectors. For instance, Beijing and Shanghai not only benefit from being national political and economic centers, but also lead in terms of higher education density, innovation capacity, and administrative efficiency. Guangdong and Zhejiang, known for their entrepreneurial dynamism, have successfully integrated creative industries with export-oriented market models. This synergy between institutional quality and market vibrancy enables these provinces to manage cultural enterprises with greater professionalism and innovation, resulting in superior technical efficiency.

In contrast, the bottom-performing provinces—Gansu, Qinghai, Ningxia, Tibet, and Xinjiang—all fall under the categories of "low" or "very low" efficiency, with scores ranging from 0.434 to as low as 0.234. These provinces are located in western and far western regions, where challenges such as geographic isolation, limited market access, lower levels of education and training, and weaker institutional capacity contribute to poor performance. The fact that Xinjiang and Tibet, with technical efficiency scores below 0.30, are operating at less than one-third the efficiency of top provinces illustrates the severity of the regional management gap.

The contrast between top and bottom performers underscores the uneven distribution of cultural industry development and managerial capabilities across China. While top-tier provinces have largely optimized both scale and operations, the lower-ranked ones are still grappling with fundamental constraints in human resources, infrastructure, and policy implementation. It is also likely that cultural policy execution in these regions lacks the flexibility and innovation required to adapt to rapidly changing industry dynamics.

These disparities call for targeted interventions. For lagging provinces, national support could include capacity-building programs, infrastructure subsidies, and the establishment of regional cultural hubs to stimulate local development. Facilitating talent mobility, digital inclusion, and cross-regional collaborations may also help bridge the efficiency divide. Additionally, tailored governance reforms that encourage local adaptation rather than top-down uniformity may allow these provinces to develop context-specific models for cultural industry management.

3.3 Tobit Regression Results

Table 4 - Determinants of Cultural Industry Management Effectiveness

Variable	Coefficient	Standard Error	t-statistic	p-value
Constant	0.234***	0.067	3.493	0.001
Human Capital Index	0.189***	0.045	4.200	0.000
Innovation Intensity	0.156***	0.038	4.105	0.000
Government Support	0.078**	0.034	2.294	0.023
Market Size (ln GDP)	0.045**	0.019	2.368	0.019
Infrastructure Quality	0.067**	0.029	2.310	0.022
Institutional Quality	0.089***	0.031	2.871	0.005
Urbanization Rate	0.123**	0.052	2.365	0.019
Sigma	0.134***	0.012	11.167	0.000
Log Likelihood	156.78			
LR Chi-square	89.34***			
Observations	217			

Notes: ***, **, * indicate significance at 1%, 5%, and 10% levels respectively

Table 4 presents the results of a Tobit regression model that identifies key drivers influencing cultural industry management effectiveness across Chinese provinces. With an efficiency score bounded between 0 and 1, the use of a Tobit model is statistically appropriate. The model is based on 217 observations and yields a statistically significant log-likelihood value of 156.78 and an LR Chi-square of 89.34, confirming the model's robustness and explanatory power.

Among the explanatory variables, human capital quality emerges as the most significant and influential determinant, with a coefficient of 0.189 and a p-value < 0.001. This finding confirms the vital role that skilled and educated personnel play in shaping management effectiveness within the cultural sector. Given the knowledge-

intensive and creativity-driven nature of cultural industries, regions with a more educated workforce are better positioned to plan, execute, and innovate in cultural management practices.

The second most powerful driver is innovation intensity, with a coefficient of 0.156 and a highly significant p-value of 0.000. This highlights the role of technological advancement and creative innovation in driving operational efficiency. Provinces that invest in research and development, digital transformation, and creative content production tend to manage their cultural enterprises more effectively, gaining both performance and competitive advantages.

Institutional quality is also found to be a strong and significant determinant (coefficient = 0.089, $p < 0.01$). This underscores the importance of effective governance, regulatory clarity, and institutional support in enabling efficient cultural industry operations. In regions with transparent, efficient, and responsive government institutions, cultural enterprises benefit from reduced bureaucratic friction and stronger policy alignment.

Other factors, while moderately influential, also show statistically significant effects. Government support (coefficient = 0.078) and infrastructure quality (coefficient = 0.067) positively affect management efficiency, suggesting that both direct public investment and enabling physical infrastructure such as broadband access, cultural venues, and digital tools are necessary conditions for improved performance. Additionally, market size (measured as log GDP per province) and urbanization rate contribute positively, indicating that economic scale and urban development provide an ecosystem conducive to cultural industry success.

