

The Effect of Subsidies on Cultural and Creative Enterprise Performance: Mediating Role of Patents

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Cultural and creative industries are located at the intersection of art, commerce and science and technology. Therefore, it has become an important industry of a country. Some governments have formulated supportive policies to promote the cultural and creative industries. Subsidy is among the important policy instruments. It is of utmost importance to study the impact of subsidy on innovation and financial performance of cultural and creative enterprises. This paper attempts to examine how subsidy can facilitate innovation and financial performance of cultural and creative enterprises, and compare the mediating role of patent quantity and patent quality between subsidies and financial performance. Based on the panel data of 141 listed cultural and creative enterprises from 2008 to 2017 in China, this paper conducts an empirical study and finds that subsidies promote the financial performance of cultural and creative enterprises. The promotion effect of subsidies on patent quantity is greater than on patent quality, and the effect of patent quality on performance is greater than that of patent quantity. Patents play a mediating role between subsidies and financial performance, but the mediating effect of patent quality is not greater than that of patent quantity. The findings make several theoretical contributions and policy implications.

Keywords: *Subsidies; Cultural and Creative Enterprise; Patent Quantity; Patent Quality; Mediating Effect.*

Introduction

Being at the crossroads between arts, business and technology, the cultural and creative industries trigger innovation, competitiveness and spill-overs in other sectors. Cultural and creative enterprises provide employment by developing innovative products and services (Collins & Snowball, 2015; Klein *et al.*, 2021), promoting regional economic development (Oyekunle, 2017; Rafael *et al.*, 2018), and improving people's happiness (Strazdas & Cernevičute, 2016). Cultural and creative industry is one of the emerging and fastest growing industries (Vlassis, 2016), and has become the pillar industry of national and regional economy (Lin *et al.*, 2016).

As an innovation-intensive industry, the core of the operating mode of cultural and creative industries lies in innovation. Its innovation ability is of great significance to the upgrading of industrial structure and economic growth (Bakhshi & McVittie, 2014; Liu & Wu, 2018). The goods and services of cultural and creative enterprises have a high degree of creative content. Cultural and creative enterprises are more innovative than many other innovation sectors (Chapain *et al.*, 2010; Zhou *et al.*, 2020). Innovation of cultural and creative enterprises requires a combination of diversified ideas with highly creative content (Petruzzelli & Savino, 2015; Zhou *et al.*, 2020), and the results are particularly uncertain. Moreover, cultural and creative products are frequently copied, and the market value of high-quality cultural and creative products is undervalued.

Cultural and creative products suffer rapid obsolescence in the market (Savino *et al.*, 2017; Zhou *et al.*, 2020). These uncertainties put pressure on cultural and creative enterprises to develop products with the overriding intention of responding to commercial demand (Kong, 2014), rather than projects with high creative content (Zhou *et al.*, 2020). The underinvestment in innovation of cultural and creative enterprises is a common phenomenon (Liu & Wu, 2018).

The underinvestment in innovation of cultural and creative enterprises justify for government's innovation policy (Oakley, 2009). Governments in many countries, such as Singapore, China, South Korea, and Australia, issued various policy instruments to encourage cultural and creative enterprises to innovate (DCMS, 1998; Zhou *et al.*, 2020). Recently, the issue of how the government promotes the cultural and creative enterprises has attracted considerable attention (Zhou *et al.*, 2020). The main purpose of this paper is to determine the extent to which subsidies could encourage cultural and creative enterprises to improve their innovation ability and thus enhance their financial performance.

Although the development of China's cultural and creative industry is relatively late, the Chinese government attaches great importance to the development of the cultural innovation industry. The cultural and creative industry has become a hot industry in China (Vlassis, 2016; Lin *et al.*, 2016). As a pillar industry of the national economy, China's cultural and creative industry has developed rapidly in recent years. According to The National Bureau of Statistics, the

added value of China's cultural and creative related industries increased from \$171 billion in 2010 to \$599.2 billion in 2018. That accounts for 4.21 percent of GDP in 2018 from 2.75 percent in 2010. The government has issued a series of policies to enhance the innovation capacity of cultural and creative enterprises. The "Cultural Industry Revitalization Plan", promulgated in 2009, proposed to substantially increase the scale of special funds to support the development and reform of the cultural and creative industry. "The 12th Five-Year Plan for Doubling the Cultural Industry" was released in 2012, emphasizing that the proportion of subsidies for the cultural and creative industry should be increased. The central and local governments have set up a special fund for the development of cultural and creative industries. According to the "China Cultural Development Report" (2017), the breadth and intensity of government subsidies have increased year by year.

