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How Does R&D Investment Affect the Financial Performance of Cultural and Creative Enterprises? The Moderating Effect of Actual Controller

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Abstract: R&D investment has a sophisticated correlation with the financial performance of cultural and creative enterprises. In this study, using the panel data of listed cultural and creative enterprises in China from 2011 to 2013, we found that R&D investment has positive impacts on financial performance in both the current and the lag periods. However, these positive impacts are moderated by actual controllers. More specifically, there is a positive moderating effect on enterprises' financial performance when the central government is the actual controller. On the other hand, there is no evident effect when the actual controller is a local government or a state-owned enterprise, and there is a clear negative moderating effect on financial performance when a natural person is the actual controller. Given these findings, we argue that local governments and state-owned enterprises should improve their long-term strategies for the cultural and creative enterprises they control and reduce actions forced by short-term economic goals. Additionally, local governments and state-owned enterprises should fundamentally stress the role of R&D in order to handle the pressure of increasingly keen competition from international companies' technological innovation programs.

Keywords: cultural and creative enterprises; R&D investment; actual controller; financial performance

1. Introduction

Research and development (R&D), which is the critical approach to a firm's economic growth via improved productivity and technological innovation [1], has attracted increasing attention from academic, commercial, and political circles [2]. However, companies do not always have sufficient R&D ability [3]. Therefore, to obtain sustaining competitive force, firms must efficiently allocate their R&D resources [1].

R&D investment, an input of organizational innovation practices and activities, is intended to provide sustainable growth by generating new products and processes while also enhancing operating productivity [2]. Although prior academic researchers have discussed the relationship between R&D investment and enterprises' financial performance [4–7], consensus regarding the implications of R&D investment for firms' financial performance has not yet been reached [1]. Some researchers argue that R&D investment can help firms enhance their ability to generate new products and technology, which then helps boost performance [8,9], while others suggest that R&D investment is positively associated with risk [10]. It is thus unclear whether R&D investment contributes to corporate financial performance [11]. As an increasing number of firms awaken to the importance of R&D investment, it is worthwhile providing a closer examination of the contribution of R&D investment for firms' financial performance.

One existing research gap in the literature shows that, although an increasing number of researchers working in the field of R&D investment and financial performance suggest that R&D investment can contribute to enhancing financial performance [9,11,12], most focus only on the current effect of R&D investment on financial performance while ignoring possible future effects [1]. Specifically, the previous literature pays less attention to the lagged effect of R&D investment on enterprises' financial performance [13]. Moreover, much research provides support for the conclusion that R&D investment is a critical factor in firms' innovative activities [2]. This is especially true for the innovation practices of cultural and creative enterprises (CCEs). The previous decades have witnessed the development of cultural and creative industries in China, but a lack of innovative ability in this sector has been a bottleneck restricting this industry from developing further [14]. Thus, relevant policies, such as subsidies for R&D investment, have been proposed to accelerate the development of CCEs, which, in fact, has become a significant national strategy. Accordingly, for cultural and creative industries, the guiding question in this study is whether R&D investment positively affects the financial performance of CCEs.

Another research gap concerns the contextual mechanisms by which R&D investment yields positive financial performance [11]. Based on organizational control theory, the key to the relationship between R&D investment and firms' financial performance depends on the actual controller, which can either improve knowledge flows and the integration of different capabilities or reduce organizational conflicts [15]. Moreover, the actual controller can appropriately alleviate the problem of insufficient R&D funds, which contribute to the development of corporate innovation activities [16]. Finally, given that R&D investment is a significant part of business strategies used by actual controllers of enterprises, the actual controllers should be seen as a significant factor in affecting the relationship between R&D investment and enterprises' financial performance [15].

In recent years, a growing amount of literature suggests that the innovation capacity of cultural and creative industries is significant to economic growth and technological innovation [17–19]. In terms of these cultural and creative industries, increasing R&D investment is the most crucial approach to increasing technological innovation abilities. Accordingly, the guiding question underlying this study is whether the actual controller of enterprises moderates the relationship between R&D investment and enterprises' financial performance. This question has been rarely examined in the existing literature. This study aimed to examine this question using panel data from listed Chinese companies.

We hold that the significant effect of R&D investment on a firm's financial performance must be based on the contingent role of the actual controller. At the cultural and creative industry-level, this research expands the scope of R&D investment by providing support for the positive effect, as well as the lagged effect of R&D investment on firms' financial performance. Moreover, our study constructed a comprehensive model to provide a thorough understanding of the contingent role of the actual controller by identifying when R&D investment may help to boost a firm's economic growth.

This paper is organized as follows. First, we review the relevant literature. We follow this by putting forward several hypotheses. Subsequently, the design and description of the empirical research models are presented. This is followed by our concrete empirical results analysis. Lastly, the discussion, conclusions, and managerial implications are drawn.