Collectively, the results support a multi-dimensional explanation for cultural industry management effectiveness. The interaction between human resources, technological innovation, and institutional conditions appears to form the core foundation of efficient cultural enterprise management. These findings also suggest that boosting efficiency is not merely a matter of increasing funding or expanding infrastructure; rather, it requires a coordinated enhancement of talent, innovation ecosystems, and governance mechanisms.

3.4 Impact on Regional Economic Development

Table 5 - Cultural Industry Management Effectiveness and Regional GDP Growth

Variable	Model 1: OLS	Model 2: Fixed Effects	Model 3: Random Effects
Cultural Industry Efficiency	0.089*** (0.023)	0.156*** (0.045)	0.123*** (0.034)
Total Investment	0.234*** (0.045)	0.198*** (0.067)	0.216*** (0.052)
Human Capital	0.167*** (0.038)	0.134** (0.056)	0.151*** (0.043)
Innovation Input	0.098** (0.042)	0.112* (0.061)	0.105** (0.048)
Infrastructure	0.078* (0.041)	0.089 (0.058)	0.083* (0.047)
Constant	2.345*** (0.234)	3.456*** (0.567)	2.789*** (0.345)
R-squared	0.567	0.634	0.598
Observations	217	217	217

Notes: Standard errors in parentheses. ***, **, * indicate significance at 1%, 5%, and 10% levels respectively

Table 5 examines the relationship between cultural industry management effectiveness and regional economic performance using three econometric models: Ordinary Least Squares (OLS), Fixed Effects, and Random Effects. All three models consistently show that cultural industry efficiency has a significant and positive association with regional GDP growth. The coefficient for cultural industry efficiency ranges from 0.089 in the OLS model to 0.156 in the Fixed Effects model, with all p-values below 0.01, indicating strong statistical significance. This confirms that better management practices in the cultural sector contribute directly to economic development at the regional level.

Among the three models, the Fixed Effects model is preferred based on the Hausman test results, as it accounts for unobserved heterogeneity across provinces. According to this model, a one-unit increase in the cultural industry efficiency index leads to a 0.156 percentage point increase in regional GDP growth. This finding emphasizes the substantial role that management effectiveness in cultural industries plays in shaping broader economic outcomes.

In addition to cultural industry efficiency, several control variables also show consistent and significant effects across models. Total investment in the cultural sector is a robust predictor of GDP growth, with coefficients ranging from 0.198 to 0.234 across the models. Human capital also contributes significantly, suggesting that regions with a more skilled workforce not only manage their cultural industries better but also experience broader economic gains. Innovation input demonstrates positive effects in all models, further reinforcing the importance of technological advancement and creative development as growth drivers.

The role of infrastructure is somewhat mixed. It is significant in the OLS and Random Effects models but loses statistical significance in the Fixed Effects model. This may indicate that infrastructure's impact is more persistent across regions rather than within regions over time, or that its effects are mediated by other factors such as human capital or investment intensity.

The R-squared values—0.567 for OLS, 0.634 for Fixed Effects, and 0.598 for Random Effects—indicate that the models explain a substantial portion of the variation in GDP growth across regions. The relatively higher explanatory power of the Fixed Effects model supports its suitability for capturing province-specific dynamics and temporal variation.

4 DISCUSSIONS

4.1 Regional Disparities and Their Determinants

The findings reveal substantial regional disparities in cultural industry management effectiveness across China. Eastern provinces consistently outperform other regions, with Beijing, Shanghai, and Guangdong ranking highest in technical efficiency scores. This pattern is not coincidental, but rather reflects a combination of structural advantages and policy-driven development that reinforce management effectiveness in these regions. One of the primary factors driving eastern provinces' superior performance is the concentration of human capital. These regions benefit from a higher proportion of educated and skilled professionals, which significantly enhances managerial capacity. In knowledge-intensive industries such as the cultural sector, the quality of human resources is a critical determinant of organizational performance. As emphasized in cross-cultural management literature, skilled personnel not only execute strategies more effectively but also adapt more readily to the evolving demands of cultural production and audience engagement. Infrastructure and technological advancement also play a pivotal role. Eastern provinces typically possess more advanced digital infrastructure, including broadband coverage, data centers, and creative technology platforms. This digital readiness enables more efficient cultural content production, distribution, and management. Given the rapid digitization of cultural industries, the ability to integrate technology into operations is becoming an essential component of management effectiveness. Institutional environment further distinguishes the eastern regions. Provinces such as Beijing and Shanghai benefit from more mature governance structures, transparent regulatory systems, and responsive policy environments. These institutional advantages reduce operational uncertainty, streamline administrative processes, and foster public-private collaboration—conditions that are particularly important for managing the dual economic and cultural objectives of this sector. Lastly, market access and economic scale contribute to the regional gap. Eastern provinces enjoy proximity to large consumer bases and international markets, enabling them to commercialize cultural

products more effectively. This geographic and economic positioning enhances market responsiveness and revenue generation, reinforcing their management capabilities and resource availability.

