



Research on The Relationship Between the Digital Transformation and The Efficiency of Regional Cultural Industry Development

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Abstract. This article explores the correlation between the digital transformation and the efficiency of regional cultural industry development using the provincial and enterprise data in China from 2013 to 2020. The followings are concluded: Firstly, the degree of industrial digital transformation has significantly positive effect on the efficiency of regional cultural industry development. Secondly, in more economically developed areas, the role of industrial digital transformation in promoting the innovation efficiency of cultural industry is more obvious. Thirdly, in the areas with higher proportion of cultural industry investment, the role of industrial digital transformation in promoting the innovation efficiency of cultural industry is more obvious.

Keywords: Cultural industry; Digital transformation; Development efficiency; Economic development; Industrial investment.

1 Introduction

The past decade has witnessed the rapid development of digitization in many fields. Currently, it is universally acknowledged that the influences from digitization and its transformation become apparent when combining it with China's cultural industry. The position of economic values is to exert Chinese characteristics in cultural field as one of the most effective estimations^[1]. In China, the economic prosperity in cultural industry should be evaluated on innovation, coordination, open and sharing aimed to assess the economic promotion of the cultural industry^[2].

Indeed, digital reforms bring high-qualified promotions to the economic values for the cultural industry since 19th National Congress of the Communist party of China^[3]. The digital economy plays a vital role under the new normal in China, and it will motivate the economic extra values by forming creative departments and generating various business contributing to an interaction between digitization and the traditional industries related to the culture part^[4]. Specifically, there is a new economic growth for cultural demand coming from digital economy, which means digital economy is upgrading the traditional cultural industries and then change it into consumption and

production through data and technology^{[5][11]}. Furtherly, there is an increasing trend of the scales, the layouts and the co-ordinations between provinces on the construction of public cultural undertakings^[6]. Similarly, the digital techniques enhance the quantity and quality of market supply through reducing the thresholds while decrease the searching cost of market demand via big data information, which makes it possible to an economic boost^{[7][12]}.

Some detailed performances are verified to prove digital transformation affecting the cultural industry as a positive catalyst. It is mentioned that the digital economy significantly increases the level of the cultural industry in high quality through dividing three districts of China, the benefits from digital economy are unequally prone to the eastern area of China, which is consistent with this research^[8]. Similarly, digital economy improves the managing skills for businesses like reducing the producing cost, it will then maximize the allocative efficiency on different resources in cultural industries^{[9][10]}.

2 Data and Methods

The target of this article is to find the correlation between the digital transformation and the efficiency of regional cultural industry development using the following economic model:

$$Y_{it} = \alpha X_{it-1} + \beta Z_{it-1} + \delta_t + \varepsilon_{it} \tag{1}$$

In the formula, *i* and *t* represent the province and the year respectively. Y_{it} is the dependent variable which is the efficiency of regional cultural industry development. This article uses the DEA model to calculate the efficiency of regional cultural industry development. X_{it-1} is the independent variable which is the degree of regional industrial digital transformation. This article uses the natural logarithm of the expenditures for technological acquisition and transformation of industrial enterprises above designated size to measure the degree of regional industrial digital transformation. In addition, Z_{it-1} is the control variable that includes the growth rate of regional GDP, the regional per consumption expenditure on culture, the proportion of expenditure on cultural industry in regional fiscal expenditure. Finally, ε_{it} is the residual term that measures the other factors affecting the dependent variable. The detailed variable definitions are shown in Table 1.

Table 1. Definitions of variables

Variable	Symbol	Calculation method
Development efficiency of regional cultural industry	DEA	The index calculated by the DEA model, in which the output is the revenue of regional cultural industry and the input includes the number of regional cultural institutions, the scale of regional cultural industry and the cultural industry investment
Degree of regional industrial digital transformation	IDT	The natural logarithm of the expenditures for technological acquisition and transformation of industrial enterprises above designated size

Regional economic development	GDP	The Natural logarithm of the gross domestic product of province i in year t
Growth rate of regional economic development	Δ GDP	Δ GDP _{it} =(GDP _{it} - GDP _{it-1}) / GDP _{it-1}
Per consumption expenditure on culture	Exp	The per consumption expenditure on culture of province i in year t
Investment in fixed assets of cultural industry	Asset	The natural logarithm of the investment in fixed assets of regional cultural industry
Proportion of expenditure on cultural industry in fiscal expenditure	Ratio	The proportion of expenditure on cultural industry in fiscal expenditure of province i in year t

Table 2 is a statistical description of the variables. It is revealed that the mean, minimum and maximum of DEA is 0.970, 0.895 and 1.000, which illustrates that the development efficiency of cultural industry in most provinces are more than 0.95. Moreover, the mean, minimum and maximum of IDT is 13.443, 2.485 and 16.229, which shows that the degree of industrial digital transformation varies greatly among provinces. Finally, the mean, minimum and maximum of Ratio is 0.460, 0.260 and 0.840 illustrating that the average proportion of expenditure on cultural industry in fiscal expenditure of province is 46.000%.