2. Theories and Hypotheses

2.1. R&D Investment and Financial Performance

The contributions of R&D investment to enterprises' financial performance are discussed widely in the literature [20,21]. We know that R&D investment can help enterprises gain new technologies and products, and can enhance corporate productivity in order to respond quickly to market demands, which can positively affect firms' profits [2,12]. With regard to market value, Sougiannis concluded that R&D investment is likely to yield fivefold growth in market value in a given period [22]. Piva and Vivarelli also indicated that R&D affects the growth of companies [23]. In addition, there are studies

that indirectly discuss the significance of R&D for enterprise performance, including discussions of linkages, spillovers, and externalities of strategic significance [24]. Accordingly, many papers examine CCEs from different views, such as by looking at the innovation capacity of cultural and creative industries [18,19]; innovation and the creative industries [25]; resources that concentrate on core technologies [26]; and CCEs' business innovations [17]. Moreover, as cultural and creative industries involve a considerable portion of highly-skilled labor contributing to innovation activities [18], some researchers examine the ability of companies to upgrade the knowledge and creative content of their cultural products and services [27,28].

Based on the previous research, it can be seen that the competitiveness of CCEs is closely associated with industrial innovation and R&D investment [29–31]. As Müller et al. indicated, various innovations are supported by creative inputs, e.g., ideas for new products and new service [32]. Choi et al. confirmed the critical role of R&D investment as the proxy of innovation performance [33]. However, a few studies suggest that R&D investment does not ensure innovation [34]. Given that technological and organizational capabilities are positively correlated to abilities to create market opportunities [29], R&D investment is vital for the innovation and financial performance of CCEs, helping them use internet and digital technology [19,35].

Given that the process of corporate R&D should be viewed as an ongoing activity, it may take a long time from R&D investment to new product realization. Therefore, there is a lag regarding the impact of R&D investment on corporate performance [13]. Moreover, some previous literature suggests that R&D activities not only affect enterprise performance in the current period but also do so with a certain time lag [7,36,37]. Similarly, Lev and Sougiannis highlighted that R&D investment is positively correlated with current and future performance [38]. Therefore, taking particular time lag effects into consideration, this study aimed to verify how R&D activities affect the financial performance of CCEs in both the current and the lag periods.

Therefore, we hypothesize that:

Hypothesis 1a (H1a): *R&D investment has a positive effect on the financial performance of CCEs.*

Hypothesis 1b (H1b): *R&D investment has a lagged effect on the financial performance of CCEs.*

2.2. The Moderating Effect of Actual Controller

Recently, researchers find that company risk is usually accompanied by R&D investment [10]. In terms of listed enterprises, this risk, which is shared by the actual controller and the shareholders, promotes the idea that R&D investment is more effectively transferred into financial performance, as the actual controller will commit more R&D resources and take less risk by themselves, which thus essentially uses other people's money to meet the controller's business assumptions [39]. Moreover, the political background and shareholding ratio of the enterprise's actual controller may affect performance as well [40–42]. For instance, Li et al. indicated that a manager's social capital has a positive impact on an enterprise's financial performance [43]. Thus, large shareholders have both the incentive and the power to restrain the self-serving behavior of managers [44–46]. Regarding listed companies in China, several empirical studies suggest that large shareholders should prioritize long-term investment projects (such as R&D projects) to increase the stability [47,48]. In this vein, institutions are seen as the strategic reflection of the actual controllers' choices, and the reputation concerns of large shareholders should be highlighted [49–51].

Researchers find that ownership is a critical factor affecting both organizational R&D investment and innovation performance [52,53]. For example, Wu concluded that ownership does indeed matter in the certification of R&D subsidies in the context of China, and that the signal effect of R&D grants is stronger for private enterprises than for state-owned enterprises [54]. Stable ownership can tightly control investment activities and monitor their management, which is crucial for the investment in new technologies [55]. Previous researchers also suggest that shareholder-oriented practices positively

impact R&D investment [56–58]. In contrast, some empirical studies argue that, to protect the interests of shareholders, managers—especially the state-owned enterprise (SOE) managers, who have few incentives to push innovation—will underinvest in innovation activities [59–61]. Moreover, some studies highlight that different types of government ownership have different levels of resources that affect firms' R&D activities [62]. For example, Minetti et al. found that concentration of ownership negatively affects innovation by reducing R&D efforts [55].

In addition, different types of actual controllers hold various perceptions of R&D investment, which further alter the effect of government subsidies on R&D investment. For instance, Teng and Yi examined the impact of ownership types on R&D intensity and innovation performance, and found a positive association between R&D activities and the innovation performance of firms owned by the central government, but a negative association for firms owned by local governments, as well as those held by private or foreign owners [62]. Managing innovation is critical to enterprises' development [63]. The system of corporate governance shapes a firm's innovation activity [15]. Researchers working in the area of creative industries also emphasize the reconciliation of the various needs of the three primary stakeholders (i.e., firms, individuals, and creative communities) [64]; creative occupations as a robust driver of product innovation [65]; and the impact of a firm's political connections on investment and innovation [66–68].

The current paper asserts that R&D investment is one type of strategic decision, and that the stance of the actual controller may determine the strategy of R&D investment. Resource availability is critical for R&D intensity and the innovation performances of firms [69,70]. Further, as Cheng reported, the effect of the actual controller can reach up to 3.61% of the stock prices of listed companies [71]. Given that corporate governance—which differs significantly across a firm's ownership concentration [72]—has a close association with R&D intensity [73], the monitoring role of the actual controller may act as an important mechanism to affect R&D investment decisions and propel firm innovation [74].