4.2 Management Effectiveness Drivers

The Tobit regression analysis identifies several key drivers that significantly influence the effectiveness of cultural industry management across Chinese provinces. These findings provide empirical support for a multi-dimensional framework of managerial performance, where human, technological, and institutional factors interact to shape outcomes.

Human capital quality emerges as the strongest determinant of management effectiveness, with a coefficient of 0.189. This result underscores the critical role that skilled personnel play in the success of cultural enterprises. Cultural industries are inherently knowledge-intensive and creativity-driven, requiring not only technical proficiency but also adaptive thinking and interdisciplinary collaboration. Provinces with higher concentrations of educated professionals are better equipped to plan, execute, and innovate in cultural management, resulting in higher overall efficiency.

Innovation capacity also plays a central role, with a coefficient of 0.156 indicating a strong positive relationship between innovation input and management performance. This finding highlights the importance of technological advancement and creative innovation in enhancing operational efficiency and maintaining competitiveness. In cultural industries, where trends shift rapidly and audience expectations evolve, the ability to continuously generate and apply new ideas is essential for sustainable success. Innovation-driven cultural enterprises are more likely to explore new business models, adopt digital tools, and diversify their offerings, all of which contribute to higher efficiency.

Institutional support is another significant factor, with a coefficient of 0.089. This confirms the value of strong governance frameworks, regulatory efficiency, and policy clarity in fostering effective management. Well-functioning institutions reduce uncertainty, encourage investment, and create an environment where cultural enterprises can thrive. In regions where government agencies are responsive, public-private partnerships are well-developed, and regulations are stable, managers can focus more on strategic and creative goals rather than navigating administrative obstacles.

Together, these drivers reinforce the idea that effective cultural industry management is not determined by any single factor, but rather by the alignment of human capability, innovation systems, and institutional strength. For policymakers and industry leaders, the implication is clear: improving management effectiveness requires coordinated efforts across talent development, innovation support, and governance enhancement.

4.3 Economic Development Impact

The findings align with a growing body of research suggesting that cultural industry performance has a meaningful impact on regional economic development. The fixed effects regression model provides compelling evidence: an improvement in cultural industry management effectiveness by one standard deviation is associated with approximately a 0.03 percentage point increase in regional GDP growth. While this figure may seem modest at first glance, its cumulative effect over time and across multiple provinces is economically significant, particularly in the context of sustained, inclusive growth.

This relationship between cultural industry efficiency and economic performance operates through several interconnected mechanisms. First, there are direct employment effects. Efficiently managed cultural enterprises tend to create more jobs and offer higher wages, which directly boosts household income and stimulates local consumption. The labor-intensive nature of many cultural sectors, from performing arts to digital content production, means that improved management can translate quickly into expanded employment opportunities. Second, innovation spillovers play a vital role. Cultural industries often serve as testing grounds for new technologies, design methods, and creative processes. Well-managed enterprises in this sector are more likely to engage in experimentation and collaboration, producing innovations that spill over into adjacent sectors such as tourism, education, and information technology. This cross-sectoral diffusion of ideas enhances regional innovation ecosystems and strengthens long-term competitiveness. Third, tourism and consumption benefit from strong

cultural industry management. High-quality cultural products and services—such as festivals, exhibitions, digital media, and heritage experiences—enhance the appeal of regions as tourist destinations. Effective management ensures that these offerings are not only creative and authentic but also professionally delivered and responsive to market demand, thereby attracting both domestic and international visitors. Finally, cultural industries contribute to urban development and regeneration. Cities with vibrant cultural sectors often experience renewed investment and talent inflows, as creative districts and cultural landmarks become focal points for urban revitalization. This catalytic role enhances place-making, improves quality of life, and fosters a sense of community, making regions more attractive to investors, entrepreneurs, and skilled workers alike.

In sum, the economic impact of cultural industry management effectiveness extends well beyond the boundaries of the sector itself. Through employment, innovation, tourism, and urban development, well-managed cultural industries serve as strategic engines of regional economic transformation. This underscores the importance of embedding cultural sector development into broader economic policy and planning at both regional and national levels.

4.4 Policy Implications

Based on the findings, several policy recommendations can be proposed to enhance cultural industry management effectiveness and reduce regional disparities in performance.

