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The Impact of the Digital Economy on China's Cultural Product Exports: A Study Based on Belt and Road Countries

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Abstract: The Belt and Road Initiative has fostered transnational economic cooperation and cultural exchange, while the development of the digital economy has created new opportunities for the expansion of Chinese cultural products into markets along the Belt and Road. Drawing on data from 113 Belt and Road countries from 2010 to 2022, this study analyzes the impact of the digital economy on China's cultural product exports. Empirical results show that the digital economy significantly and positively promotes the export of Chinese cultural products to Belt and Road countries. This effect remains significant even after controlling for factors such as economic scale, population, geographical distance, and cultural proximity. Furthermore, both digital and traditional factors shape the trade patterns of cultural products, with traditional trade theory variables—such as economic size, population, geographical distance, and shared language—still exerting significant influence. The findings provide a scientific basis for corporate digital transformation and government digital trade policies, offering important guidance for promoting the expansion of Chinese cultural products in Belt and Road markets.

Keywords: digital economy, cultural product exports, Belt and Road countries, export trade

1. Introduction

The digital economy, as a representative of emerging economic forms, is becoming a key driver of global economic transformation and development. Since the Belt and Road Initiative was proposed in 2013, it has gradually evolved into a major platform for cooperation connecting Asia, Europe, and Africa. As of 2023, 149 countries and 32 international organizations have signed cooperation documents related to the Belt and Road. Under the dual impetus of the Belt and Road Initiative and the digital economy, China's cultural product exports are experiencing a critical strategic opportunity. Through digital transformation, Chinese cultural enterprises can better leverage digital technologies to optimize their industrial chains, enhance product added value, and expand international markets. However, this process also faces various challenges, including the adaptability of digital technologies, the localization of cultural products, and intensified international competition. Therefore, studying the export of Chinese cultural products to Belt and Road countries in the context of the digital economy is of great importance for promoting market expansion and enhancing the cultural influence of China along the Belt and Road.

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2. Literature review

2.1. The Belt and Road Initiative and cultural products

As a bridge linking economy and culture, cultural products have gradually become an important domain of cooperation under the Belt and Road Initiative. Zang Xin et al. [1], through empirical analysis, found that countries with closer cultural affinities are more inclined to purchase cultural products, providing theoretical support for cultural trade cooperation among countries along the Belt and Road. Qu Ruxiao and Yang Xiu [2] revealed that local market effects and factor endowment advantages significantly influence China's trade in cultural products, offering important insights for exporting cultural products to Belt and Road countries.

Although the Belt and Road Initiative offers broad development space for cultural trade, it also faces certain challenges. Fang Ying and Wu Xuechun [3] pointed out that while the digitalization of cultural trade has positive effects, its promotion process still encounters various obstacles. The uneven dissemination and application of digital technologies across Belt and Road countries may hinder the progress of digital transformation in cultural trade.

2.2. The development of the digital economy

As a vital component of the global economy in the 21st century, the digital economy has drawn significant attention from both academia and policymakers. Crespo, Cuadros, and Lutz [4] proposed that the development of the digital economy relies not only on the construction of digital infrastructure but also on the adoption of digital tools and platforms, which collectively drive the digital transformation of economic activities. Freund and Weinhold [5], from the perspective of the internet's impact on trade in services, explored the role of the digital economy in international trade and pointed out that the widespread application of internet technologies has created new channels and models for service trade.

For countries along the Belt and Road, the generally lower levels of digital economy development have, to some extent, constrained their digital economic cooperation with China. Lu Chang [6], from the perspective of connectivity, examined the influencing factors of digital economic development in Belt and Road countries. Du Yiyang [7] took Guangdong Province as a case study to explore development pathways for the digital economy under the Belt and Road framework, offering references for regional digital economic growth.