Furthermore, based on the information disclosed on the financial reports of China's listed companies, this study divided the actual controllers of CCEs into four types: the central government, local governments, state-owned enterprises, and natural persons. Different types of actual controllers may have distinct contingent effects on the relationship between R&D investment and the financial performance of their CCE. Meanwhile, we also considered a time lag effect. In combination with the four types of actual controllers, we present the following hypotheses:

Hypothesis 2 (H2): *When the actual controller is the central government, the positive impact of R&D investment on the financial performance of CCEs will be stronger in both the current period (H2a) and the lag period (H2b).*

Hypothesis 3 (H3): *When the actual controller is the local government, the positive impact of R&D investment on the financial performance of CCEs will be stronger in both the current period (H3a) and the lag period (H3a).*

Hypothesis 4 (H4): *When the actual controller is a state-owned enterprise, the positive impact of R&D investment on the financial performance of CCEs will be stronger in the both the current period (H4a) and the lag period (H4b).*

Hypothesis 5 (H5): *When the actual controller is a natural person, the positive impact of R&D investment on the financial performance of CCEs will be stronger in both the current period (H5a) and the lag period (H5b).*

3. Methods

3.1. Data Sources

In this study, CCEs were the research object. On the one hand, cultural and creative industries have become an emerging and vital sector in China in recent years. On the other hand, R&D intensity

in these Chinese industries is lower than that of developed economies, such as in the United States and the European Union [75]. Therefore, it is important to discuss the R&D investment of Chinese CCEs. We used the panel data of 2011–2013 from Shanghai and Shenzhen A-share listed companies in cultural and creative industries to test our hypotheses. Due to a lack of officially released data regarding R&D and the actual controllers of cultural and creative industries, we collected our data from annual financial reports of listed companies one by one, which was a time-consuming process. The CCE data were selected using the "Cultural and Cultural-related Industries Classification (2012) of China National Bureau of Statistics" designation. A three-year dataset (from 2011 to 2013) drawn from 103 CCEs was obtained.

3.2. Measurement of Variables

Dependent variable. In previous research, indicators such as gross profit, profit margin, turnover, market share, and overall value are often employed to assess the financial performance of enterprises [4,5,37,76–78]. Following previous research [77], and given that the selection of the dependent variable corresponding to R&D investment should be the indicator capable of revealing core profitability of enterprises, we measured financial performance using net profit to reflect the authentic and objective profitability of enterprises.

Independent variable. Based on previous research [7], we measured R&D investment using total R&D expenses. R&D expenditures can improve the absorptive capacity of firms, which allows for more key knowledge and technology to be brought in, and helps to increase enterprise performance [79]. Generally, total R&D expenses include both internal R&D expenses and external R&D expenses. Internal R&D expenses refer to all expenditures spent on R&D-related activities that occur within a firm, and external R&D expenses mainly refer to R&D expenditures spent outside the firm, especially covering R&D services that are outsourced to contractors [80]. In accordance with China's official regulation titled "International Accounting Standards No. 9—R&D Expenses", total R&D expenses should include all expenditures directly ascribed to R&D activities, as well as expenses that can reasonably be allocated to such activities. Therefore, in this study, we used internally-sourced R&D investment and externally-sourced R&D investment as the indicators of total R&D expenses [4,81,82].

Moderating variable. The actual controller was the moderating variable. As outlined above, the actual controller falls into four groups: the central government, local government, state-owned enterprise, or natural person. This classification is based on information disclosed from annual financial reports and the government regulations, including "Acquisition of Listed Companies Management Approach", "Stock Listing Rules of both the Shanghai and Shenzhen Stock Exchanges", and "Behavior Guidelines of SME Board Controlling Shareholders of Listed Companies & the Actual Controller". In this study, the actual controller classified as "the central government" consists of the State-owned Assets Supervision and Administration Commission, as well as national ministries. The actual controller classified as "local government" comprises local governments (e.g., provincial or municipal governments), China State-owned Assets Management Committees of local governments, and departments and agencies of local governments (e.g., the Administration Committee of the Economic Development Zone). The actual controller classified as "state-owned enterprises" includes state-owned companies and state shareholding companies. Lastly, the actual controller classified as "natural persons" consists of enterprises in which information is disclosed in annual reports by "one or several natural persons".

Control variables. Given that factors such as industry, ownership, company size, and annual fluctuation are likely to affect the relationship between government subsidies and R&D investment, these factors were considered as control variables. In terms of industry, many prior studies use this as a control variable [42,83–85]. We classified the cultural and creative industries as the industry control variable, based on the "Cultural and Related Industrial Classification (2012) from China National Bureau of Statistics", which includes ten industries: (1) news and publishing services; (2) radio, TV and movies services; (3) arts and cultural services; (4) cultural information transmission services;

(5) cultural creativity and design services; (6) cultural recreation and entertainment services; (7) arts and crafts production; (8) production of auxiliary cultural products; (9) production of stationary; and (10) production of special cultural euipment.

Ownership is critical for enterprise innovation [74], and previous studies reveal that there is a significant relationship between ownership and the strategy and performance of enterprises [86–88]. Thus, in terms of ownership types, a company can be classified by its ownership characteristic, e.g., state-owned enterprises (SOEs), collectively-run enterprises (CREs), private enterprises (PEs), or foreign-invested enterprises (FIEs).

