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Can Social Donation Increase the R&D Investment of Enterprises?

—Analysis from the Perspective of Institutional Environment

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Abstract

This paper selects the listed companies of Shanghai and Shenzhen A shares in China from 2013 to 2018 as the research object, empirically analyzes the impact of social donation on R&D investment, and examines how the institutional environment regulates the relationship between them. The empirical study shows that social donation has an incentive effect on R&D investment of enterprises. Both formal and informal institutional environment can encourage R&D investment. The formal institutional environment has no obvious regulating effect on the relationship between social donation and R&D investment, while the informal institutional environment has a significant positive regulatory effect on this relationship. The conclusion of this paper is helpful for us to have a comprehensive understanding of the impact of external environmental factors on R&D investment in the process of enterprise transformation and upgrading.

Keywords

Social Donation, Formal Institutional Environment, Informal Institutional Environment, R&D Investment

1. Introduction

At present, all kinds of "black swan" and "gray rhino" incidents occur frequently, such as the Sino-US trade war and novel coronavirus, which have a significant impact on the survival of enterprises. During this special period, many enterprises take the initiative to donate to help poor areas. The social donation activities carried out by enterprises is an important manifestation of their direct social responsibility, which is concerned by many scholars at home and abroad. The survey results show that at present, donation activities by enterprises have

become the norm, and about 90% of enterprises have carried out social donation activities. The donation activity of the enterprise is to transfer its inherent resources to the society free of charge, which is helpful for the enterprise to create a moral image and win the recognition of the public. Thus, it can enhance brand recognition and accumulate more social capital for enterprises. In addition, for enterprises themselves, R&D activities are conducive to technological breakthroughs and access to more professional capital. It has been found that the institutional environment and social donation and other factors can affect the intensity of R&D investment. When studying the institutional environment and R&D activities, domestic scholars divide the institutional environment into three dimensions: the degree of market economy, the level of financial market development, the degree of protection of laws and regulations and the level of government service. Ashraful Alam et al. (2019) and Han et al. (2020) point out that the degree of institutional environment in the area where the enterprise is located is positively related to R&D activities. That is, a perfect market environment is conducive to promoting the R&D activities of enterprises. In addition to the formal system, Schout & North (1990) point out that traditional culture, religious beliefs and customs as an informal environment, which has an important impact on the operation and development of enterprises.

Breuer et al. (2009) put forward the influence chain model of "culture-attitude-behavior", pointing out that the intangible value formed in people's mind will guide their behavior and attitude towards things, and then affect the decision-making behavior of enterprises. Zhao et al. (2008) believe that culture and education can influence managers' preference for venture capital, such as the development direction of enterprises, M&A decisions and innovation strategies. To sum up, regional institutional environmental differences may have an impact on the relationship between social donation and R&D investment, but most studies only examine the impact of formal institutions and do not include informal institutional factors into the research framework. This paper takes Shanghai and Shenzhen A-share listed companies from 2013 to 2018 as the research object, examines the relationship between social donation and corporate R&D investment, and further analyzes the regulatory effect of different institutional environments on this relationship.

2. Theoretical Analysis and Research Hypotheses

In order to facilitate the analysis of this paper, the logical framework of social donation, institutional environment and R&D investment is constructed, as shown in Figure 1. Among them, the relationship between social donation and R&D investment is used to verify hypothesis H1; Institutional environment, as a regulating variable, is used to verify hypothesis H2 and hypothesis H3. It also verifies the two path mechanisms that social donation has an impact on R&D investment, one is to obtain more government subsidies, and the other is to improve the competitive advantage of enterprises.
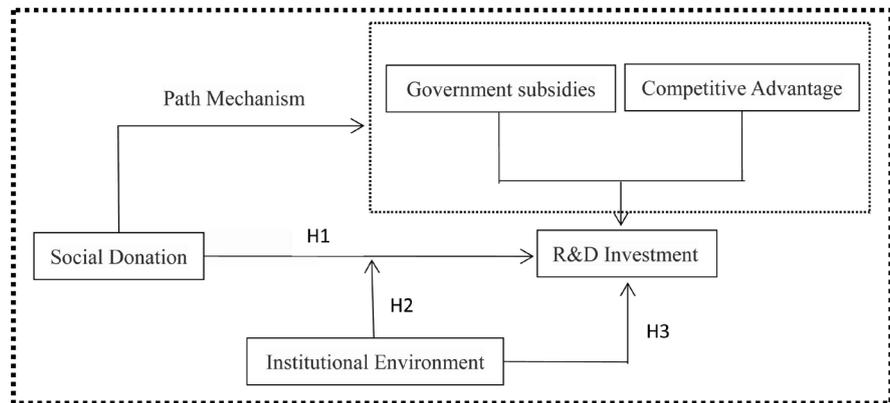
Figure 1. Logical analysis framework of social donation, institutional environment and R&D investment.