Regarding digital economy and international cooperation, Zuo [8] investigated the challenges and countermeasures of cross-border data forensics in the digital era of the Belt and Road, highlighting legal and security issues in international digital economy cooperation. Wang and Liang [9], from a Chinese perspective, defined and analyzed the scale and structure of digital content trade, providing a new lens for understanding the relationship between the digital economy and cultural trade.

2.3. Overview of research on the digital economy and cultural product exports

In studies exploring the relationship between the digital economy and cultural product exports, scholars generally agree that the digital economy—through tools such as cross-border e-commerce, big data, and social media—has significantly enhanced the international competitiveness of cultural products. Fu Xiaodong and Du Qiong [10] found that the digital economy significantly promotes cultural product exports by reducing transaction costs, improving market matching efficiency, and enhancing the global dissemination of cultural products.

Peng [11], in studying the innovative development of the digital cultural industry, emphasized the critical role of digital technologies in cultural product innovation and international communication. Xiao Yu and Xia Jiechang [12] conducted an in-depth analysis of the current state, challenges, and

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international comparisons of China's digital cultural industry, offering valuable references for understanding the global competitiveness of China's digital cultural products. Zuo Hui [13] analyzed the development trends in the digitalization of cultural products, revealing the profound transformation that digitalization has brought to the cultural industry.

3. Research design

3.1. Research model

To verify the impact of the digital economy on the development of export trade, this study constructs the following econometric model:

$$\ln EXP = \beta_0 + \beta_1 \ln Digital + \beta_2 \ln GDP + \beta_3 \ln PGDP + \beta_4 \ln CHNDigital + \beta_5 POP + \beta_6 Asset + \beta_7 Dist + \beta_8 Lan + \varepsilon$$

In this model, the dependent variable is the export volume of cultural products ($\ln EXP$), and the core explanatory variable is the level of digital economy development ($\ln Digital$). Control variables are introduced to account for other factors that may influence the export of cultural products. β_0 is the constant term, β_1 represents the coefficient measuring the impact of the digital economy on cultural product exports, β_{2-8} are the coefficients for the control variables, and ε is the error term.

3.2. Variable measurement and description

3.2.1. Dependent variable

The export volume of cultural products (EXP) is the dependent variable, measured by the total value of China's cultural product exports to countries along the Belt and Road, expressed in 100 million RMB.

3.2.2. Explanatory variable

The level of digital economy development (Digital) is the core explanatory variable in this study. Following the approach of Zhe Ru [14], the entropy method is used to construct an index system for evaluating digital economy development. This composite index primarily covers two dimensions: digital infrastructure and digital trade.

Table 1: Index system for evaluating digital economy development

Primary Indicator	Secondary Indicator
Digital Infrastructure	Proportion of Internet Users
	Secure Internet Servers per Million People
	Mobile Broadband Subscriptions per 100 People
	Fixed Broadband Subscriptions per 100 People
	Mobile Cellular Subscriptions per 100 People
Digital Economy	Share of ICT Service Exports
	Share of ICT Product Exports

3.2.3. Control variables

Economic scale (GDP): A fundamental factor influencing trade, measured by each country's gross domestic product. Level of economic development (PGDP): Measured by each country's per capita GDP, reflecting consumer purchasing power. China's digital economy development level

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(CHNDigital): Controls for the influence of the exporting country's digitalization level. Population size (POP): Represents market capacity. Cultural assets (Asset): Reflects the cultural industry base of the target country. Geographical distance from China (Dist) and common language with China (Lan): Capture the effects of trade costs and cultural proximity.

The following table summarizes the definitions, data sources, and expected directions of impact for the main variables:

3.3. Data sources and processing methods

This study selects 113 countries along the Belt and Road as the research sample, covering the period from 2010 to 2022. The data are mainly sourced from the World Bank's World Development Indicators (WDI) database, the Digital Economy Report published by the International Telecommunication Union (ITU), the China Foreign Trade Statistical Yearbook released by the Ministry of Commerce of China, as well as databases from the National Bureau of Statistics, the General Administration of Customs, and the World Trade Organization (WTO)'s International Trade Statistics database. To address missing data, interpolation methods are employed, resulting in a panel dataset comprising 1,131 observations.