In terms of enterprise size, various indicators could be used, including "employees", "business income", or "total assets" [89], which are regulated in "Medium, Small & Micro Enterprise Approach to Statistical Division (NBS [2011] No. 75) from China National Bureau of Statistics". Many previous researchers use number of employees to signify firm size in their quantitative models [90], and find that this indicator significantly affects enterprise performance [76,89,91,92]. Moreover, Dang et al. suggested that, when main measures, such as "total assets", "total sales" and "market cap" are not available, "number of employees" can serve as the proxy of enterprise size [89]. Hence, we employed "number of employees" as the indicator for the sizes of the companies [93].

In addition, there are some unpredictable factors that can vary with time. Thus, we also include anannual fluctuation factor as an additional control variable. Overall, the measurements of the variables used in this paper are summarized in Table 1.

Table 1. Measures.

Variable	Measurements
Financial performance	Net profit
R&D investment	Internally and externally-sourced R&D investment
Actual controller	Dummy
Size	Number of employees
Industry	Dummy
Ownership	Dummy
Year	Dummy

3.3. The Econometric Models

We established the econometric models in accordance with the dependent, independent, moderating, and control variables, respectively. Given the data from 2011 to 2013, a one-year lag period was considered for testing the lagged moderating effect. Based on H1, the econometric model is written as Equation (1):

$$Perf_{i,t} = \alpha_0 + \beta_1 R\&D_{i,t} + \beta_2 R\&D_{i,t-1} + \beta_3 Ind_{i,t} + \beta_4 Own_{i,t} + \beta_5 Size_{i,t} + \lambda_0 Year + \varepsilon_{i,t} \quad (1)$$

where $Perf_{i,t}$ denotes the financial performance of the cultural and creative company i in the year t; $R\&D_{i,t}$ is the R&D investment of company i in the year t; the subscript i is the number of the cultural and creative company; and the subscript t is the year (from 2011 to 2013). Additionally, with respect to the control variables, $Ind_{i,t}$ denotes types of industries; $Own_{i,t}$ is an ownership of listed companies; $Size_{i,t}$ is the number of employees; $Year$ is an annual fluctuation factor; and $\varepsilon_{i,t}$ is the random error.

In terms of the moderating variable (i.e., the actual controller), this study conducted a more detailed empirical research process using the method of a dummy variable. Based on H2, the econometric model is written as Equation (2):

$$\begin{aligned} Perf_{i,t} = {} & \alpha_0 + \beta_1 R\&D_{i,t} + \beta_2 R\&D_{i,t-1} + \beta_3 Ind_{i,t} + \beta_4 Own_{i,t} + \beta_5 Size_{i,t} + \beta_6 Boss\_1_{i,t} \\ & + \beta_7 Boss\_1_{i,t} \times R\&D_{i,t} + \beta_8 Boss\_1_{i,t} \times R\&D_{i,t-1} + \lambda_0 Year + \varepsilon_{i,t} \end{aligned} \quad (2)$$

In Equation (2), *Boss* denotes the dummy variable of the type of listed companies' actual controllers. Additionally, $Boss\_1_{i,t}$ is the category of the central government; the classified value of which is as follows:

$$Boss\_1_{i,t} = \begin{cases} 1, \text{ actual controller is central government} \\ 0, \text{ other type} \end{cases}$$

Based on H3, the econometric model is written as Equation (3):

$$\begin{aligned} Perf_{i,t} = {} & \alpha_0 + \beta_1 R\&D_{i,t} + \beta_2 R\&D_{i,t-1} + \beta_3 Ind_{i,t} + \beta_4 Own_{i,t} + \beta_5 Size_{i,t} + \beta_6 Boss\_2_{i,t} \\ & + \beta_7 Boss\_2_{i,t} \times R\&D_{i,t} + \beta_8 Boss\_2_{i,t} \times R\&D_{i,t-1} + \lambda_0 Year + \varepsilon_{i,t} \end{aligned} \quad (3)$$

In Equation (3), $Boss\_2_{i,t}$ shows that the type of actual controller is a local government; the classified value of which is as follows:

$$Boss\_2_{i,t} = \begin{cases} 1, \text{ actual controller is central government} \\ 0, \text{ other type} \end{cases}$$

Based on H4, the econometric model is written as Equation (4):

$$\begin{aligned} Perf_{i,t} = {} & \alpha_0 + \beta_1 R\&D_{i,t} + \beta_2 R\&D_{i,t-1} + \beta_3 Ind_{i,t} + \beta_4 Own_{i,t} + \beta_5 Size_{i,t} + \beta_6 Boss\_3_{i,t} \\ & + \beta_7 Boss\_3_{i,t} \times R\&D_{i,t} + \beta_8 Boss\_3_{i,t} \times R\&D_{i,t-1} + \lambda_0 Year + \varepsilon_{i,t} \end{aligned} \quad (4)$$

In Equation (4), $Boss\_3_{i,t}$ shows that the category of actual controller is a state-owned enterprise; the classified value of which is as follows:

$$Boss\_3_{i,t} = \begin{cases} 1, \text{ actual controller is central government} \\ 0, \text{ other type} \end{cases}$$

Based on H5, the econometric model is written as Equation (5):

$$\begin{aligned} Perf_{i,t} = {} & \alpha_0 + \beta_1 R\&D_{i,t} + \beta_2 R\&D_{i,t-1} + \beta_3 Ind_{i,t} + \beta_4 Own_{i,t} + \beta_5 Size_{i,t} + \beta_6 Boss\_4_{i,t} \\ & + \beta_7 Boss\_4_{i,t} \times R\&D_{i,t} + \beta_8 Boss\_4_{i,t} \times R\&D_{i,t-1} + \lambda_0 Year + \varepsilon_{i,t} \end{aligned} \quad (5)$$

In Equation (5), $Boss\_4_{i,t}$ shows that the category of actual controller is a natural person; the classified value of which is as follows:

$$Boss\_4_{i,t} = \begin{cases} 1, \text{ actual controller is central government} \\ 0, \text{ other type} \end{cases}$$

4. Results

The results of the descriptive statistics of the variables are found in Table 2.