However, evaluating the impact of subsidies on innovation and financial performance of cultural and creative enterprises has been a challenging task (Zhou et al., 2020). Empirical findings on the effects of subsidies have illustrated different views. Some scholars believe that subsidies can alleviate the financing constraints of cultural and creative enterprises, increase cash flow, help improve their financial situation (Jourdan & Kivleniece, 2017), enhance the production capacity of new products and new technologies, and thus improve performance (Zhou et al., 2020; Vanino *et al.*, 2019). However, some scholars believe that subsidies may crowd out enterprise R&D investment of cultural and creative enterprises (Messerlin & Parc, 2017). Moreover, other scholars have also found that subsidies have no effect on the performance of cultural and creative enterprises (McKenzie & Walls, 2013).

The characteristics of innovation in cultural and creative enterprises suggest the need to explore the specific determinants of innovation in this particular sector (Savino et al., 2017; Zhou et al., 2020). The research on innovation policy needs to consider the peculiarity of cultural and creative enterprises (Oakley, 2009; Savino et al., 2017). Therefore, it is necessary to conduct a rigorous empirical analysis of the impact of subsidies on the innovation of cultural and creative enterprises.

Although literature shows that innovation ability plays an important role in the technological progress of cultural and creative industries (Wijngaarden *et al.*, 2016; Bakhshi & McVittie, 2014). It has also been confirmed that subsidies can enhance the innovation ability of enterprises, thus promoting the growth of enterprise performance (Liu *et al.*, 2019). However, the existing literature mainly focuses on R&D input as a proxy variable of innovation ability, and rarely takes patents as a proxy variable of innovation ability to study the relationship between subsidies, patents and financial performance.

Literature on subsidies and financial performance mainly take R&D input as a mediating variable, and pay less attention to the impact of patent output (Liu *et al.*, 2019). Research shows that R&D investment does not guarantee innovation outputs (Dalziel *et al.*, 2011). Patents are more closely related to financial performance of cultural and creative enterprises.

Moreover, previous studies did not distinguish the effect of subsidies on the patent quantity and patent quality. The research found that the impact of subsidies "emphasizing

more on patent quantity than patent quality" (Dang & Motohashi, 2015). As the characteristic of patent quantity and patent quality is different, distinguishing these two types of patents constitutes an important feature to study the effect of subsidies. Therefore, it is necessary to distinguish the role of patent quantity and patent quality when judging the relationship between subsidies and performance of cultural and creative enterprises.

In response to this research gap, this paper focuses on specific types of patents, namely patent quantity and patent quality. The empirical study will explore the mechanism of subsidies on financial performance of cultural and creative enterprises, and compare the mediating role of two types of patents. This paper seeks to contribute to the existing literature in several aspects. First, the study reveals the impact of subsidies on the performance of cultural and creative enterprises, which enriches the research of subsidies on the innovation of cultural and creative enterprises. Second, this paper distinguishes the effects of patent quality and patent quantity, and illustrates that patent quality and patent quantity play different mediating roles between subsidies and financial performance of cultural and creative enterprises. The research findings can provide a reference for government subsidy policy decision-making, as well as an important reference for other countries.

The study is organized as follows. Section 2 presents theoretical analysis and research hypotheses. Section 3 describes data sources and research methods. Section 4 is empirical analysis. Section 5 is the conclusion and discussion.

Theoretical Analysis and Research Hypothesis

Subsidies and Financial Performance of Cultural and Creative Enterprises

Subsidy is a kind of free transfer payment provided by the government to enterprises for certain purposes (Le & Jaffe, 2016; Zhou *et al.*, 2020). Research conclusions of subsidies on the financial performance of enterprises has not yet reached consensus.

Scholars holding the promotion view believe that subsidies can effectively promote financial performance. Due to the higher degree of uncertainty in innovation of cultural and creative enterprises (Gu & O'Connor, 2006), the financing constraints of enterprises are increased (Hahn *et al.*, 2017; Savino *et al.*, 2017). Therefore, the insufficient investment in cutting-edge R&D fields of culture and creativity may be particularly prominent. Researchers have confirmed that financing is particularly important for cultural and creative enterprises (Hardin, 2017). In this case, from the perspective of alleviating financing constraints, subsidies can bring a buffer effect to cultural and creative enterprises, increase the cash flow (Jourdan & Kivleniece, 2017), and reduce the uncertainty of R&D (Chapman and Hewitt-Dundas, 2018). Companies can use these resources to pursue innovation at an ideal level of R&D effort under unfavorable market conditions (Zhou *et al.*, 2020). Subsidies transmit dual authentication signals. On the one hand, subsidies release an official certification signal to investors, which means that the R&D projects of enterprises are of high quality or the R&D capabilities of enterprises are worthy of recognition (Colombo *et al.*, 2013). On the other hand, subsidies also release a signal of credit to firms, which means

that the R&D will be completed under supervision of the government, so the projects can be completed with high quality. The receiving subsidies can send a positive signal to the outsiders and attract more human and financial resources (Soderblom *et al.*, 2015). So the subsidized enterprises have a higher survival rate and better economic performance. Subsidies promote enterprise R&D investment (Howell, 2017) and increase the rate of enterprise innovation transfer rate (Bedu & Vanderstocken, 2019). Jourdan and Kivleniece (2017) found that subsidies helped local producers in French film industry increase the rate of innovation. Therefore, subsidies can significantly improve the performance of cultural and creative enterprises.