2.1. The Impact of Social Donation on R&D Investment of Enterprises

As a form of social responsibility, corporate social donation has been embedded in the corporate development strategy. And R&D investment is an important strategic choice for enterprises to establish external competitive advantage. For enterprises, social donation activities have certain advantages. Social donation can not only enhance the recognition of products in the hearts of the public, but also help to consolidate the relationship between government and enterprises, and then obtain heterogeneous resources (Hall & Oriani, 2006). At present, China is in a critical period of economic development and transformation, many scarce resources are still in the hands of the government, a better relationship between government and enterprises can help enterprises to reduce external uncertainty. On the one hand, many existing studies have shown that social donation activities by enterprises will get more government subsidy resources. These financial resources can effectively reduce the cost of R&D, making those R&D projects with low profits or losses profitable, thus leveraging the R&D investment of enterprises. On the other hand, enterprises' active social donation activities can bring a good external environment and policy environment and reduce business risks. Therefore, for those enterprises that prefer risky investment, the good business environment ensures the smooth market of their R&D products and improves their competitive advantage (Wang & Liu, 2018). In order to further consolidate the existing monopoly position, it will also urge enterprises to increase their own R&D investment. Therefore, this paper puts forward:

H1: corporate social donation can promote the R&D investment of enterprises, that is, the larger the scale of social donation, the higher the intensity of R&D investment.

2.2. The Institutional Environment Affects the Research and Development of Enterprises

In recent years, more and more scholars pay attention to the impact of institu-

tional environment on the business activities of micro-enterprises. The institutional environment of the region can affect the R&D investment cost and expected profit of enterprises, and then have an impact on managers' innovation decisions (Su et al., 2010). Specifically, a sound market mechanism in the region is conducive to reducing the cost of various factors of production. And a mature institutional environment can improve the factors of production and product mobility, thus reducing the cost of production. In addition, a government with a sense of market efficiency can provide more preferential policies for enterprises. An efficient approval rate can indirectly reduce the R&D cost of enterprises and provide necessary infrastructure for the development of enterprise innovation activities, which is conducive to attracting more innovative talents. On the other hand, the traditional culture, religious beliefs and customs of the region will also affect people's expectations of decision-making in the future. The ideas advocated in Chinese traditional culture, such as people-oriented, attaching importance to the group and harmony, continuous self-improvement and the unity of justice and interests, can encourage people to unite, carry forward the quality of honesty and friendliness, and reduce fraud (Ahn et al., 2020). These traditional cultures rooted in the hearts of the people can restrain the behavior of economic subjects. When the society generally agrees with the idea of win-win cooperation, it helps to reduce the cost that enterprises have to bear in carrying out innovative activities. When the public is honest and trustworthy as the criterion, this can effectively reduce external uncertainty and improve the efficiency of research and development. When the public has a unified understanding of justice and benefit, and when the business activities of enterprises aim to improve people's quality of life and enhance the level of productivity, this can reduce the short-sighted behavior of enterprises and improve the expected returns of long-term behaviors such as R&D activities, which is conducive to enterprises to carry out more innovative activities. Therefore, this paper puts forward:

H2: Both institutional environment and non-institutional environment can positively promote the R&D investment of enterprises.

