

# Technological structure determination of Chinese creative cultural product export

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## Abstract

This paper adopts Technology Content Index and Relative Technological level Index to determine export structure of Chinese creative cultural products in the past decade. The results show that creative cultural products exported from China are mainly of middle or low technology content; the overall technological level of export structure of creative cultural products is lower than the world level, which has not been improved for a long period of time. Therefore, China should strengthen originality and technological innovation, bring cultural resources into full play, and further optimize industrial and export structure of creative cultural industries.

*Keywords:* Creative Cultural Products, Technology Content, Trade Structure

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## 1 Introduction

With the great adjustment of world's industrial structure and range, knowledge-or technology-intensive industries have increasingly become the focus of a country's development, and creative capital centering on knowledge creation has gradually become a key force of a country's core competitiveness. The creative cultural industry characterized by high technology, high added value, non-pollution and high demand elasticity, having shown its cutting edge in the profound adjustment of world's industrial structure, has therefore been considered by many scholars as a new round of industrial wave following manufacturing and IT industry.

With the rapid development of creative industries, studies on creative industries keep deepening. Chinese scholars have conducted in-depth studies on competitiveness of creative industries. Qu Guoming (2012), according to studies based on revealed comparative advantage index and trade competitiveness index, found that Chinese creative products presented a strong comparative advantage and international competitiveness, but they were in primary forms[1]; Shang Tao (2011), based on studies on trade models and division of labor of Chinese creative industries, found that Chinese creative products in technology-and capital-intensive sectors with high added creation were short of international competitiveness, the overall evolution trend of international division of creative industries was turning from trade among different industries to intra-industry trade, and the degree of international specialization had undergone a decrease[2]; Yang Xiuyun (2010) evaluated international competitiveness of creative industries in

China and six other representative countries with Diamond Model and index methods, and his study showed that China's creative industries had only demand conditions as strong element in international competitiveness with industrial resources, industrial operations and government efficiency as weak elements[3]; Zhang Jie (2009), through competitiveness determination of Chinese creative industries, drew a conclusion that Chinese creative industries were still in the stage of "Made in China"[4]; Gao Changchun (2012) found in his study that Japan's creative industries had formed a relatively complete industrial system with a high industrial level, strong corporate competitiveness and at the stage of horizontal division of labor in the international division, which had a strong reference significance to the development of Chinese creative industries[5]; Tan Na (2013) made a simple comparison between Chinese and Australian creative industry development level with the catastrophe progression method[6]; Hu Fei (2009) made a simple comparison between Chinese creative product competitiveness and that of the United States, Britain and other developed countries and regions from 1996 to 2006 with related competitiveness index[7]; Bai Yuan (2013) studied trade dependence of the world's creative cultural products and drew the following conclusions: the world's creative cultural product trade pattern had basically taken shape, national creative cultural products were increasingly dependent on the world's market, and the present and future markets of China existed in developed countries and high-income developing countries and regions[8]; Zhou Jing (2011) found in his study that developed countries still took dominant position in world trade of

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creative cultural products, but the status of developing and emerging economies kept increasing in world trade of creative products[9]; Nie Ling (2013) studied international competitiveness changes of the four BRIC countries in creative products and services in terms of international market share index, revealed comparative advantage index and trade competitiveness index, and she argued that Chinese and Indian creative product trade was preferable, Russian and Brazilian creative service trade had distinct advantages, and the BRIC countries were at different nodes of the value chain of global creative industries[10].

In summary, although Chinese scholars studied development and trade structure of Chinese creative industries, in-depth analysis special for technological structure of creative cultural product trade are inadequate. Therefore, this paper uses Technology Content Index (TCI) and Relative Technological level (RTL) to compare and analyze technical structure of Chinese creative cultural product export, and put forward the policy recommendation to further enhance technology content of Chinese creative cultural products.

## 2 Determination of technology content index of Chinese creative culture products

### 2.1 DETERMINATION OF TECHNOLOGY CONTENT INDEX OF CHINESE CREATIVE CULTURE PRODUCTS

Technology content refers to the increase in added value brought by technology in the formation of the product's added value. If technology is taken as a production factor, then technology content of product can also be understood as rewarding for technology, a production factor, in the distribution of product's added value. For creative cultural products, it means the incremental added value brought by technology in the formation of creative cultural products' added value, or rewarding for technology in the distribution of creative cultural products' added value.