Scholars holding the inhibition view believe that subsidies cannot effectively improve the financial performance of enterprises because subsidies violate the principle of market allocation. Moreover, rent-seeking would destroy the competitive ecology. These would lead to lower production efficiency (Karlson *et al.*, 2020), which would result in deviation of enterprise performance from the expectation of subsidies. Governments may use subsidies to strengthen political and financial control over the technological and industrial production of culture and creative industries (UNESCO, 2005; Zhou *et al.*, 2020). In this case, firms may invest in projects that can meet the requirement of the government rather than those with high creative content, which might restrict firms from carrying out more explorative innovation (Zhou *et al.*, 2020). Studied the film industry in Korea and France, Messerlin and Parc (2017) found that enterprises that did not receive subsidies were more prosperous than those that received subsidies in the long run. McKenzie and Walls (2013) studied subsidies in the Australian film industry and found that subsidies had no significant effect on the film's box office.

Given that China's cultural and creative industry is an emerging and fast-growing industry, the government has increased its support for cultural and creative enterprises. The development of cultural and creative industries has become a national strategy. So, we propose the hypothesis.

H1: Subsidies promote financial performance of cultural and creative enterprises.

Subsidies, Patents and Financial Performance of Cultural and Creative Enterprises

Subsidies and Patents of cultural and creative Enterprises

Enterprises with financing constraints tend to have a strong risk-aversion attitude, which may avoid highly innovative projects with high uncertainty of investment return, and hinder the rational allocation of enterprises' innovative resources (Bronzini & Piselli, 2016). Due to the high degree of uncertainty of cultural and creative R&D projects, this phenomenon of sub-optimal allocation of resources may be more obvious in cultural and creative enterprises. Subsidies can provide target enterprises with more high-quality resources to eliminate the uncertainty in the innovation process (Jourdan & Kivleniece, 2017), thus promoting the innovation of cultural and creative enterprises (Zhou *et al.*, 2020). Branstetter and Sakakibara (2002) analyzed Japanese government-sponsored R&D consortia

and found that participating firms have higher R&D expenditures as well as more patents. Jourdan and Kivleniece (2017) pointed out that subsidies can help French film production companies improve their innovation and performance. Subsidies encourage cultural and creative enterprises to undertake more challenging and innovative projects (Wanzenbock *et al.*, 2013; Zhou *et al.*, 2020). This effect of subsidy on innovation is more significant in China, because the government controls some scarce resources (Zhou *et al.*, 2020). Subsidy policies will have a significant impact on the innovation of cultural and creative enterprises (Zhou *et al.*, 2020). Innovation performance is an important indicator to measure the effectiveness of subsidies (Le & Jaffe, 2016).

As the output of R&D activities, patents are an important measure of enterprises' innovation performance (Dang & Motohashi, 2015). Research shows that the number of patent applications by subsidized companies has increased significantly (Kim *et al.*, 2018; Le & Jaffe, 2016; Bronzini & Piselli, 2016). Some studies found that the patent application of enterprises is sometimes manifested as a strategic behavior, whose purpose is not to improve the innovation ability of enterprises, but to cater to the government policies in order to obtain certain benefits (Hall & Harhoff, 2011). The reason lies in the information asymmetry between the government and enterprises. The subsidies may induce moral hazard and adverse selection in the process of patent application (Du & Mickiewicz, 2016; Chen & Yoon, 2019). In order to meet the subsidy standard or complete the assessment, some enterprises would apply for low-quality or non-operational value patents, forming a "patent bubble" or "innovation illusion", and thus deviating from the expectation of subsidies (Dang & Motohashi, 2015). Thoma (2013) compared the data from European Patent Office and Chinese Patent Office and found that the value of patents authorized in China was lower than that of foreign enterprises. Some scholars believe that the effect of subsidies on patents has the phenomenon of "attaching more importance to patent quantity than patent quality".

Patents and financial Performance of Cultural and Creative Enterprises

There are many literatures focusing on the effect of patents on financial performance of enterprises (Christodoulou *et al.*, 2018; Ortiz-villajos & Sotoca, 2018). Researchers have confirmed the key role of patent on performance (Carolan, 2008; Dang & Motohashi, 2015). From different perspectives of innovation, such as innovation capability (Wijngaarden *et al.*, 2016), core technology resources (Larraneta *et al.*, 2012), and business model innovation (Bakhshi & McVittie, 2014), many literatures have studied the innovation of cultural and creative enterprises. Unique and innovative products and services are the core competitiveness of cultural and creative industries, which are usually expressed in the form of patents (Li *et al.*, 2019). As the innovative output of R&D in cultural and creative industries, patents are characterized by valuable, scarce, difficult to imitate and irreplaceable. They can help enterprises gain an advantage of competition and increase their financial efficiency (Bewaji, 2013; Jell *et al.*, 2017). The competitiveness of cultural and creative

enterprises is closely related to innovation activities (Jaw *et al.*, 2012; Potts, 2009).