2.3. Social Donation, Institutional Environment and R&D Investment

The social donation activities of enterprises are carried out under a certain institutional environment. Therefore, there are significant differences in the regulatory effects of different institutional environments on social donation and R&D investment. After combing the formal institutional environment, it is concluded that the perfect institutional environment is often more competitive and cruel. Enterprises are more willing to devote their limited resources to production activities in order to gain more market share. Social donation activities are equivalent to putting some enterprises' own resources into the society free of charge, which will undoubtedly affect the business activities of enterprises (Shen et al., 2012). Therefore, in the areas with a sound formal institutional environment, the enthusiasm of enterprises to make social donations is relatively low,

thus affecting the role of social donation activities in promoting enterprise R&D activities. On the other hand, in areas with strong traditional culture, people have more feelings of helping others, and entrepreneurs hope to make more people enjoy life and satisfy their own spiritual world through donation activities (Qian, 2017). Therefore, it can be seen that the informal environment is conducive to enhance the scale of social donations, and then affect the intensity of R&D investment. Therefore, this paper puts forward:

H3: compared with the formal institutional environment, the informal institutional environment has a stronger positive regulatory effect on social donation and R & D investment.

3. Research and Design

3.1. Sample Selection and Data Sources

Select the listed companies of Shanghai and Shenzhen A shares in China from 2013 to 2018 as the research samples. The enterprise data related to this article are all from the CSMAR database, and delete the original data according to the following criteria: 1) Eliminate the samples of enterprises marked as ST by the exchange. 2) Eliminate the samples with missing values in the data. 3) The report structure of financial listed companies is obviously different from other industries, so financial enterprises are excluded. 4) Exclude the enterprises whose R&D investment is 0. Finally, 2427 observations were obtained, and the main variables in this paper are reduced by 1%.

3.2. Variable Description

1) Social donation (Donate) and R&D investment (RD). Social donation (Donate) indicators come from the social responsibility column of the CSMAR database. The related treatment methods draw lessons from the research of Jin et al. (2014). The natural logarithm of corporate social donations is used to reflect corporate donations. When the data of social donation is not disclosed in the enterprise report, the value of Donate is 0. And in order to better study whether corporate social donation behavior will affect the R&D situation of enterprises, set the virtual variable Dum. If the enterprise has a social donation in that year, the value of Dum is 1, otherwise it is 0. The data related to the (RD) index of R&D investment come from the manual collation of the R&D innovation column of listed companies in the CSMAR database. And draw lessons from the research of Ye and Li (2019) to deal with the natural logarithm of R&D investment, so as to effectively avoid the problem of non-normal distribution of variables.

2) Market environment (Market, Inmarket). In order to explore the possible impact of the regional institutional environment, the market environment is divided into formal institutional environment (Market) and informal institutional environment (Inmarket). Using the research method of Chen (2005) for reference, the "China Marketization Index" edited by Fan Gang and others is used as the formal institutional environment (Market) to measure the enterprise area.

The informal system draws lessons from the research of Hsueh et al. (2015). Choose the number of Confucian temples, Confucian temples and Taoist temples per 10,000 square kilometers of land where listed companies are registered to measure the religious and cultural environment (Inmarket) of the area where the company is located. The data comes from the report of the religious Affairs Bureau of the State Council on the identification of national key Buddhist and Taoist monasteries in Han areas.

3) Control variables. Drawing lessons from the relevant research of Yu et al. (2013) and Yin & Jiang (2015), the following variables are selected as the control variables of this paper: controlling shareholder shareholding ratio (Top1), financial debt ratio (Financial), return on net assets (ROE), intangible assets ratio (Inassets), cash ratio (Cash), operating gross profit margin (Magin) and the nature of the actual controller of the enterprise (State). The specific indicators are described in Table 1.