To ensure the data are suitable for factor analysis, this study conducts both the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The test results are shown in the table below:

Table 2: KMO test

Bartlett test of sphericity	9000.696 (0.000)
KMO	0.797

The KMO value is 0.797, which exceeds the critical threshold of 0.7, indicating a strong correlation among the variables and that the data are appropriate for factor analysis. The value of Bartlett's test of sphericity is 9000.696, with a significance level of 0.000, rejecting the null hypothesis that "the correlation matrix is an identity matrix," and further confirming the suitability of the data. These test results indicate that the selected variables share sufficient common variance, allowing for the effective extraction of common factors and laying a solid foundation for subsequent empirical analysis.

4. Empirical analysis and discussion of results

4.1. Data description and statistical analysis

Table 3: Descriptive statistics of main variables

Variable	Observations	Mean	Std. Dev.	Median	Min	Max
Export	1131	13.72	2.592	13.72	3.611	20.19
Digital	1131	0.539	0.229	0.522	0.0663	0.986
GDP	1131	25.15	1.878	24.86	20.45	30.70
PGDP	1131	11.65	2.151	11.16	6.844	17.41
CHNDigital	1131	0.519	0.107	0.492	0.366	0.706
POP	1131	16.24	1.561	16.17	12.21	21.06
Asset	1131	22.19	6.169	22	1	56
Dist	1131	9.014	0.489	9.023	7.067	9.868
Lan	1131	0.0195	0.138	0	0	1

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As shown in Table 3, the mean value of cultural product exports (Export) is 13.72, with a standard deviation of 2.592, a minimum of 3.611, and a maximum of 20.19, indicating significant differences in the scale of cultural exports among countries. The mean of digital economy development (Digital) is 0.539, with a standard deviation of 0.229, suggesting uneven levels of digital economic development across sample countries, where some have reached a relatively advanced stage while others remain comparatively underdeveloped.

The mean GDP is 25.15 with a standard deviation of 1.878, reflecting disparities in economic size among sample countries. The mean per capita GDP (PGDP) is 11.65 with a standard deviation of 2.151, ranging from 6.844 to 17.41, indicating considerable differences in development levels across countries. The mean value of China's digital economy development level (CHNDigital) is 0.519, with a relatively small standard deviation (0.107), suggesting that China's digital economy remained relatively stable during the study period while continuing to show a growth trend.

Descriptive statistics for control variables such as population size (POP), cultural assets (Asset), geographical distance (Dist), and shared language (Lan) also reveal notable diversity among the sample countries, providing a foundation for subsequent analysis of the factors influencing cultural product exports.

4.2. Correlation analysis

Table 4: Correlation analysis of main variables

	1	2	3	4	5	6	7	8	9
Export	1	0.357***	0.786***	0.013	0.041	0.626***	0.029	-0.269***	0.212***
Digital	0.350***	1	0.554***	-0.148***	0.214***	-0.164***	-0.030	-0.182***	0.105***
GDP	0.777***	0.551***	1	-0.043	0.033	0.621***	0.029	-0.168***	0.120***
PGDP	0.005	-0.143***	-0.049	1	0.076**	0.091***	0.037	0.022	-0.031
CHNDigital	0.023	0.212***	0.024	0.066**	1	0.039	-0.023	-0.001	-0.003
POP	0.638***	-0.152***	0.675***	0.042	0.031	1	-0.037	-0.035	0.009
Asset	-0.002	-0.046	-0.007	0.002	-0.031	-0.022	1	-0.211***	0.099***
Dist	-0.290***	-0.076**	-0.120***	-0.064**	-0.002	-0.129***	-0.219***	1	-0.186***
Lan	0.200***	0.104***	0.100***	-0.050*	-0.003	0.013	0.057*	-0.179***	1

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The results of the correlation analysis show a significant positive correlation between digital economy development (Digital) and cultural product exports (Export), with a correlation coefficient of 0.357 ($p<0.01$), providing preliminary support for the hypothesis that digital economy development promotes cultural exports.