Patent quantity and patent quality are two dimensions of patents, both of which can promote the financial performance of enterprises. The increase in the number of patents can improve the sales revenue and profit of enterprises to a certain extent (Conti *et al.*, 2013; Le & Jaffe, 2016). In addition, high-tech cultural and creative enterprises had to face high technical risks and innovation failure rate (Petruzzelli & Savino, 2015). Due to the asymmetric information between the internal research teams and the external investors, investors cannot accurately assess the innovation level of enterprises (Hoenig & Henkel, 2015). The number of patents can be used as a signal of the technical level of an enterprise to attract external financing, which significantly improves the evaluation of the enterprise by external investors (Chen *et al.*, 2018).

Although the existing researches on patent and performance mainly focus on the number of patents, patent quality has a greater impact on the financial performance of enterprises (De Rassenfosse, 2013). High-quality resources, including more advanced technologies and higher

heterogeneity, can bring more competitive advantages and higher returns to enterprises. The empirical results show that there is a significant positive correlation between patent quality and financial performance of enterprises. Only patents with high citation can capture investors' favor. Compared with patent quantity, patent quality has a more significant effect on the improvement of firms' financial performance (Artz *et al.*, 2010). Therefore, the following hypothesis is proposed.

H2a: Patent quantity plays a mediating role between subsidies and financial performance;

H2b: Patent quality plays a mediating role between subsidies and financial performance;

H3: The mediating effect of patent quality is greater than that of patent quantity.

This paper explores the mechanism of subsidies on financial performance of Cultural and creative enterprises by differentiating patent into two dimensions: patent quality and patent quantity, and compares the mediating role of the two types of patents in subsidies and financial performance. The research model is shown in Figure 1.

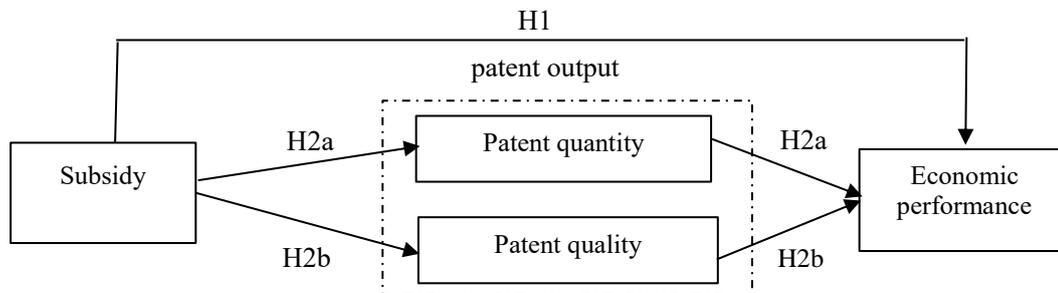


Figure 1. Research Model

Research Design

Sample and Data Source

Cultural and creative industry has become an important emerging strategic industry in China. However, the innovation ability of cultural and creative enterprises is lower than that of developed countries such as the United States and the European Union (Huang *et al.*, 2015). Therefore, this paper takes the cultural and creative enterprises as the research object. The listed cultural and creative enterprises from 2008 to 2017 are selected as research samples to explore the impact of subsidies on the innovation and financial performance. The research is of great significance to promoting the development of cultural and creative industry.

The following points are mainly considered in the process of sample selection. Firstly, the samples were selected according to The Classification Standards of Cultural and Related Industries (2012) issued by the National Bureau of Statistics of China. Secondly, firms of Special Treatment and listed for less than 3 years were excluded. Thirdly, firms with missing data were eliminated. 141 valid

samples were finally determined. Data of subsidies, patents and financial performance are getting from China Stock Market & Accounting Research Database, Annual Report of listed companies (cninfo.com), and The Statistical Yearbooks of province from 2008 to 2017.

Variable Design

Explained variable. Financial performance (Perform). Indicators of financial performance of listed companies include turnover, profit margin, market share, overall value of enterprises, etc. (Zang *et al.*, 2019; Booltink & Saka-Helmhout, 2018). The paper holds that subsidies are included in the accounting of net income at the accounting level, and the enhancement of net income is obvious. Return on assets is the ratio of after-tax profit to assets of an enterprise. Its advantage is that it can comprehensively reflect the company's operating performance. The disadvantage is that there are too many relevant influencing factors, including the cost factors. The focus of this paper is whether subsidies promote the innovation and profitability of enterprises. The main business income refers to the operating income obtained by an enterprise engaged in certain main production and business activities, which

reflects the innovation ability and profitability. Therefore, this paper selects the main business income as the proxy variable of the financial performance of enterprises.