3.3. Model Setting

First of all, model (1) and model (2) are constructed to verify the relationship between social donation and R&D investment. There are two steps to verify the relationship between the two. First, take the social donation behavior (Dum) as the explanatory variable to verify the relationship between corporate social donation and R & D investment. Second, take the scale of social donation (Donate) as the main explanatory variable to find out the relationship between the scale of

Table 1. Variable definition.

Variable	Variable symbol	Index measurement
Research and development investment	RD	The natural logarithm of R & D investment.
Scale of social donation	Donate	Add 1 to the amount of social donation and take the natural logarithm.
Social donation behavior	Dum	If the enterprise has social donation behavior, the value of Dum is 1, otherwise it is 0.
Regional formal institutional environment	Market	Marketization Process Index .
Regional informal institutional environment	Inmarket	The number of Confucian temples and temples per 10,000 square kilometers in the region.
Proportion of shares held by controlling shareholders	Top1	The ratio of the number of shares held by the largest shareholder of an enterprise to the total number of shares.
Financial debt ratio	Financial	(non-current liabilities + short-term loans + non-current liabilities due within one year + transactional financial liabilities + derivative financial liabilities)/total liabilities.
Return on net assets	ROE	Net profit/total assets.
Rate of intangible assets	Inassets	Total intangible assets/total assets.
Cash ratio	Cash	Balance of cash and cash equivalents/total assets at the end of the period.
Operating gross margin	Magin	(operating income-operating cost)/operating cost.
The nature of the actual controller of the enterprise	State	Set to a virtual variable, the value of the state-owned enterprise is 1, otherwise it is 0.
Industry/year	Ind/Year	Control

social donation and the R&D investment of enterprises. In order to avoid the impact of reverse causality on the empirical results, the lagging social donation data is selected as the research variable. The regression model is as follows:

$$RD_{i,t} = \beta_0 + \beta_1 Dum_{i,t-1} + \beta_2 Top1_{i,t} + \beta_3 Financial_{i,t} + \beta_4 ROE_{i,t} + \beta_5 Inassets_{i,t}$$
$$+ \beta_6 Cash_{i,t} + \beta_7 Magin_{i,t} + \beta_8 State_{i,t} + \sum Industy + \sum Year + \varepsilon_{i,t} \quad (1)$$

$$RD_{i,t} = \beta_0 + \beta_1 Donate_{i,t-1} + \beta_2 Top1_{i,t} + \beta_3 Financial_{i,t} + \beta_4 ROE_{i,t} + \beta_5 Inassets_{i,t}$$
$$+ \beta_6 Cash_{i,t} + \beta_7 Magin_{i,t} + \beta_8 State_{i,t} + \sum Industy + \sum Year + \varepsilon_{i,t} \quad (2)$$

Secondly, model (3) and model (4) are constructed to verify the relationship among social donation, market environment and R&D investment. Among them, the explained variable is R&D investment (RD). The main explanatory variables are regional formal institutional environment (Market), regional informal institutional environment (Inmarket) and the intersection of social donation scale and market environment (Donate*Market, Donate*Inmarket).

$$RD_{i,t} = \beta_0 + \beta_1 Donate_{i,t-1} + \beta_2 Market_{i,t} + \beta_3 Donate_{i,t-1} * Market_{i,t} + \beta_4 Top1_{i,t}$$
$$+ \beta_5 Financial_{i,t} + \beta_6 ROE_{i,t} + \beta_7 Inassets_{i,t} + \beta_8 Cash_{i,t} + \beta_9 Magin_{i,t} \quad (3)$$
$$+ \beta_{10} State_{i,t} + \sum Industy + \sum Year + \varepsilon_{i,t}$$

$$RD_{i,t} = \beta_0 + \beta_1 Donate_{i,t-1} + \beta_2 Inmarket_{i,t} + \beta_3 Donate_{i,t-1} * Inmarket_{i,t} + \beta_4 Top1_{i,t}$$
$$+ \beta_5 Financial_{i,t} + \beta_6 ROE_{i,t} + \beta_7 Inassets_{i,t} + \beta_8 Cash_{i,t} + \beta_9 Magin_{i,t} \quad (4)$$
$$+ \beta_{10} State_{i,t} + \sum Industy + \sum Year + \varepsilon_{i,t}$$