4.3. Baseline regression analysis

To investigate the impact of the digital economy on China's exports of cultural products, we constructed two progressive baseline regression models. Table 3 reports the estimation results of these models.

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Table 5: Estimation results of the baseline regression model

VARIABLES	(1) Export	(2) Export
Digital	3.9725***	1.6680***
	(0.3219)	(0.5529)
GDP		0.6028***
		(0.0894)
PGDP		0.0364*
		(0.0207)
CHNDigital		-0.7810
		(0.4828)
POP		0.5666***
		(0.0949)
Asset		-0.0122
		(0.0079)
Dist		-0.8899***
		(0.0788)
Lan		2.0550***
		(0.1490)
Constant	11.5728***	-3.3115***
	(0.1892)	(1.0452)
Observations	1,131	1,131
R-squared	0.123	0.679
Adj R-squared	0.122	0.676

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

In Model (1), we consider only the core explanatory variable—the level of digital economy development (Digital). The results show that the coefficient of the digital economy is 3.9725, which is significant at the 1% level, indicating that the digital economy has a significant positive effect on cultural product exports. This implies that for every 1% increase in the digital economy level of a target country, China's cultural product exports to that country increase by approximately 3.97%.

In Model (2), we add control variables such as economic scale, per capita GDP, China's digital economy level, population size, cultural assets, geographic distance, and common language. The coefficient of the digital economy drops to 1.6680 but remains significant at the 1% level, indicating that the positive effect is robust. The coefficients of GDP and population size are both positive and significant, aligning with economic theory expectations.

Regarding model fit, as more control variables are added, the adjusted R^2 increases from 0.122 in Model (1) to 0.676 in Model (2), indicating that the model's explanatory power improves. The final model can explain approximately 67.6% of the variation in cultural product exports, reflecting a good fit.

4.4. Robustness tests

To verify the reliability of the baseline regression results, we conducted two robustness tests, as shown in Table 4. The first column presents the results of a winsorization test, which reduces the influence of outliers by trimming extreme values. The second column estimates a replacement model using a two-way fixed effects model to test the sensitivity of results to model specification.

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Table 6: Robustness test results

VARIABLES	(1) Winsorization Export	(2) Replacement Model Export
Digital	1.7659***	1.9941*
	(0.5288)	(1.0974)
GDP	0.5760***	0.3408*
	(0.0869)	(0.2053)
PGDP	0.0260	-0.1881
	(0.0201)	(0.1539)
CHNDigital	-0.7279	-0.0977
	(0.4677)	(0.7454)
POP	0.5976***	0.6103
	(0.0933)	(0.7779)
Asset	-0.0081	-0.0007
	(0.0076)	(0.0103)
Dist	-0.8561***	-0.0137
	(0.0747)	(0.9357)
Lan	2.0523***	5.1769***
	(0.1514)	(1.7200)
Constant	-3.4769***	-5.6366
	(1.0452)	(19.3646)
Observations	1,131	1,131
R-squared	0.682	0.914
Adj R-squared	0.680	0.903

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

In the winsorization test, the coefficient of digital economy development (Digital) is 1.7659 and is significant at the 1% level, which is very close to the result of the baseline regression Model (2) (1.6680). In the replacement model, the coefficient is 1.9941 and significant at the 10% level, further confirming the robustness of the positive effect of the digital economy on cultural product exports.