Explanatory variables. Subsidies (Subsidy). In the annual report of listed firms, the subsidies are divided into non-operating income and deferred income due to different accounting methods. "Subsidies related to assets" shall be recognized as deferred income, which shall be booked into the current profit and loss after being evenly distributed according to the service life of assets. "Subsidies related to earnings" shall be included in the current profit and loss according to the period in which relevant expenses or losses occur. This paper selects non-operating income of subsidies, including tax rebates, financial allocations and so on.

Mediating variables. Patents are a key indicator to evaluate innovation performance (Pouris & Pouris 2009). Patents can be divided into two dimensions: patent quality (Quality) and patent quantity (Quantity) according to the characteristics of the patent. The patent quantity is mainly expressed by the number of patent applications per year (Kim *et al.*, 2018; Le & Jaffe, 2016; Bronzini & Piselli, 2016). There is no uniform indicator or standard to measure the patent quality. Patent quality is mainly measured by single or multiple indicators, such as number of patent citations, number of valid patents and breadth of patent knowledge (Boeing & Mueller, 2019; Lahr & Mina, 2016; Aghion *et al.*, 2018; Ogrimah, 2016). Considering that Chinese Patent Office does not disclose patent citation data, referring to Aghion *et al.* (2018), the knowledge breadth method is used to measure patent quality. The quantitative information of IPC classification numbers in patent documents was used and weighted by the Herfindahl Hirschman index (HH). The formula is shown in formula (1):

$$patent_knowledge_{nt,type} = 1 - \sum \alpha^2 \quad (1)$$

Where α is the specific gravity of the classification number.

Control variables. Considering that scale of enterprise (Size), capital structure (CS), cash flow (NCFPS) and government-firm relationship (Goverter) are likely to have an impact on the relationship between subsidies and financial performance, the above factors are selected as control variables.

The scale of an enterprise can be measured by indicators such as "employees", "operating income", "total assets" and "net assets" as stipulated in Measures for Statistical Departments of Micro, Small and Medium-Sized Enterprises (China National Bureau of Statistics). Previous studies often used the number of employees to represent the scale of an enterprise and found that this indicator has a significant impact on financial performance of the enterprise (Dang *et al.*, 2018; Goerzen & Beamish, 2003). Refer to Dang *et al.* (2018), the number of employees is used to measure the scale of the enterprise.

The capital structure reflects the cash liquidity and debt position of the enterprise, and the cash flow reflects the operating net assets of the enterprise. The two variables reflect the capital position of the enterprise from different perspectives. Debt financing will influence executives' decisions on R&D projects, and excessive debt financing can also lead to changes in control and affect corporate financial performance. In terms of government-firm relationship, researches show that politically connected enterprises are more likely to receive subsidies (Chaney *et al.*, 2011). Moreover, in countries and regions with low rule of law and backward economic development, the relationship between government and enterprise may lead to rent-seeking (Karlson *et al.*, 2020). The variables and descriptions are shown in Table 1.

Table 1

Variable and Description

Variable type	Variable name	Variable symbol	Description of variable measurement method
Explained variable	Financial performance	Perform	Natural logarithm of main business income
Explanatory variables	Subsidy	Subsidy	The natural logarithm of government subsidy in non-operating income
Mediating variable	Patent	Patent	Patented is represented by 1, otherwise 0
	Patent quantity	Quantity	Annual patent applications by firms
	Patent quality	Quality	Measure with patent knowledge width method
Control variable	Firm scale	Size	Number of employees
	Capital Structure	CS	Liquidity/Total Assets*100%
	cash flow	NCFPS	Net cash flow from operating activities/total equity at the end of the year
	Government-firm relations	Goverter	It is 1 that the senior executives have the experience of government agency, otherwise it is 0

Note: No patent refers to the enterprise have no patent application in 6 consecutive years and more

Statistical Analysis

Descriptive Statistics

SPSS 22.0 is used to analyze the variables. Among the 685 samples, the minimum main business income of cultural and creative enterprises is \$13.259 million; the maximum is \$22.53 million, and the standard deviation is \$1.1287 million. The minimum subsidy is 0; the maximum is \$16,455 million, and the standard deviation is \$1.6816 million, indicating that the subsidy fluctuates greatly. The

minimum, maximum and mean value of patent quantity is 0, 2108 and 34.8040, respectively, with a standard deviation of 131.5555. The minimum and maximum of patent quality are 0 and 0.9627 respectively, and the standard deviation is 0.3191.

Among the control variables, the minimum value of firm size is 26, and the maximum value is 20,354, with a standard deviation of 3123.5768. The minimum value of capital structure is 11.0209 % and the maximum value is 98.5794 %, with a mean value of 58.7341 %. The minimum

value of cash flow is -2.7925, the maximum value is 13.7659, and the mean value is 0.3436. The mean value of government-enterprise relationship is 0.8660, indicating

that 86.6 % of the executives in listed cultural and creative enterprises have served in government agencies. The results are shown in Table 2.

