

# Correlation Analysis of Cultural Industry in Gansu Province\*

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**Abstract**—According to the input-output table of Gansu Province in 2012, the basic input-output flow table of four departments was drawn up to analyze the input-output, mainly including forward correlation and backward correlation analysis, ripple effects analysis, etc. The research results show that the cultural industry in Gansu Province has relatively general relations with the second and third industries, the cultural service industry has relatively weak dependence on the second and third industries, and the cultural industry has obviously failed to become the pillar industry in Gansu Province. This paper proposes that Gansu should give full play to the basic advantages of cultural characteristics and focus on the development of cultural industry to promote the rapid development of Gansu's national economy.

**Keywords**—cultural industry; input-output; correlation effects; ripple effects

## I. INTRODUCTION

As an important sector of the national economy, the cultural industry not only needs to guarantee the residents' material and cultural life, but also support China's economic transformation and upgrading, which plays a unique role in promoting the development of the national economy. After The Cultural Industry Revitalization Plan was introduced, the cultural industry has gradually become a strategic industry in China. The report on the 19th National People's Congress of CPC pointed out that we are going to build a socialist cultural power, and Gansu Province focuses on the development of cultural industry in recent years, although Gansu has rich cultural resources as well as a group of cultural brands which have great influences nationwide such as journal Readers, the cultural industry still falls behind comparing with other industries in Gansu. Therefore, it is of theoretical and practical significances to study and analyze the correlation effects and ripple effects of Gansu cultural industry, which can provide reference for formulating the development policy of cultural industry in the future.

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## II. RESEARCH METHODS AND DATA DESCRIPTION

### A. Input-output Model

The input-output model, proposed by the famous American economist Vassily Leontief, is a scientific method to analyze the interdependence between industries in the national economic system. The basic steps of using the input-output model for analysis are as follows: first, collect the input-output data of various industries, and draw up input-output table accordingly. Secondly, build the input-output model, according to the vertical and horizontal balance relations existing in the input-output table. Finally, carry out economic analysis based on the input-output table and related mathematical methods guiding by research purpose. Input-output model is able to clearly depict both relationship between the consumption of requirement and distribution supply, and ripple effects of different industries that how deep one industry can influence another, it is the most common model used to do academic analysis of industrial structure and economic effect currently. This article will use relevant concepts of input and output to analyze the correlation effects of cultural industry in Gansu Province, and the calculation formula of main measure index is given below.

1) *Direct distribution coefficient*: The direct distribution coefficient refers to the proportion of the products, which a department distributed (provided) to all departments as productive use and society as final use, in the total amount of products of that department. The calculation formula is as follows:

$$h_{ij} = \frac{Z_{ij}}{X_i} \quad (i, j = 1, 2, 3, \dots, n)$$

Where  $h_{ij}$  represents the direct distribution coefficient,  $Z_{ij}$  represents the direct consumption of the products from the number "i" department consumed by the number "j" department, and  $X_i$  represents the total output.

2) *Complete Distribution Coefficient*: The complete distribution coefficient refers to the synthesis of the direct distribution relationship and the indirect distribution

relationship of each department. The calculation formula is as follows:

$$G = (I - H)^{-1} - I$$

Where “H” is the direct distribution coefficient matrix, “I” refers to the identity matrix, and “G” stands for the complete distribution coefficient matrix.

3) *Direct consumption coefficient*: Direct consumption coefficient refers to the direct consumption of a product consumed in creating unit product in an industry. The calculation formula is as follows:

$$a_{ij} = \frac{Z_{ij}}{X_j} \quad (i, j = 1, 2, 3, \dots, n)$$

Where  $a_{ij}$  is the direct consumption coefficient,  $Z_{ij}$  refers to the direct consumption of the products from the number “i” department consumed by the number “j” department, and  $X_j$  is the total input.

4) *Complete consumption coefficient*: The complete consumption coefficient can be obtained on the basis of the direct consumption coefficient:

$$B = (I - A)^{-1} - I$$

Where “A” is direct consumption coefficient matrix, ‘I’ is unit matrix, and “B” is complete consumption coefficient matrix.

5) *Influence coefficient*

$$F_j = \frac{\sum_{i=1}^n \bar{b}_{ij}}{\frac{1}{n} \sum_{j=1}^n \sum_{i=1}^n \bar{b}_{ij}} \quad (j=1, 2, 3, \dots, n)$$

Where  $\bar{b}_{ij}$  is the element of the matrix  $(I - A)^{-1}$ , and the influence coefficient refers to the extent of the impact to the productive requirement of each department in national

economy, when some product department of the national economy adds a unit of final product. The larger the coefficient is, the greater the pulling effect of the industry on other industries will be. On the contrary, it indicates that it has little pulling effect on other industries.