Other key variables such as GDP, geographic distance (Dist), and common language (Lan) maintain consistent signs and significance levels with the baseline regression results, indicating that the findings are not sensitive to model specifications or sample selection and exhibit strong robustness. The adjusted R^2 values for the two robustness models are 0.680 and 0.903, respectively, indicating strong explanatory power.

5. Conclusion and recommendations

5.1. Research conclusions

The digital economy has a significant positive impact on China's exports of cultural products to countries along the Belt and Road. Empirical results indicate that for every 1% increase in the digital economy development index of a partner country, China's export of cultural products to that country increases by approximately 1.668% ($p<0.01$), and this result remains robust under various specification tests. This suggests that the digital economy has become a key driving force in the growth of China's international trade in cultural products.

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In addition, both traditional trade factors and digital economy elements jointly influence the pattern of cultural product exports. The empirical analysis shows that traditional trade determinants—such as the economic scale, population size, geographical distance, and common language of the partner country—continue to have significant impacts on cultural product exports. This indicates that while the digital economy has, to some extent, weakened the barriers of geographic distance, cultural product trade remains influenced by core variables in traditional trade theory.

5.2. Policy recommendations for digital economy transformation

The rapid rise of the digital economy presents unprecedented strategic opportunities, as well as multifaceted challenges, for the export of Chinese cultural products. Within the strategic framework of the Belt and Road Initiative, the digital economy has become a key connector between China and countries along the route, providing new growth momentum and innovation pathways for cultural product exports. Based on the research findings, this study offers the following policy recommendations for promoting China's export of cultural products to Belt and Road countries in the digital economy era:

5.2.1. Enterprise digital transformation strategies

In terms of building digital infrastructure and data capabilities, cultural enterprises should systematically develop internal digital infrastructure—including cloud computing, big data, and artificial intelligence platforms—to provide solid technical support for cultural product innovation and internationalization. At the same time, enterprises need to establish comprehensive cross-border data analysis platforms to systematically collect and analyze data on cultural preferences and consumption trends in target markets. This would enable full-process digitalization from creative conception and content production to marketing and promotion, thereby enhancing their decision-making precision in the global market.

Regarding product innovation and cultural adaptation, enterprises should retain the core values of Chinese cultural identity while localizing their products to better align with the aesthetic preferences and consumption habits of target markets. Emerging technologies such as VR/AR can be leveraged to create immersive cultural experiences, enhancing interactivity and user engagement. Moreover, enterprises should actively collaborate with local cultural institutions to co-develop products. Through cross-cultural creative integration, they can generate innovative content that retains Chinese cultural appeal while fitting the local cultural context, thereby increasing international acceptance.

5.2.2. Government policy support and international cooperation

To improve the support system for digital trade, the government should streamline approval procedures for the export of digital cultural products, establish standards for digital cultural trade, and improve mechanisms for digital copyright protection—creating a favorable policy environment for cultural enterprises to "go global." In addition, efforts should be made to promote the development of cross-border payment systems, reducing transaction costs and risks for enterprises operating internationally, and facilitating the efficient global circulation and trading of digital cultural products.

In fostering a digital cultural industry ecosystem, the government should lower the cost of digital transformation for cultural enterprises through various measures such as fiscal subsidies, tax incentives, and financial support—especially supporting small and medium-sized cultural enterprises in enhancing their digital capabilities. At the same time, a public service platform for the digital cultural industry should be established to provide technical support, talent training, and market intelligence. This would help build industry clusters and promote upstream-downstream collaboration

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across the cultural digital industry chain, thereby forming a sound and sustainable development ecosystem.

Regarding international cooperation mechanisms, the government should actively establish multilateral coordination mechanisms for digital cultural trade, and create regional platforms for digital cultural exchange to encourage resource sharing and talent mobility. Furthermore, China should participate in the formulation of international digital trade rules, enhance its discourse power and influence in global digital cultural governance, and create a favorable international environment for the global expansion of Chinese cultural enterprises. These efforts will help build a more equitable and inclusive global digital cultural trade system.

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