Table 2. Descriptive statistics. Unit: ¥10,000.

Variable	Mean	Standard Deviation	Minimum	Maximum
Financial performance	17,550.24	44,414.34	−78,200	325,000
R&D investment	12,450.81	26,637.99	129.35	190,000
R&D investment (lagged)	9561.71	22,217.33	27.95	185,000
Industry	5.53	1.93	1.00	9.00
Ownership	2.67	0.82	1.00	4.00
Size	4406.58	16,912.98	139	219,000
Year (dummy)	0.56	0.49	0.00	1.00

4.1. Model Selection

The first step in the empirical study of panel-data econometric models is to select the models scientifically. In general, fixed-effect, random-effect, and mixed-OLS models should be compared and analyzed to select the most appropriate type that is capable of revealing objective data. As found in the results of the fixed-effect model, the *F*-value reaches 25.29, and the *p*-value is smaller than 0.001, suggesting that the individual fixed effect is significant. Therefore, the fixed-effect model is shown to be better than the mixed-OLS model.

The result of the random-effect model indicates that the statistic of χ^2 is 144.39, and the corresponding *p*-value is smaller than 0.001, suggesting that the individual random effect is significant. The random-effect model also outperforms the mixed-OLS model. Subsequently, we compared the fixed-effect model with the random-effect model using the Hausman test. The results of the Hausman test verify that the statistic of χ^2 is 33.32 and the corresponding *p*-value is smaller than 0.001, while the difference of the parameter estimation variance is a non-positive definite matrix. When the models are continuously examined by consistent estimates of Hausman in the covariance matrix (sigmaless), we found that the statistic of χ^2 is 21.33 with its *p*-value smaller than 0.001. This result overrides the random-effect model assumption. Moreover, the statistic of χ^2 is 18.12 and drops at the level of 1% by the efficient estimator in the covariance matrix (sigma more). Overall, both tests above suggest that the fixed-effect model is better than the random-effect model, and thus, the former is selected.

4.2. Main Findings

In the Table 3, the empirical analysis of the fixed-effect model, regarding the joint parameter test, the statistic of *F* and the value of *p* are 25.29 and 0, respectively, revealing that the parameters are generally quite significant. The goodness-of-fits of the three dimensions of this model's inner-group, between-group, and the overall sample reach are 0.584, 0.267 and 0.209, respectively. Additionally, the variable coefficient and its significance test suggest that the current R&D investment coefficient is 1.815, and is significant at the level of 1%; the first-order lag variable coefficient of R&D investment is larger than 0; and the *p*-value at the level of 5% is found to be significant as well. These results suggest that R&D investment has both a direct and a lagged effect on the financial performance of CCEs. Thus, H1 is supported.

Table 3. Regression results of fixed effect.

Variable	Model (Fixed Effect)	
	Coefficient	**Standard Error**
_Cons	−8034.171 ***	2658.158
$R\&D_{i,t}$	1.815 ***	0.209
$R\&D_{i,t-1}$	0.221 **	0.014
Nine dummies for industry	Added	added
Four dummies for ownership	Added	added
$Size_{i,t}$	Added	added
Year	Added	added
R^2: Group	0.584	
R^2: Between-group	0.267	
R^2: Overall	0.209	
F-value	25.290 ***	

Note: Significance level: *** $p < 0.01$, ** $p < 0.05$.

4.3. The Results of Moderating Effects

4.3.1. Central Government as the Actual Controller

When the actual controller of the CCEs is the central government, the results in Table 4 show that the statistic of *F* is 27.01, and its corresponding *p*-value is smaller than 0.001. Further, the goodness-of-fits of the three dimensions of this model's inner-group, between-group, and the overall

sample are 0.655, 0.441 and 0.390, respectively, suggesting that the model is generally significant. Moreover, the results show that the interaction coefficient of the actual controller and the R&D investment is 1.518 with a significance level of 1%. Thus, H2a is supported. This reveals that the positive impact of R&D investment on the financial performance of CCEs becomes stronger in the lag period, when the actual controller is the central government. However, the interaction coefficient of the actual controller and the first-order lag is found not to be significant. Therefore, H2b is not supported. This finding suggests that the central government, as the actual controller, may be beneficial to boost a firm's productivity and financial performance in the short-term or in the current period, but it will breed bureaucracy in the long run because of excessive centralization, which is detrimental to the improvement of corporate financial performance. It is thus wise for the central government to properly and reasonably decentralize according to market demands.

Table 4. Results of moderating effect of the central government as the actual controller.