6) *Induction coefficient*

$$E_i = \frac{\sum_{j=1}^n \bar{b}_{ij}}{\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n \bar{b}_{ij}} \quad (i = 1, 2, 3, \dots, n)$$

Where  $\bar{b}_{ij}$  is the element of the matrix  $(I - A)^{-1}$ , and the induction coefficient refers to the degree of requirement induction accepted by some department, when each department of national economy adds a unit of final use for each time, that is, the output quantity that this department needs to provide for the production of other departments. A large coefficient indicates that the department has a strong sense of requirement towards economic development; on the contrary, it indicates a weak sense of requirement.

B. *The Data Shows*

This paper adopts the 2012 input-output table of the 139 department issued by the Gansu Provincial Bureau of Statistics, combined with the newly revised Cultural and Related Industries Classification (2018) issued by the National Bureau of Statistics. On the basis of dividing the cultural industry into cultural manufacturing and cultural services (see "Table I"), it is then consolidated into a four-sector input-output table. The five sectors are: the primary industry, the cultural industry, the secondary industry, the tertiary industry except the cultural industry, and the cultural industry. From this, the basic flow table of the four sectors of the input and output table of Gansu Province in 2012 can be obtained, as shown in "Table II".

TABLE I. CLASSIFICATION OF CULTURAL INDUSTRIES

Number	Cultural manufacturing industry	Number	Cultural service industry
1	papermaking	8	Education
2	Print and record media reproductions	9	Health
3	Culture, education, art, sports and entertainment	10	News and publishing
4	Coatings, inks, pigments and similar products	11	Radio, television, film and film recording production
5	Radio and television equipment and radar and ancillary equipment	12	Social work
6	Audiovisual equipment	13	Culture
7	Culture, office machinery	14	Physical education
		15	Entertainment
		16	Telecommunications and other information transmission services
		17	Software and information technology services

**TABLE II. BASIC FLOW TABLE OF FOUR SECTORS OF INPUT AND OUTPUT IN GANSU PROVINCE IN 2012**

	<b>Primary industry</b>	<b>Secondary industry(excluding cultural industries)</b>	<b>Tertiary industry (excluding cultural industries)</b>	<b>Culture industry</b>	<b>Total output</b>
<i>Primary industry</i>	1622990.363	2372193.998	345079.7547	9800.498985	13307395.3
<i>Secondary industry(excluding cultural industries)</i>	3385318.333	58586286.91	5078112.055	1920021.477	97191072.47
<i>Tertiary industry (excluding cultural industries)</i>	475613.6232	9691590.893	7069592.368	1142754.904	33267312.21
<i>Culture industry</i>	16336.98106	765303.6531	2818757.3	1219846.22	9334860.001
<i>Total investment</i>	13307395.3	97191072.47	33267312.21	9334860.001	

<sup>a</sup> Data source: Calculated according to the Gansu Province 2012 Input-Output Table

### III. EMPIRICAL ANALYSIS

Analysis of the Correlation Effect of Cultural Industry in Gansu Province Industrial linkage refers to the interrelationship and dependence between industries through the supply and demand of products. The degree of association between industries is measured by the degree of relevance, and the degree of association between the two industry sectors is indicated according to the degree of industrial relevance. If the industrial relevance is greater than the average industrial relevance, there is a close relationship between the two industrial sectors. The industrial relevance can be divided into forward association and backward linkage from the perspective of association, which are expressed by the distribution coefficient and the consumption coefficient respectively.

#### A. Forward Correlation Effect

The forward correlation degree is measured using the direct allocation coefficient and the full allocation coefficient. The input and output tables of the 5 departments that have been compiled are calculated according to formulas (1) and (2), as shown in "Table III" and "Table IV". The direct distribution coefficient reflects the direct dependence of the downstream industry on the industry. The direct distribution coefficient of the cultural industry indicates the share of the industry in each sector of the cultural industry and other

sectors. It can be seen from "Table III" that there is a clear dependence between the cultural industry and the tertiary industry that excludes culture. The average coefficient of direct distribution among industries in Gansu Province is 0.52634306, and the direct distribution coefficient of cultural industry to the tertiary industry that excludes cultural industries is 0.301960319, which is smaller than the direct distribution average coefficient. The complete distribution coefficient of the cultural industry is a comprehensive reflection of the direct distribution relationship and indirect distribution relationship of the cultural industry to various departments. From "Table IV", the cultural industry has played a certain supporting role in the elimination of the second and third industries of the cultural industry. The average value of the complete distribution coefficient is 1.473019441, and the complete distribution coefficient of the cultural industry to the secondary industry excluding the cultural industry is 0.624485508053608 and is the maximum value. The complete distribution coefficient for itself is 0.1841657924083, which is the tertiary industry that excludes the cultural industry. The complete distribution coefficient is 0.496656873362406, and the complete distribution coefficient of the cultural industry to other industries is less than the average, indicating that the cultural industry is weak.