Many Chinese and foreign scholars, such as R. Glenn Cummins and Todd Chambers(2011)[11], Fan Gang, Guan zhixiong, Yao Zhizhong (2006)[12], have studied technology content of products. Guan zhixiong (2002) proposed a simple and feasible method to calculate technology content of products: take an exporter's market share of the product in the world as weight which is multiplied by per capita GDP of the exporter[13]. However, as an absolute value, technology content of traded goods, which will be affected by price, economy and other factors, is of no inter-temporal comparability. Technology content acquired in this way is only of comparative significance in order without truly reflecting real technology content of products. Moreover, export scale differences between countries will also make deviation in technology content determination. Therefore,

with reference to calculation methods of Liu Zhuanshi, Zhang Juan (2010), this paper reflects technological level of exported creative cultural products by calculating relative technology content index (TCI)[14], namely:

$$TCI_{jt} = TC_{jt} / \sum_{j=1}^m TC_{jt} \quad (1)$$

In the formula,  $TCI_{jt}$  refers to  $TCI$  of product  $j$  in year  $t$ , and  $t$  represents time;

$$\text{in } TC_{jt} = \frac{\sum_{i=1}^n X_{ijt}}{\sum_{i=1}^n X_{ijt}} y_{it} \text{ which is the same as}$$

calculation method proposed by Guan Zhixiong (2002),  $X_{ijt}$  is country  $i$ 's output of product  $j$  in year  $t$ , and  $y_{it}$  is the country's per capita GDP in year  $t$ .  $TCI_{jt}$  is the relative value of different products' added value in the same year; by calculating the ratio of different products, the impact of export scale and tendency of a country can be offset.

### 2.2 CHOICE OF DATA

Creative cultural industries are called and classified differently in different countries without a uniform concept and classification. United Nations Conference on Trade and Development uses the name of creative industries with a definition as: "the cycles of creation, production and distribution of goods and services that use creativity and intellectual capital as primary inputs. They comprise a set of knowledge-based activities that produce tangible goods and intangible intellectual or artistic services with creative content, economic value and market objectives." In *Creative Economy Report 2008 and 2010* jointly published by UNCTAD and UNDP, core creative products and services are taken as the major statistic object of creative industrial trade. Among them, core creative products are divided into seven categories, including arts and crafts, audiovisuals, designs, performing arts, new media, publication and visual arts. Creative services are divided into advertising, market research and public opinion research services, construction, engineering and other technological services, personal, cultural and recreational services, and research and development.

Few countries have made systematical statistics on trade of emerging creative industries, and therefore, based on data availability, this paper takes UNCTAD database as the primary data source, and selects data of top fifty countries and regions in creative cultural product export in 2011 as calculation sample. The analyses in this paper focus on the core creative products for failure of normal statistics as a result of missing data of many creative cultural services.

### 2.3 TECHNOLOGICAL LEVEL OF VARIOUS CREATIVE CULTURAL PRODUCTS

According to per capita GDP and creative cultural product export data of fifty economies in 2011,  $TC_{jt}$ , technology content of various creative cultural products in 2011 can be calculated with formula  $TC_{jt}$ , as shown in Figure 1. In the seven creative cultural products, Visual arts enjoy highest TC with audiovisuals followed and handicrafts as the lowest. Music is not shown in Figure 1 because music data and thus its TC value were not available after 2006. However, just according to calculation result of the year 2006, music TC in 2006 was USD 36,586, ranking third following visual arts and audiovisuals.

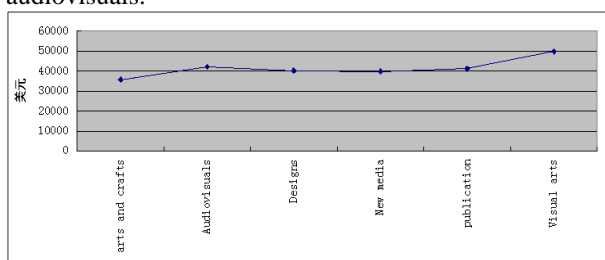


FIGURE 1 Technology Content of Various Creative Cultural Products in 2011

TABLE 1 TCI of Creative Cultural Products from 2002 to 2011

Data source: <http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>

Time Products	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Arts and crafts	0.130	0.129	0.125	0.124	0.124	0.145	0.144	0.143	0.142	0.142
Audiovisuals	0.151	0.152	0.150	0.154	0.152	0.179	0.175	0.177	0.176	0.170
design	0.144	0.141	0.140	0.139	0.141	0.164	0.164	0.165	0.166	0.166
New media	0.137	0.137	0.137	0.138	0.137	0.158	0.162	0.158	0.159	0.158
Performance arts	0.139	0.143	0.148	0.147	0.147	-	-	-	-	-
Publication	0.136	0.138	0.139	0.139	0.140	0.167	0.167	0.167	0.164	0.168
Visual arts	0.163	0.160	0.159	0.159	0.159	0.187	0.187	0.190	0.193	0.195

As music data was unavailable from 2006 to 2007, TCI of other six creative cultural products significantly increased. After 2007, TCI of these six creative cultural products changed little with technology content of visual arts and audiovisuals keeping high and that of arts and crafts at the lowest.