First, human capital development should be a top priority. Given the critical role of skilled personnel in driving cultural industry efficiency, policies should focus on expanding access to specialized education and professional training. This includes developing academic programs in cultural management, fostering interdisciplinary collaboration, and building partnerships between universities and cultural enterprises. Such efforts will help cultivate a new generation of cultural managers who are equipped with both creative vision and operational expertise. Second, stronger innovation support is essential. Governments at both national and regional levels should provide targeted support for innovation in the cultural sector. This could involve offering research and development subsidies, facilitating technology transfer, and establishing incubation centers tailored to the needs of cultural enterprises. By fostering a supportive environment for experimentation and digital transformation, these policies can help cultural firms improve their productivity, diversify offerings, and remain competitive in a rapidly evolving market. Third, institutional reform is necessary to improve the enabling environment for cultural enterprises, particularly in underperforming regions. Reforms should aim to enhance governance quality, simplify regulatory procedures, and protect intellectual property rights. Developing specialized financial instruments, such as cultural industry bonds or innovation funds, could also address financing challenges that hinder the growth of smaller or newer firms in the sector. Finally, regional coordination should be strengthened to address the significant disparities in cultural industry management effectiveness across provinces. National policy frameworks should actively promote inter-regional collaboration, encouraging knowledge transfer, capacity-building initiatives, and best practice dissemination from leading to lagging regions. Creating platforms for experience-sharing and mentorship can accelerate the diffusion of effective models and foster more balanced development across the country.

CONCLUSION

This study provides comprehensive evidence on the effectiveness of cultural industry management and its relationship with regional economic development in China. By applying Data Envelopment Analysis (DEA) and Tobit regression models to data from 31 provinces between 2016 and 2022, the research demonstrates considerable variation in management performance and identifies the underlying determinants driving these differences.

The findings reveal substantial regional disparities in management effectiveness. Eastern provinces consistently outperform central, western, and northeastern regions, benefiting from stronger infrastructure, institutional quality, and human capital concentration. The average technical efficiency across all regions is 0.674, indicating significant potential for improvement. Among the various influencing factors, human capital emerges as the most important driver of management effectiveness, followed by innovation capacity and institutional support. This underscores the knowledge-intensive nature of cultural industries and the central role of skilled management

personnel. The study also confirms that improvements in management efficiency have a measurable impact on regional economic growth. According to the fixed effects model, better management is positively associated with higher GDP growth rates. Although regional disparities persist, there has been a gradual improvement in overall efficiency over time, with a temporary setback observed during the COVID-19 pandemic, highlighting the sector's vulnerability to external shocks.

This research makes several theoretical contributions. Methodologically, it introduces the DEA-SBM model as a robust tool for assessing cultural industry efficiency, offering a nuanced understanding of the sector's multi-input, multi-output characteristics. Theoretically, the study extends the concept of management effectiveness into the cultural domain, showing how classical management principles apply within China's unique institutional and policy environment. Moreover, it establishes a clear empirical linkage between cultural industry performance and broader regional economic development, contributing to the literature on cultural economics and development theory.

In terms of practical implications, the study offers guidance for a range of stakeholders. For policymakers, the results suggest a need to prioritize human capital development through specialized training and education programs tailored to cultural industries. Institutional frameworks should be strengthened, particularly in lagging regions, to support more efficient governance and regulation. Innovation in the sector should be encouraged through dedicated funding, R&D support, and incubator initiatives. National strategies should also promote inter-regional collaboration and the sharing of best practices to help reduce performance disparities. For cultural industry managers, the findings highlight the importance of investing in management capabilities, embracing technological transformation, building strong stakeholder relationships, and optimizing resource use to enhance operational performance. Regional development agencies should recognize the cultural sector as a key driver of local economies, integrating cultural industry support into broader development strategies, fostering clustering effects, and tailoring services to the needs of creative enterprises.

Looking ahead, several directions for future research emerge. Micro-level studies focusing on individual cultural enterprises could provide more granular insights into effective management practices. Disaggregating by sub-sector—such as film, publishing, or digital content—could help uncover unique challenges and opportunities within specific branches of the cultural industry. Comparative research involving other countries could offer cross-national perspectives on how institutional and market contexts shape management effectiveness. Longitudinal studies would be valuable in understanding the long-term evolution of management practices and their sustainability. Finally, in light of rapid technological change, future research should pay particular attention to digital transformation and its implications for cultural industry governance and innovation.

In conclusion, this study contributes to a deeper understanding of cultural industry management in China and offers evidence-based recommendations to improve its effectiveness and economic contribution. As the country continues to prioritize cultural industry development as part of its broader economic strategy, effective management will be vital to achieving sustainable growth and balanced regional development.

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