Variables	Model (Fixed Effect)	
	Coefficient	**Standard Error**
_Cons	−3738.086	2682.326
$R\&D_{i,t}$	1.165 ***	0.256
$R\&D_{i,t-1}$	0.062	0.104
Nine dummies for industry	added	added
Four dummies for ownership	added	added
$Size_{i,t}$	added	added
$Boss\_1_{i,t}$	0.000	—
$Boss\_1_{i,t} \times R\&D_{i,t}$	1.518 ***	0.396
$Boss\_1_{i,t} \times R\&D_{i,t-1}$	0.000	—
Year	added	added
R^2: Group	0.655	
R^2: Between-group	0.441	
R^2: Overall	0.390	
F-value	27.010 ***	

Note: Significance level: *** $p < 0.01$.

4.3.2. Local Government as the Actual Controller

When the actual controller of the CCEs is a local government, the results in Table 5 show that the statistic of *F* is 27.01, and its corresponding *p*-value is smaller than 0.001. Further, the goodness-of-fits of the three dimensions of this model's inner-group, between-group, and the overall sample are 0.6554, 0.441 and 0.390, respectively, suggesting that the model is generally significant. Moreover, the results show that all the interaction coefficients of R&D investment and actual controller in the current and first-order lag periods are not significant. Thus, H3 is not supported. The results reveal that local governments exert no significant moderating effect on the relationship between R&D investment and financial performance of CCEs. The possible reasons for this may be that, on the one hand, the decentralization of local governments is conducive to business management, while, on the other hand, due to the autonomy, it may be more difficult for local governments to deal with corresponding problems during the R&D process.

Table 5. Results of moderating effect of the local government as the actual controller.

Variables	Model (Fixed Effect)	
	Coefficient	**Standard Error**
_Cons	−7920.238	3141.038
$R\&D_{i,t}$	1.862 ***	0.218
$R\&D_{i,t-1}$	0.224 **	0.106
Nine dummies for industry	added	added
Four dummies for ownership	added	added
$Size_{i,t}$	added	added
$Boss\_2_{i,t}$	5845.473	10,191.790
$Boss\_2_{i,t} \times R\&D_{i,t}$	−0.645	0.719
$Boss\_2_{i,t} \times R\&D_{i,t-1}$	−1.092	2.258
Year	added	added
R^2: Group	0.592	
R^2: Between-group	0.261	
R^2: Overall	0.206	
F-value	14.290 ***	

Note: Significance level: *** $p < 0.01$, ** $p < 0.05$.

4.3.3. State-Owned Enterprise as the Actual Controller

When the actual controller of the CCEs is a state-owned enterprise, the results in Table 6 show that the statistic of *F* is 14.33, and its corresponding *p*-value is significant at a level of 1%. Further, the goodness-of-fits of the three dimensions of this model's inner-group, between-group, and the overall sample are 0.593, 0.349 and 0.246, respectively, suggesting that the model is generally significant. Moreover, the findings demonstrate that all the interaction coefficients of R&D investment and actual controller in the current and first-order lag periods are not significant. Thus, H4 is not supported. This reveals that state-owned enterprises as the actual controller do not affect the relationship between R&D investment and the financial performance of CCEs.

Table 6. Results of moderating effect of the state-owned enterprises as the actual controller.

Variables	Model (Fixed Effect)	
	Coefficient	**Standard Error**
_Cons	−8937.939	10,708.35
$R\&D_{i,t}$	1.440 ***	0.397
$R\&D_{i,t-1}$	0.748	0.483
Nine dummies for industry	added	added
Four dummies for ownership	added	added
$Size_{i,t}$	added	added
$Boss\_3_{i,t}$	−4894.942	10,123.72
$Boss\_3_{i,t} \times R\&D_{i,t}$	0.689	2.972
$Boss\_3_{i,t} \times R\&D_{i,t}$	−0.501	0.650
Year	added	added
R^2: Group	0.593	
R^2: Between-group	0.227	
R^2: Overall	0.170	
F-value	14.330 ***	

Note: Significance level: *** $p < 0.01$.

4.3.4. Natural Person as the Actual Controller

When the actual controller of the CCEs is a natural person, the results in Table 7 show that the statistic of *F* is 17.30, and its corresponding *p*-value is significant at a level of 1%. Further, the goodness-of-fits of the three dimensions of this model's inner-group, between-group, and the overall sample are 0.637, 0.314, and 0.219, respectively, demonstrating that the model is generally significant.

Moreover, the results show that the interaction coefficient of R&D investment and actual controller in the current period is negative, while the interaction coefficient of R&D investment and actual controller in the first-order lag period is positive but not significant. Thus, H5 is also not supported. The results reveal that a natural person as the actual controller weakens the impact of R&D investment on firms' financial performance in the current period, while it strengthens the positive impact of R&D investment on firms' financial performance in the lagged period. Regarding the negative moderated effect, we find that a natural person, as the actual controller, tends to share the outputs of R&D with other shareholders, so as to reduce the risk of providing a free ride to others. Accordingly, firms with a natural person as the actual controller tend to place more emphasis on R&D investment than other controllers in the long run.

Table 7. Results of moderating effect of the natural person as the actual controller.