In addition, an overview of this decade shows that the yearly TCI of publication changed little, but it was on the steady rise with TCI ranking gradually higher than designs and audiovisuals. In 2011, it ranked the third in the six creative cultural products, showing its technology content had significantly increased in recent years.

### 3 Technological structure analysis on Chinese creative cultural product export

In order to better analyze technological structure of Chinese creative cultural product export, this paper selects 10 economies of Britain, the United States, Japan, Korea, India, Russia, Brazil, Singapore, France and world for comparison and analysis. Table 2 shows the proportion of creative cultural product export accounting

According to formula (1), TCI of seven creative cultural products in the decade can be further calculated, as shown in Table 1.

Table 1 shows that TCI of visual arts in the decade ranked the first followed by audiovisuals with arts and crafts at the lowest, indicating that in creative cultural products, visual arts and audiovisuals have high technology contents while arts and crafts are of low technology content. According to data available in half a decade, music developed well with its TCI ranking higher in seven products during these five years. The development tendency shows that, except for arts and crafts and music, TCI of other five creative cultural products changed little from 2002 to 2006, indicating that in this half a decade, these five products maintained high technology content while products with low technology content remained unchanged too. In these five years, TCI of arts and crafts went down obviously and that of music boasted a significant increase, indicating that technology content of arts and crafts declined while that of music enjoyed an increase during these five years.

for total export of creative cultural products of some economies in 2011. Table 2 shows that in creative cultural product export, designs with ordinary technology content were a major export. In ten economies listed in the table, either developed or emerging developing countries, design export accounted for more than half of creative cultural product export; on the contrary, audiovisuals and music with high technology content made up small proportions of export with the export proportion of developed countries higher than the world average. An important reason for the small proportion of these two products in creative cultural product export was difficulty in data collection.

In Chinese creative cultural product export, arts and crafts with middle-level technology content and new media with low technology content did not accounted for the largest proportion, but their proportions were higher than the world average, those of India and Russia, two BRIC countries, and those of Singapore and Korea; and export proportions of audiovisuals and visual arts with high technology content were lower than those of the world, and far lower than those of Singapore and Korea.

In four BRIC countries, export proportions of these two products were below the world average, but export proportions of Brazil were relatively high and the Russian

visual arts with relatively high technology content performed well.

TABLE 2 Percentage of Each Creative Cultural Product Export in Total Creative Cultural Product Export of Some Economies in 2011

2011TCI	Arts and crafts	audiovisuals	Design	New media	Publication	Visual arts	Music*
	0.142	0.170	0.166	0.158	0.168	0.195	0.147
Percentage of Each Creative Cultural Product Export in Total Creative Cultural Product Export							
World	7.535	0.108	66.354	9.635	9.488	6.856	0.929
China	10.903	0.015	56.169	22.190	6.257	4.445	0.250
India	5.719	0.017	59.851	9.172	22.511	2.719	0.272
Russia	7.550	0.004	75.114	4.107	7.378	5.845	0.272
Brazil	11.753	0.040	54.296	13.846	14.880	5.166	0.444
Singapore	3.575	0.091	72.871	7.111	7.533	8.798	0.455
Korea	4.276	0.134	76.269	7.257	4.189	7.846	0.283
Japan	6.895	0.045	73.133	11.776	4.164	3.962	1.141
France	5.111	0.050	67.192	8.990	12.719	5.890	1.365
Britain	6.921	0.105	56.767	12.713	10.676	12.762	1.623
USA	7.214	0.344	67.551	7.310	6.704	10.864	0.481

Data source: Ditto.

Note: \* As music data were unavailable after 2006, the index remained that of 2006; TCI of music ranked the third in seven creative cultural products in 2006.

On the whole, in Chinese creative cultural product export, products with middle and low added value made up the majority, focusing on designs with middle-and low-added value and new media with low added value. For India and Brazil, two BRIC countries, creative cultural product exports with middle and low added value also accounted for the majority, but publication with middle-and high-added value made up quite a few; Russia, another BRIC country, Singapore and Korea mainly concentrated creative cultural product export on middle-added-value designs with products of low, middle-and-high, or even relatively high added value accounting for a certain proportion. The above comparison and analysis show the structure of Chinese creative cultural product export were not reasonable and technology content of Chinese creative cultural product export needed to be improved.

#### 4 Overall technological level of Chinese creative cultural product export

A comprehensive analysis of proportion and TCI of creative cultural product export offers us a detailed understanding of technological structure of Chinese creative cultural products. However, to analyze overall technological level of Chinese creative cultural product, another index—Relative Technological Level (RTL) needs to be introduced:

$$RTL_{it} = TL_{it} / TL_{wt} \quad (2)$$

In the formula,  $TL_{it}$  is technological level of creative cultural product export in country i, and  $TL_{wt}$  is

the average technological level of the world's creative cultural products. That is,  $RTL_{it}$  is the ratio between technological level of a country's creative cultural product export and the average technological level of the world's creative cultural products.