Table 2

Descriptive Statistical Analysis of the Main Variables

Variable	N	Mean	SD	Min.	Max.
Perform	685	17.93	11.287	13.259	22.53
Subsidy	685	10.6819	16.816	0.0000	16.46
Quantity	685	34.8040	131.5555	0.0000	2108.0000
Quality	685	0.5257	0.3191	0.0000	0.9627
Size	685	2664.029	3123.5768	26.0000	20354.0000
CS	685	58.7341	19.4130	11.0209	98.5794
NCFPS	685	0.3436	0.7564	-2.7925	13.7659
Goverter	685	0.8660	0.3412	0.0000	1.0000

Reliability and Validity Test

SPSS 22.0 software is used to analyze the correlation of variables. The results show that subsidies are significantly positively correlated with financial performance (rSubsidy = 0.584, p<0.01), and subsidies are significantly positively correlated with the patent quantity and patent quality

(rQuantity = 0.114, p<0.01; rQuality = 0.073, p<0.1). Patent quantity and patent quality are significantly positively correlated with financial performance (rQuantity = 0.196, p<0.01; rQuality = 0.130, p<0.01). There is no collinearity in the model variables (VIF<5). The results are shown in Table 3.

Table 3

Correlation Matrix of Variables

	VIF	Perform	Subsidy	Quantity	Quality	Size	CS	NCFPS	Goverter
Perform		1	0.584***	0.196***	0.130***	0.646***	-0.261***	0.087**	0.065*
Subsidy	1.301		1	0.114***	0.073*	0.408***	-0.137***	0.134***	0.070*
Quantity	1.140			1	0.218***	0.110**	-0.039	-0.055	0.027
Quality	1.100				1	0.044	0.100***	-0.101***	0.014
Size	1.366					1	-0.230***	0.096**	0.049
CS	1.089						1	-0.141***	-0.051
NCFPS	1.052							1	0.005
Goverter	1.026								1

Note: ***, **, * are significant at the level of 1 %, 5 % and 10 % respectively.

Model Building

The mediation effect model is constructed as follows:

$$\begin{cases}
 perform_{it} = \alpha + \beta_1 subsidy_{it} + \beta_2 control_{it} + \varepsilon_{it} \\
 patent_{it} = \alpha + \beta_1 subsidy_{it} + \beta_2 control_{it} + \varepsilon_{it} \\
 perform_{it} = \alpha + \beta_0 subsidy_{it} + \beta_1 patent_{it} + \beta_2 control_{it} + \varepsilon_{it}
 \end{cases} \quad (2)$$

In formula (2), perform represents financial performance, patent represents innovation performance, subsidy represents government subsidy, and control represents control variables. *i* and *t* represent cultural and creative firms and year respectively, α , β are the parameters to be estimated, and ε_{it} is the random error term.

Empirical Analysis

Subsidies, Patents and Financial Performance

Ebalance matching is used to eliminate the influence of control variables, regression analysis is conducted among subsidies, patents and financial performance respectively. The results are as follows.

Model (1) shows that the regression coefficient of subsidies on financial performance is 0.5050 (p<0.01), which indicates that subsidies can significantly improve the financial performance of cultural and creative enterprises. H1 is supported.

Model (2) shows that the regression coefficient of subsidies on patents is 0.3461 (p<0.01), which indicating that subsidies significantly promote patents of cultural and creative enterprises.

Model (3) shows that the regression coefficient of patents on financial performance is 0.7471(p<0.01), which indicates that patents significantly contribute to the financial performance of enterprises. It indicates that patents play a mediating role between subsidies and financial performance of cultural and creative enterprises.

Total and Mediating Effects of Patent Quantity and Patent Quality

Patents are further divided into patent quantity and patent quality, and the total effect and mediating effect of patents are analyzed.

Model (1) shows that the total effect of subsidies on financial performance is 0.242 (p<0.01), which indicates that subsidies improve the financial performance of cultural and creative enterprises.

Model (2) shows the coefficient of subsidies on patent quantity is 13.438 (p<0.05), indicating that subsidies significantly foster parents quantity. Model (3) shows the coefficient of the patent quantity on financial performance is 0.0011 (p<0.01), which indicating that patent quantity significantly promote the financial performance. That is,

patent quantity plays an mediating role between subsidies and financial performance. H2a is supported.

Model (4) shows the coefficient of subsidies on patent quality is 0.033 (p<0.01), indicating that subsidies significantly improve patent quality. Model (5) shows the coefficient of patent quality on financial performance is 0.446 (p<0.01), which indicating that patent quality significantly promote financial performance of cultural and creative enterprises. So, patents quality plays a mediating role between subsidies and financial performance. H2b is supported.