Variables	Model (Fixed Effect)	
	Coefficient	**Standard Error**
_Cons	−12,127.05	11,640.99
$R\&D_{i,t}$	2.317 ***	0.256
$R\&D_{i,t-1}$	0.215 *	0.111
Nine dummies for industry	added	added
Four dummies for ownership	added	added
$Size_{i,t}$	added	added
$Boss\_4_{i,t}$	2666.526	16,673.900
$Boss\_4_{i,t} \times R\&D_{i,t}$	−1.288 **	0.538
$Boss\_4_{i,t} \times R\&D_{i,t-1}$	0.083	0.571
Year	added	added
R^2: Group	0.637	
R^2: Between-group	0.314	
R^2: Overall	0.219	
F-value	17.300 ***	

Note: Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.4. Robustness Test

We next conducted robustness tests by excluding 10% of the original sample and replacing the financial performance measured—calculated by net profit—with revenue. The results are shown in Table 8. They suggest that the coefficients are nearly consistent with the regression results found in Tables 3–7.

4.5. Endogeneity Test

Even though the combination of fixed effects and year fixed effects in this research can remedy the endogeneity problem [94], to further cope with endogeneity resulting from reverse causality or omitted variables, the lagged dependent variable was added into the original model [94]. The results are shown in Table 9. They reveal that, when controlling for the lagged financial performance, the results are essentially consistent with the prior results described in Tables 3–7.

Table 8. Robust results of fixed effects with 90% sample size.

Variable	Model 1 (H1)	Model 2 (H2)	Model 3 (H3)	Model 4 (H4)	Model 5 (H5)
_Cons	−8763.323 *** (2625.483)	−3449.702 (2738.606)	−8539.748 *** (3200.890)	−9785.545 (11,858.270)	−13,705.72 (12,220.39)
$R\&D_{i,t}$	1.811 *** (0.208)	1.155 *** (0.252)	1.859 *** (0.217)	1.489 *** (0.399)	2.302 *** (0.253)
$R\&D_{i,t-1}$	0.218 ** (0.104)	0.058 (0.102)	0.220 ** (0.105)	0.667 (0.484)	0.224 ** (0.110)
$Boss\_1_{i,t}$		–			
$Boss\_2_{i,t}$			5505.467 (10,116.830)		
$Boss\_3_{i,t}$				−4346.501 (10,096.190)	
$Boss\_4_{i,t}$					5165.345 (16,531.420)
$Boss\_1_{i,t} \times R\&D_{i,t}$		1.520 *** (0.389)			
$Boss\_1_{i,t} \times R\&D_{i,t-1}$		–			
$Boss\_2_{i,t} \times R\&D_{i,t}$			−0.681 (0.714)		
$Boss\_2_{i,t} \times R\&D_{i,t-1}$			−1.179 (2.242)		
$Boss\_3_{i,t} \times R\&D_{i,t}$				0.614 (2.964)	
$Boss\_3_{i,t} \times R\&D_{i,t-1}$				−0.423 (0.650)	
$Boss\_4_{i,t} \times R\&D_{i,t}$					−1.174 ** (0.540)
$Boss\_4_{i,t} \times R\&D_{i,t-1}$					−0.065 (0.572)
Nine dummies for industry	added	added	added	Added	added
Four dummies for ownership	added	added	added	Added	added
$Size_{i,t}$	added	added	added	Added	added
Year	added	added	added	Added	added
R^2: Group	0.612	0.687	0.620	0.618	0.664
R^2: Between-group	0.204	0.246	0.203	0.182	0.164
R^2: Overall	0.161	0.256	0.161	0.134	0.118
F-value	25.600 ***	28.030 ***	14.480 ***	14.330 ***	17.530 ***

Note: Significance level: *** $p < 0.01$, ** $p < 0.05$.

Table 9. Endogeneity test.

Variable	Model 1 (H1)	Model 2 (H2)	Model 3 (H3)	Model 4 (H4)	Model 5 (H5)
_Cons	−8022.525 *** (2692.299)	−3746.506 (2712.124)	−7877.203 ** (3196.155)	−8796.582 (10,797.500)	−12,228.770 (11,763.890)
$R\&D_{i,t}$	1.815 *** (0.210)	1.165 *** (0.258)	1.862 *** (0.219)	1.419 *** (0.409)	2.318 *** (0.258)
$R\&D_{i,t-1}$	0.221 ** (0.105)	0.062 (0.105)	0.223 ** (0.107)	0.778 (0.502)	0.214 * (0.112)
Financial performance$_{i,t-1}$	*Control*	*Control*	*Control*	*Control*	*Control*
$Boss\_1_{i,t}$					
$Boss\_2_{i,t}$		–			
$Boss\_3_{i,t}$				−4952.743 (10,196.130)	
$Boss\_4_{i,t}$					2740.867 (16,809.060)
$Boss\_1_{i,t} \times R\&D_{i,t}$		1.518 *** (0.399)			
$Boss\_1_{i,t} \times R\&D_{i,t-1}$		–			
$Boss\_2_{i,t} \times R\&D_{i,t}$			−0.645 (0.724)		
$Boss\_2_{i,t} \times R\&D_{i,t-1}$			−1.116 (2.288)		
$Boss\_3_{i,t} \times R\&D_{i,t}$				0.649 (2.997)	
$Boss\_3_{i,t} \times R\&D_{i,t-1}$				−0.542 (0.675)	
$Boss\_4_{i,t} \times R\&D_{i,t}$					−1.301 *** (0.555)
$Boss\_4_{i,t} \times R\&D_{i,t-1}$					0.100 (0.597)
Nine dummies for industry	added	added	added	added	added
Four dummies for ownership	added	added	added	added	added
$Size_{i,t}$	added	added	added	added	added
Year	added	added	added	added	added
R^2: Group	0.584	0.655	0.592	0.593	0.637
R^2: Between-group	0.267	0.441	0.261	0.231	0.314
R^2: Overall	0.209	0.390	0.206	0.176	0.219
F-value	19.950 ***	22.190 ***	12.330 ***	12.380 ***	14.920 ***