**TABLE III. DIRECT DISTRIBUTION FACTOR FOR THE FOUR SECTORS**

	<b>Primary industry</b>	<b>Secondary industry (excluding cultural industries)</b>	<b>Tertiary industry (excluding cultural industries)</b>	<b>Culture industry</b>
<i>primary industry</i>	0.121961535	0.178261331	0.025931427	0.00073647
<i>Secondary industry(excluding cultural industries)</i>	0.034831577	0.602794942	0.05224875	0.019755122
<i>Tertiary industry (excluding cultural industries)</i>	0.014296725	0.291324734	0.212508673	0.034350683
<i>Culture industry</i>	0.001750105	0.08198341	0.301960319	0.130676434

TABLE IV. COMPLETE DISTRIBUTION FACTOR FOR THE FOUR SECTORS

	Primary industry	Secondary industry (excluding cultural industries)	Tertiary industry (excluding cultural industries)	Culture industry
<i>Primary industry</i>	0.163613154	0.587521183	0.08406912	0.017658961
<i>Secondary industry (excluding cultural industries)</i>	0.112233325	1.738414877	0.212502985	0.070721652
<i>Tertiary industry (excluding cultural industries)</i>	0.064181079	1.050956488	0.371659286	0.07813716
<i>Culture industry</i>	0.03522032	0.624485508	0.496656873	0.184165792

**B. Backward Correlation Effect**

The direct consumption coefficient and the complete consumption coefficient are used to represent the backward correlation effect, and the direct consumption coefficient represents the direct value of a product consumed per unit of product produced. The large direct consumption coefficient means that the industry has a strong pulling effect on other industries. The complete consumption factor is the sum of direct and indirect consumption of another product when producing one unit of end-use product, and its size reflects the strength of the integrated pulling action.

From "Table V" and "Table VI" calculated according to formula (3) and formula (4), the cultural industry's pulling effect on the secondary and tertiary industries is higher than the average level in other industries. The average direct consumption coefficient of each industry is 0.517050547. The direct consumption coefficient of the cultural industry

for the second industry excluding the cultural industry is 0.20568294, followed by the direct consumption coefficient of 0.1306764343, and the cultural industry rejects the cultural industry. The direct consumption coefficient of the secondary industry is greater than the average. From "Table VI", the comprehensive driving of the secondary and tertiary industries in the cultural manufacturing industry is generally the average value of the total consumption coefficient between the industries is 1.44916166, the cultural industry for itself and the second and third industries that exclude the cultural industry. The complete consumption factor is less than the average. The total consumption coefficient of the cultural industry to the secondary industry excluding the cultural industry is 0.7363274015, which is 3.57 times of its direct consumption coefficient, followed by the complete consumption coefficient of the tertiary industry excluding the cultural industry. 0.2784630189 is 2.27 times of the direct consumption coefficient.

TABLE V. DIRECT CONSUMPTION FACTOR FOR FOUR SECTORS

	Primary industry	Secondary industry (excluding cultural industries)	Tertiary industry (excluding cultural industries)	Culture industry
<i>Primary industry</i>	0.121961535	0.02440753	0.010372938	0.001049882
<i>Secondary industry (excluding cultural industries)</i>	0.25439376	0.602794942	0.152645697	0.205682943
<i>Tertiary industry (excluding cultural industries)</i>	0.03574055	0.099716884	0.212508673	0.122418001
<i>Culture industry</i>	0.001227662	0.007874218	0.084730539	0.130676434

TABLE VI. FOUR DEPARTMENTS COMPLETE CONSUMPTION COEFFICIENT

	Primary industry	Secondary industry (excluding cultural industries)	Tertiary industry (excluding cultural industries)	Culture industry
<i>Primary industry</i>	0.163613154	0.080443362	0.033628837	0.025173893
<i>Secondary industry (excluding cultural industries)</i>	0.819700395	1.738414877	0.620831429	0.736327402
<i>Tertiary industry (excluding cultural industries)</i>	0.160447026	0.359729518	0.371659286	0.278463019
<i>Culture industry</i>	0.024706319	0.059979632	0.139362698	0.184165792

**C. Ripple Effect Analysis**

The industrial ripple effect can be expressed by two measurement indicators: the influence coefficient and the sensitivity coefficient. The influence coefficient is greater than 1, indicating that the influence and spread of the

industry on other industries is greater than the average social influence. If the sensitivity coefficient is greater than 1, it indicates that the promotion of the department to other departments is greater than the social average. It can be seen from "Table VII" that the influence and sensitivity of the cultural industry are almost the same, and the cultural

industry has not become a key sector of the national economy. The sensitivity coefficient of the whole cultural industry is 0.7615973511, which is still less than the second and third industries that exclude the cultural industry. The

influence coefficient of the cultural industry is 0.7262617547, which is only higher than the first industry. It is not obvious to other industries.