Comparing model (2) with model (4), the promotion effect of subsidies on patent quantity is 13.438 (p<0.05), and promotion effect of subsidies on patent quality is 0.033 (p<0.01). It can be found that the promotion effect of subsidies on patent quantity is much larger than that of patent quality. It indicates that at the current stage, the promotion effect of subsidies on patent quantity is greater than that of on patent quality of cultural and creative enterprises in China.

Comparing model (3) with model (5), the coefficient of patent quantity on financial performance is 0.0011 (p<0.01)

and the coefficient of patent quality on financial performance is 0.446 (p<0.01). It can be found that the impact of patent quality on financial performance is greater than that of patent quantity. It indicates that the improvement of patent quality is the key to enhance financial performance of cultural and creative enterprises. The results are shown in Table 5.

To assess the weight of the mediating role in the total effect, referring to MacKinnon (2008), the formula $P_M = \frac{ab}{ab+c'}$ is adopted, where a is the coefficient of the independent variable on the mediating variable, b is the coefficient of the mediating variable on the dependent variable, ab is the indirect effect, and c' is the direct effect of the independent variable on the dependent variable after considering the mediating variable. $ab + c'$ is the total effect.

According to the calculation, the ratio of the mediating effect of patent quantity and patent quality to the total effect is 6.12 % and 6.09 % respectively, which indicating the mediating effect of patent quality is not greater than that of patent quantity. Therefore, H3 is not supported.

Table 4

Results of Subsidies on Patents and Financial Performance

Variable	Financial performance (1)	Patents (2)	Financial performance (3)
Patent			0.7471*** (4.55)
Subsidy	0.5050*** (7.69)	0.3461*** (5.97)	0.1102*** (6.88)
Size	0.0003*** (16.36)	0.00001** (2.26)	0.0001*** (9.69)
CS	-0.0037 (-1.22)	-0.0001 (-0.99)	-0.0009 (-0.24)
NCFPS	0.0047 (0.10)	0.0228 (1.22)	0.2286** (2.18)
Goverter	-0.1438 (-1.42)	-0.1308* (-1.80)	-0.1014 (-0.89)
Cons	9.9942*** (29.62)	0.9557*** (5.60)	9.3024*** (24.00)
R ²	0.7359	0.6355	0.7066
F	57.84***	137.80***	106.4000***

Note: ***, **, * are significant at the level of 1 %, 5 % and 10 % respectively

Table 5

The Results of Total and Mediating Effects of Patent Quantity and Patent Quality

Variable	Financial performance (1)	Patent quantity (2)	Financial performance (3)	Patent quality (4)	Financial performance (5)
Subsidy	0.242*** (6.47)	13.438** (2.48)	0.227*** (6.17)	0.033*** (3.86)	0.227*** (6.18)
Quantity			0.0011*** (4.43)		
Quality					0.446*** (4.30)
Size	0.0002*** (7.23)	0.0071** (2.29)	0.0002*** (7.29)	0.0001*** (3.33)	0.0002*** (7.06)
CS	-0.005* (-1.82)	-0.211 (-1.07)	-0.005* (-1.75)	0.001** (2.37)	-0.006** (-2.11)
NCFPS	-0.051 (-1.18)	-11.927 (-1.45)	-0.038 (-0.90)	-0.033*** (-2.23)	-0.036 (-0.89)
Goverter	0.017 (0.19)	18.422 (1.29)	-0.003 (-0.03)	0.029 (0.91)	0.004 (0.04)
Cons	10.038*** (27.88)	-1.740 (-0.05)	10.040*** (28.37)	0.196** (2.04)	9.951*** (28.59)
R ²	0.564	9	0.578	0.113	0.578
F	94.10***	3.58***	104.40	11.41***	91.81***
N	685	685	685	685	685

Note: ***, **, * are significant at the level of 1 %, 5 % and 10 % respectively

Conclusions

Research Conclusion

Taking Chinese listed cultural and creative enterprises as samples, the paper explores the effect of subsidies on financial performance, and compares the mediating role of patent quantity and patent quality between subsidies and financial performance. The findings make several theoretical contributions and policy implications. The results show as follows.

First, this research enriches the research regarding subsidies on innovation, and financial performance of cultural and creative enterprises. The extant literatures pay less attention to the effect of subsidies on performance of cultural and creative enterprises. There are many previous researches on subsidies and performance, but there is less literature on the impact of subsidies on the performance of cultural and creative enterprises. This paper shows that the subsidies can incentivize innovation and improve the performance of cultural and creative enterprises. These findings reinforce the arguments that subsidies promote R&D and performance. This finding offers a new analytic basis for studying multi-level drivers of cultural and creative enterprises' innovation.