Table 2. Descriptive statistics of variables

Variable	Obs	Mean	SD.	Min	Max
DEA	248	0.970	0.025	0.895	1.000
IDT	246	13.443	1.832	2.485	16.229
Δ GDP	248	7.163	2.560	-5.000	12.500
Exp	248	7.756	0.298	6.537	8.612
Ratio	248	0.460	0.117	0.260	0.840
GDP	248	9.821	0.968	6.704	11.615
Asset	248	14.957	1.768	10.596	18.184

3 Results and Discussion

Empirical results are known in this part. The first step is the descriptive analysis. It is found that the cultural industry in Beijing has the highest efficiency of development in China from 2018 to 2020. In fact, Beijing is indeed a famous historical and cultural city in China. Tianjin, Fujian and Hainan provinces have been among the top five cities in China for three consecutive years. For Shanghai, Guangdong, Jiangsu and Zhejiang, the efficiency of the cultural industry development is not as good as economic performance. Moreover, the degree of industrial digital transformation in Guangdong province has always ranked first in China. In addition, Shanghai and Jiangsu have ranked among the top three in the country for three consecutive years. Zhejiang has ranked among the top five in the country for three consecutive years. In summary, the degree of industrial digital transformation is positively correlated with the level of local economic development (figures are omitted by the layout).

The table 3 below shows the regression result of the degree of regional industrial digital transformation to the efficiency of the cultural industry development. The column (1) is the result without the control variables. From the column (1), we know that the coefficient of IDT is 0.083 with the t-value is 3.20, which illustrates that the

efficiency of cultural industry development is positively correlated with the degree of industrial digital transformation. The column (2) is the result with the control variables. From the column (2), we find that the coefficient of IDT is 0.082 with the t-value is 2.60, which illustrates that the efficiency of regional cultural industry development is also positively correlated with the degree of industrial digital transformation.

Table 3. Degree of industrial digital transformation and efficiency of cultural industry development

	OLS (1)	OLS (2)
	DEA	DEA
IDT	0.083*** (3.20)	0.082*** (2.60)
ΔGDP		0.000 (0.00)
Exp		0.060 (0.37)
Ratio		-0.005 (-0.02)
Year Fixed Effect	Yes	Yes
Adj-R2	0.2263	0.2391
Obs	246	246

Note: *, ** and *** indicate significance at 10%, 5% and 1% levels. T-values are in parentheses.

Table 4 is the regression result on the effect of level of regional economic development on the mechanism of the industrial digital transformation influencing the efficiency of cultural industry development. From the column (1), we find that the coefficient of the IDT is 0.041 with the t-value is 3.91 and the coefficient of the cross item is 0.049 with the t-value is 3.86, which illustrates that China’s GDP can amplify the positive effect of the degree of industrial digital transformation on the efficiency of regional cultural industry development. The column (2) is the result with the control variables. From the column (2), we find that the IDT and the cross item are both significantly correlated with the efficiency of cultural industry development.

Table 4. Level of economic development, degree of industrial digital transformation and efficiency of cultural industry development

	OLS (1)	OLS (2)
	DEA	DEA
IDT	0.041*** (3.91)	0.044*** (4.09)
IDT×GDP	0.049*** (3.86)	0.051*** (3.96)
GDP	0.036* (1.93)	0.041** (2.10)
ΔGDP		0.000 (0.00)
Exp		0.166 (1.09)
Ratio		0.077 (0.31)
Year Fixed Effect	Yes	Yes
Adj-R2	0.4909	0.5227
Obs	246	246

Note: *, ** and *** indicate significance at 10%, 5% and 1% levels. T-values are in parentheses.

Table 5 is the regression results of the effect of the proportion of regional cultural industry investment on the mechanism of industrial digital transformation affecting the efficiency of cultural industry development. From the column (1), we see that the coefficient of the IDT is 0.022 with the t-value is 3.92, which illustrates that the DEA is positively with the IDT. The coefficient of the cross item is 0.017 with the t-value is 3.56, which means that the Asset can amplify the positive effect of the degree of industrial digital transformation on the efficiency of cultural industry development. The column (2) is the result with the control variables. From the column (2), we find that the results have no obvious changes.

Table 5. Proportion of cultural industry investment, degree of industrial digital transformation and efficiency of cultural industry development

	OLS (1)	OLS (2)
	DEA	DEA
IDT	0.022*** (3.92)	0.026*** (3.89)
IDT×Asset	0.017*** (3.56)	0.019*** (3.55)
Asset	0.064 (0.88)	0.088 (1.12)
ΔGDP		-0.005 (-0.18)
Exp		0.166 (1.10)
Ratio		0.157 (0.75)
Year Fixed Effect	Yes	Yes
Adj-R2	0.5844	0.6100
Obs	246	246

Note: *, ** and *** indicate significance at 10%, 5% and 1% levels. T-values are in parentheses.

4 Conclusions

This research applies the economic models to discover the correlation between the efficiency of regional cultural industry development and the degree of industrial digital transformation. Firstly, the degree of industrial digital transformation has significantly positive effect on the efficiency of regional cultural industry development. Secondly, in more economically developed areas, the role of industrial digital transformation in promoting the innovation efficiency of cultural industry is more obvious. Thirdly, in the areas with higher proportion of cultural industry investment, the role of industrial digital transformation in promoting the innovation efficiency of cultural industry is more obvious. Fourthly, the control variables such as the gross domestic product, the

consumption expenditure on cultural industry and the proportion of cultural industry investment have no effect on the efficiency of cultural industry development.

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