TABLE VII. INDUCTION AND IMPACT FACTORS FOR THE FOUR SECTORS

Coefficient	Primary industry	Secondary industry(excluding cultural industries)	Tertiary industry(excluding cultural industries)	Culture industry
Reaction coefficient	0.641118717	1.635270568	0.962013364	0.761597351
Influence coefficient	0.71994368	1.674033331	0.879761234	0.726261755

#### IV. CONCLUSIONS AND SUGGESTIONS

##### A. Conclusions

This paper analyzes the input and output tables of the 4 sectors of the cultural industry in Gansu Province in 2012, and draws the following conclusions:

1) *The cultural industry in Gansu Province is closely related to the secondary and tertiary industries:* The distribution coefficient and consumption coefficient of the cultural industry to the secondary and tertiary industries are in a medium condition. The cultural manufacturing industry consumes some products of the secondary industry and provides certain products for the tertiary industry. Therefore, the cultural industry is responsible for the secondary and tertiary industries. Development has played a certain role but not big.

2) *Gansu Province's cultural service industry is weakly dependent on the secondary and tertiary industries:* The direct consumption coefficient and direct distribution coefficient of the cultural industry to the tertiary industry are far less than the average level, and the total consumption coefficient and the complete distribution coefficient are also smaller than the industrial association average. Therefore, the cultural industry is weakly dependent on the secondary and tertiary industries.

3) *The cultural industry has not become a pillar industry in Gansu Province:* The cultural industry in Gansu Province generally exhibits the characteristics of "low impact and low sensitivity", and it has not been able to effectively promote the development of the national economy of Gansu Province. Therefore, although Gansu Province has cultural advantages, the cultural industry has not become a pillar industry in Gansu Province, and the development of cultural industry needs to be strengthened.

##### B. Suggestions

1) *Accelerating the supply-side structural reform and focus on the development of cultural industries:* The development of cultural industry in Gansu not only depends on the development between industries, but also on the development between industries. At present, the driving role of Gansu cultural industry is relatively slow, and the driving role of cultural industry is relatively backward. Therefore, it

is imperative to speed up the supply side structure. Sexual reform, focus on the development of cultural industries, build Gansu cultural characteristic industries, and increase the development of Gansu's characteristic tourism, radio media, film and television and other cultural service industries, so that it can effectively exert the role of cultural industries in the national economy.

2) *Increasing the intensity of resource integration and enhance the level of agglomeration development:* While developing cultural service industry and cultural manufacturing industry, we cannot separate the two. We must increase resource integration, promote overall development, and integrate development with other related industries, improve the mechanism of industrial integration and develop new cultural products. The industry standard system is to build a demonstration base for industrial integration and development, in order to extend the cultural industry chain. In addition, we will increase the cultivation of cultural innovation and sharing concepts, and strive to build a nationally renowned cultural brand, enhance the cultural industry structure and development vitality, and accelerate the transformation and upgrading of the cultural industry.

#### REFERENCES

- [1] Yang Yuxin, Zhang Shengping. Empirical Analysis and Industrial Policy of China's Industrial Correlation [J]. *Management World*, 1993(05): 39-46+225
- [2] Mei Guoping, Gan Jingyi, Zhu Qingyi. Jiangxi cultural industry development evaluation and development path research [J]. *Jiangxi Social Sciences*, 2014, (11): 52 - 56.
- [3] Jiang Ping, Wang Yong. Research on Input and Output Efficiency of Full-calibre Chinese Cultural Industry — Based on Analysis of Three-stage DEA Model and Super Efficiency DEA Model[J]. *Quantitative Economics & Technology Economics*, 2011, 28(12): 69-81
- [4] Guo Yimeng, Wan Miao. Analysis of input and output of cultural industry in Sichuan Province [J]. *Technological innovation and application*, 2014, (36): 43-45.
- [5] Liang Feng. Research on the development model of cultural industry in Chongqing [D]. Chongqing: Master's thesis of Chongqing Technology and Business University, 2010.