4. Empirical Results and Analysis

4.1. Descriptive Statistical Analysis

Table 2 reports the average, standard deviation, minimum, median, and maximum values of the variables selected in this article. From the results of the table, we can see that the average (RD) of R&D investment is 18.3245, the minimum is 13.7918, and the maximum is 22.5517. It can be seen that there are obvious differences in R&D investment among enterprises, and some enterprises have a higher level of R&D investment. The standard deviation of (Donate) for the scale of social donation is 6.8796, which shows that there are significant differences in the scale of social donation among enterprises. The average (Dum) of social donation behavior is 0.3745, indicating that 37% of the enterprises in the choice of sample data have social donation behavior. This value is consistent with previous studies. In addition, in terms of market environment indicators, the average and standard deviation of regional formal institutional environment (Market) are 8.1474 and 1.6670 respectively. The average and standard deviation of regional informal institutional environment (Inmarket) are 2.7264 and 3.3330 respectively.

4.2. Multiple Regression Analysis

1) The relationship between social donation and R&D investment. Table 3 reports the empirical results, we can see that column (2) is the regression result

Table 2. Descriptive statistics.

Variable	N	Mean	Sd	Min	Max
RD	2427	18.3245	1.7507	13.7918	22.5517
Donate	2427	5.2483	6.8796	0	18.2484
Dum	2427	0.3745	0.4841	0	1
Market	2427	8.1474	1.6670	2.53	10
Inmarket	2427	2.7264	3.3330	0.0060	11.041
Top1	2427	37.7908	15.4089	8.7726	75.4581
Financial	2427	0.4559	0.2431	0.0044	0.8926
ROE	2427	0.0713	0.1084	−0.5318	0.3056
Inassets	2427	0.0494	0.0502	0.0003	0.3074
Cash	2427	0.2748	0.2715	0.0153	1.5009
Magin	2427	0.2618	0.1603	−0.0103	0.7272
State	2427	0.5369	0.4987	0	1

Table 3. Social donation and R&D Investment.

Variables	RD	RD	RD
	(1)	(2)	(3)
$Donate_{t-1}$			0.0460***
			(8.2684)
Dum_{t-1}		0.5577***	
		(7.0999)	
Top1	0.0116***	0.0135***	0.0132***
	(5.2157)	(5.1196)	(5.0520)
Financial	0.0245	0.0634	0.0600
	(0.1607)	(0.3513)	(0.3340)
ROE	3.5509***	2.9623***	2.8805***
	(10.6850)	(7.8028)	(7.6167)
Inassets	−1.2168*	−1.2715	−1.4237
	(−1.6567)	(−1.4578)	(−1.6394)
Cash	−0.1410	−0.1152	−0.1248
	(−0.8031)	(−0.5486)	(−0.5979)
Magin	−1.7075***	−1.7646***	−1.7802***
	(−7.2303)	(−6.2808)	(−6.3688)
State	0.2719***	0.2212***	0.2216***
	(3.7998)	(2.6262)	(2.6446)
Year/Industy	Control	Control	Control
Constant	15.9511***	15.7444***	15.7212***
	(52.0278)	(46.3867)	(46.5564)
R-squared	0.2247	0.2447	0.2525
Adj.R^2	0.2163	0.2331	0.2409
N	2425	1707	1707

Note: ***, ** and * are significant at the significant level of 1%, 5% and 10%, respectively, with *t* values in parentheses.

between social donation behavior and R&D investment, and the coefficient of Dum_{t-1} is significantly positive (passing the significance level test of 1%). This shows that social donation by enterprises is beneficial to increase R&D investment. In addition, column (3) is the regression result between the scale of social donation and R&D investment, the coefficient of social donation scale (Donate) is positive, and passed the significance level test of 1%. That is, the scale of social donation of enterprises can promote R&D investment. Suppose H1 is verified.