Second, consistent with the argument that subsidies have a great impact on the innovation of cultural and creative enterprises (Zhou *et al.*, 2019), this research helps to clarify the promotion effect of subsidies on the patent of cultural and creative enterprises. Furthermore, by dividing the patents into the dimensions of patent quantity and patent quality, the results show that subsidies promote the patents of cultural and creative enterprises. This finding suggests that the effect of subsidies on patent quantity is greater than that on patent quality of cultural and creative enterprises. It shows that subsidized cultural and creative enterprises pay more attention to the patent quantity but ignore patent quality in China at present. There is a certain degree of patent bubble phenomenon (Dang & Motohashi, 2015).

Third, our study draws a more detailed picture of the subsidies on patents and financial performance of cultural and creative enterprises. It is found that both patent quantity and patent quality promote financial performance of cultural and creative enterprises, but the effect of patent quality on financial performance is greater than that of patent quantity. As an intuitive embodiment of innovation of cultural and creative enterprises, the patent quantity reflects the innovation capability, thus promoting financial performance (Le & Jaffe, 2016; Chen *et al.*, 2018). Patent quality is the breadth of innovation knowledge, which reflects the complexity of the knowledge contained in the patent and increases the cost of imitation of the technology. The cultural and creative enterprises with high-quality patents can have the market monopoly right for a certain period of time, so it can effectively promote performance of cultural and creative enterprises (Vanino *et al.*, 2019; Artz *et al.*, 2010). This finding highlights the role of government to incentivize cultural and creative enterprises to achieve innovation and improve performance.

Fourth, this study sheds light on the mediating role of patents between subsidies and financial performance. Subsidies boost patents by stimulating investment in R&D, and patents promote the financial performance of cultural and creative enterprises. Therefore, patents play a mediating

role between subsidies and financial performance of cultural and creative enterprises. It is found that patent quality has a greater promoting effect on financial performance than patent quantity. However, the promotion effect of subsidies on patent quantity is much more than that of patent quality. As a result, the mediating effect of patent quality between subsidies and financial performance is not greater than that of patent quantity. In other words, the effect of subsidies on financial performance through increasing patent quantity is slightly greater than that of patent quality. One of the reasons may be that subsidies decisions-making are largely based on the number of patent applications and authorizations. So it is difficult to form patent quality-oriented incentive policies environment (Dang & Motohashi, 2015). The second reason may be the imperfect protection of intellectual property rights, which makes cultural and creative products often be copied and the market value of high-quality products undervalued. As a result, the transfer effect of patent quality between subsidies and performance of cultural and creative enterprises is weakened. The finding expands the understanding of the effects of subsidies, innovation and financial performance by putting the story in the context of China's cultural and creative industry.

Implications

For policy makers, this research could provide useful reference for those countries that employ subsidies as policy instruments to facilitate innovations of cultural and creative enterprises.

Since subsidies can help cultural and creative enterprises to implement innovation and improve performance, governments should design appropriate policy instruments to incentivize cultural and creative enterprises to achieve more innovation outcomes. The government should strengthen the continuous subsidies for cultural and creative enterprises in order to enhance their enthusiasm for innovation and improve financial performance.

Studies have shown that Chinese government has paid more attention to the input additionally effect of subsidies, i.e. to what extent the government support incentivizes firms to invest more on innovation inputs, rather than the effectiveness of the subsidies in fostering innovation outputs (Zhou *et al.*, 2020). This paper finds that the promotion effect of subsidies on patents quantity is much greater than that of patents quality. This highlights that there is inefficiency in subsidies. Therefore, it is necessary to pay more attention to the efficiency and quality of subsidies. Subsidy decision-making should not only be dependent on patent quantity, but also on patent quality in order to guide enterprises to improve the quality of innovation, cultivate high value-added enterprises, and promote the sustainable development of cultural and creative enterprises.

The government should attach importance to building a good external environment for innovation. It is necessary for the government to optimize the market operation mechanism, create a fair and just environment, and strengthen protection of intellectual property rights so as to stimulate the original and independent innovation of cultural and creative industries.

The government should strengthen supervision of subsidies while increasing the amount of subsidies in order to ensure their effective use of subsidies. Moreover, the post-evaluation mechanism of subsidies should be established. Scientific and reasonable performance evaluation standards should be formulated and regular evaluation should be carried out so as to improve the efficiency and effectiveness of subsidies.

Furthermore, the paper can also provide implications for managers of enterprises. Managers should understand that patent quality plays a significant role in improving enterprise performance. Cultural and creative enterprises should increase investment in R&D, attach more importance to high-quality innovation, improve their independent innovation ability, and achieve sustainable development.

Limitations

There are still some limitations in this study, which need to be further studied. First, this paper fails to divide subsidies into multiple types, and the effects of different types of subsidies on innovation and financial performance of enterprises are vague to some extent. Future research can study the impact of different types of subsidies on the innovation of cultural and creative enterprises in more detail, and compare the effect of different policy instruments. Second, the conclusion of this paper is based on the sample data of listed cultural and creative enterprises in China. It should be extended to other industries to improve the universality of the conclusion.

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