Note: Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5. Conclusions

5.1. Theoretical Contributions

In recent years, R&D has been viewed as a critical strategy to boost firms' economic growth [1,2]. However, research discussing CCEs is scant. Thus, to narrow this gap, using the panel data of CCEs in China, the present study tested the complicated relationships between R&D investment and enterprises' financial performance, and further examined the moderating effects of different types of actual controllers on these relationships.

On the one hand, our findings confirm that R&D investment promotes the financial performance of CCEs in both the current and lag periods. Despite the significant value of R&D investment on firms' financial performance, as identified in most of the literature [8,9,11], the continuous effect of R&D investment on firms' financial performance has not been thoroughly investigated because of the extra time from R&D investment to the final output [13]. To advance this line of research, we argued that R&D investment exerts a positive lagged effect on firms' financial performance. Thus, this study provides a better understanding of the relationship between R&D investment and firm performance by including the current and lag periods. Moreover, this research focused on the contribution of R&D investment in Chinese CCEs, indicating that CCEs should also focus on the key role of R&D and innovation in both the current and the lagged periods [13]. In addition, CCEs should establish a normalized R&D investment guarantee mechanism to promote constant innovation. Overall, our findings reveal that R&D investment is a vital antecedent of firms' financial performance in the current, as well as lagged periods. This work thus enriches the research scope of R&D investment.

On the other hand, our results suggest that the actual controller serves as a moderator, making it clear that the actual controller moderates the effect of R&D investment on firms' financial performance. Other studies suggest that the effectiveness of R&D investment depends mainly on agency perspective [11]; however, our study focused on the perspective of the shareholder. This research provides various useful insights, as follows: Based on organizational control theory, we assert that the central government should prioritize R&D and innovation investment of CCEs in current periods, while the central government does not significantly affect the relationship between R&D investment and firms' financial performance. Moreover, our findings reveal that local government and state-owned company controllers do not significantly moderate the relationship between R&D investment and enterprises' financial performance in either the current or lagged period. Finally, we find that those CCEs controlled by natural persons have a lagged negative moderating effect on the relationship between R&D investment and enterprises' financial performance. Overall, this research verifies the boundary conditions of R&D investment and financial performance, thus expanding the research on R&D investment and the actual controller.

5.2. Managerial Implications

According to the results of this study, several meaningful managerial suggestions can be put forward. First, compared with local governments, the central government can prioritize more R&D and innovation investment in CCEs, as well as in their long-term development. Given that the central leaders and officials in China put greater emphasis on short-term economic goals, local governments primarily undertake the target of GDP growth rather than R&D investment. This pressure of economic-oriented targets will be directly or indirectly transferred to those CCEs controlled by central officials, forcing those enterprises to seek instant success and quick profits. Accordingly, Chinese governments should stress the target of R&D and innovation and strengthen the long-term strategies for CCEs. In addition, more freedom might be given to these CCEs to help nurture their core technical capacities.

Second, our findings reveal that state-owned company controllers do not have a significant moderating effect on the relationship between R&D investment and enterprises' financial performance. In this study, the actual controllers of state-owned enterprises consist of state-owned companies and

state shareholding companies, which both feature a strong relevance to policy. For instance, the chairpersons or general managers at these companies typically possess intrinsic political connections. However, political advantages might actually weaken the innovative momentum of top executives, as they may consciously or unconsciously allocate considerable resources to their preferred political activities and affiliations, thus exerting a crowding-out effect on their enterprises' R&D activities. This finding reveals that even state-owned CCEs with politically advantageous relationships should greatly emphasize both the investment in political resources (which is unavoidable and important in the current context of China) and investment in R&D innovation.

Lastly, for CCEs controlled by natural persons, the lagged negative moderating effect is comparatively obvious. A possible explanation for this phenomenon might be the general idea of "spending one's own money". These controllers are likely to stress continual R&D investment more than those in state-owned enterprises. Furthermore, these natural-person controllers not only highlight current investments and returns but also strive to promote positive spillover effects of R&D investments in the long run.

In brief, when the CCEs are dominated by Chinese governments, those governments should not only formulate industrial support policies but also explore the objective development rules of CCEs in depth to fully grasp the long-term strategic significance of R&D for these types of enterprises and to roll out effective regulations and systems to protect their innovation investments.

5.3. Limitations and Future Research

This study has several limitations that may provide insight for future research directions. First, the span of time in this study was comparatively short, using data from 2011 to 2013 only, which may have limited the research results with respect to the moderating effect in the lag period. Second, more factors could be considered in terms of the construction of the econometric models. Third, our research focused only on the data of Chinese CCEs, thus our findings might be industry-specific. Thus, caution should be exercised when generalizing our findings to other industries.

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