$TL_{it}$  can be acquired by a weighted average of proportion of creative cultural product export in country i in year t and TCI of this product in the same period. The formula is shown as follows:

$$TL_{jt} = \sum_{j=1}^m \left( \frac{X_{ijt}}{\sum_{j=1}^m X_{ijt}} \right) * TCI_{jt}$$

According to formula (2), overall technological level of creative cultural product export in China, India, Russia, Brazil, Singapore and Korea from 2002 to 2011 can be calculated, as shown in Table 3.

Table 3 shows Chinese, Indian, Russian, Brazilian, Singaporean and Korean relative technological level of creative cultural product export from 2002 to 2011. The six listed countries had small RTL difference. A comparison among the four BRIC countries reveals that except for Russia, RTL of other three countries were less than 1 in the decade, indicating their structures of creative cultural product export were at a low level, below the world's average. In recent years, China had the lowest RTL in the three countries. A comparison to Korea and Singapore, two major emerging developing countries in Asia, shows that China lagged a bit behind in overall technology of creative cultural products.

TABLE 3 Relative Technological Level (RTL) of some countries *Data resource: Ditto.*

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Country										
<b>China</b>	0.984	0.982	0.978	0.979	0.981	0.981	0.988	0.986	0.983	0.985
<b>India</b>	0.974	0.986	0.992	0.996	0.997	1.000	1.001	0.992	0.995	0.997
<b>Russia</b>	1.003	0.999	0.999	0.996	0.998	1.002	1.003	1.001	1.000	1.001
<b>Brazil</b>	0.983	0.992	0.995	0.992	0.989	0.987	0.995	0.987	0.989	0.990
<b>Singapore</b>	0.996	0.998	1.002	1.005	1.004	0.985	0.991	1.002	1.011	1.010
<b>Korea</b>	1.008	1.008	1.008	1.008	1.012	1.018	1.013	1.010	1.015	1.007

The Table 3 shows that in the first year of the observation period, overall technological level of Chinese creative cultural products was higher than those of India and Brazil, but in the subsequent two years, technological level of Chinese creative cultural products declined and kept at the bottom in the six countries listed in the table, indicating that export structure of Chinese creative cultural products did not improve much in recent years and the overall technological level needed to be enhanced. The data show that the overall technological level of Indian creative cultural products developed well and improved fast in the decade.

#### 4 Summary

Based on analysis of TCI and export proportion of seven creative cultural products, this paper finds that most exported Chinese creative cultural products were of low technology content and concentrated on designs with middle-and low-added value and new media with low added value. RTL analysis shows that overall technological level of Chinese creative cultural product export structure was below the world level and kept unchanged for a long period of time.

Advantages of Chinese creative cultural product export are mainly concentrated in labor-intensive products and those with certain originality and low technology content. Such advantages will be offset by the rise of Chinese labor cost, the increase of raw material cost and the development of labor-intensive industries in India and other countries in recent years. As for some creative cultural products with strong originality and high technology investment, Chinese international competitiveness lagged much behind developed and even some advanced developing countries. All mentioned above show that China needs to improve technological level of creative cultural products and adjust export structure immediately.

Therefore, China has to maintain its existing advantages and strengthen originality and technological innovation so as to occupy a place in the global export market of creative cultural products. First, the government should play a macroeconomic guidance role through financial, tax, administrative and other methods

to boost financing environment for creation enterprises, improve intellectual property protection system, promote harmonious and orderly agglomeration construction of creative cultural industries, and scientifically guide enterprises to invest in creative cultural industries with high technology content. Second, we must adhere to the strategy putting men of talent first and encourage cultivation of practical, comprehensive and creative men of talent jointly by universities and enterprises; introduction, training and gathering of creative men of talent through option, high pay, part-time job, creative achievement incentive and other methods should be accelerated. Third, development of creative cultural industries and establishment of brand awareness should be carried out from an international perspective; competitiveness of Chinese creative cultural industries should be enhanced through international cooperation and study, and Chinese outstanding creative products should be promoted through trade fairs and other forms; development of marketing planning, sales agents and other intermediaries should be encouraged to promote sales of creative cultural products. Fourth, we must rely on existing labor forces and resources, accumulate the growing highly qualified personnel and technology, make rational use of cultural resources which failed to be fully exploited, and enhance investments in technology so as to improve Chinese international competitiveness of creative cultural industries, gradually increase technology content of Chinese creative cultural industries, and adjust industrial and export structures of creative cultural industries.

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