2) The relationship among social donation, institutional environment and R&D investment. From the results of Table 4, it can be concluded that the (Markket) coefficients of formal institutional environment and informal institutional

Table 4. Social donation, institutional environment and R&D investment.

Variables	RD	RD	RD	RD
	(1)	(2)	(3)	(4)
Donate_{t-1}	0.0446***	0.0439***	0.0452***	0.0450***
	(8.0848)	(7.9270)	(8.1566)	(8.1609)
Markket	0.1275***	0.1262***		
	(5.4053)	(5.3516)		
Donate_{t-1}*Markket		0.0054*		
		(1.6563)		
Inmarket			0.0406***	0.0371***
			(3.4830)	(3.1973)
Donate_{t-1}*Inmarket				0.0072***
				(4.4678)
Top1	0.0125***	0.0125***	0.0118***	0.0120***
	(4.8012)	(4.7909)	(4.4413)	(4.5608)
Financial	0.1231	0.1246	0.0914	0.0744
	(0.6897)	(0.6988)	(0.5102)	(0.4177)
ROE	2.6468***	2.6690***	2.8505***	2.9041***
	(7.0107)	(7.0686)	(7.5601)	(7.7418)
Inassets	−1.2096	−1.2442	−1.2088	−1.1794
	(−1.4031)	(−1.4435)	(−1.3930)	(−1.3668)
Cash	−0.1263	−0.1226	−0.1412	−0.1231
	(−0.6099)	(−0.5923)	(−0.6782)	(−0.5945)
Magin	−1.7565***	−1.7547***	−1.8080***	−1.8246***
	(−6.3355)	(−6.3325)	(−6.4868)	(−6.5828)
State	0.2879***	0.2900***	0.2061**	0.1988**
	(3.4276)	(3.4539)	(2.4642)	(2.3898)
Year/Industry	Control	Control	Control	Control
Constant	14.7948***	14.8090***	15.7435***	15.7412***
	(39.3285)	(39.3764)	(46.7682)	(47.0245)
R-squared	0.2653	0.2665	0.2579	0.2666
Adj.R^2	0.2535	0.2543	0.2459	0.2544
N	1707	1707	1707	1707

Note: ***, ** and * are significant at the significant level of 1%, 5% and 10%, respectively, with t values in parentheses.

environment are significantly positive. This shows that the institutional environment plays a significant positive role in promoting the impact of R&D investment. Suppose H2 is verified. On the other hand, the coefficient of $Donate_{t-1}$*Markket is significant at the level of 10%, and the coefficient of $Donate_{t-1}$*Inmarket passes the test of significance level of 1%. This shows that the regional informal institutional environment plays a more significant positive role in regulating the relationship between the scale of social donation and R&D investment. Suppose H3 is verified.

4.3. Path Analysis

As mentioned above, enterprises' social donation can effectively improve R&D investment through two ways: access to government subsidy resources and enhance competitive advantage. In the actual situation, do they all play their due role? In order to explore this problem in depth, the relevant empirical analysis is carried out. Among them, the intensity of government subsidies (Sub) is characterized by the natural logarithm of the total government subsidies received by enterprises. The competitive advantage (HHI) index selects the enterprise earnings per share to characterize, this is because the earnings per share can fully reflect the comprehensive strength of the enterprise. The relevant results of path analysis see Table 5, from the table Panel A results show that enterprises can get more government subsidy resources through social donation activities, and government subsidies are conducive to the increase of enterprise R&D investment. From the results of Panel B, it can be concluded that the social donation activities of enterprises also help to improve the competitive advantage of enterprises, and the competitive advantage is also conducive to the increase of R&D investment. The empirical results show that these two paths have passed the relevant empirical tests.

Table 5. Path analysis.

Variables	Panel A		Panel B	
	Sub	RD	HHI	RD
	(1)	(2)	(3)	(4)
$Donate_{t-1}$	0.0510*** (8.6237)	0.0266*** (5.2317)	0.0052*** (3.8763)	0.0425*** (7.7030)
Sub		0.4670*** (22.0247)		
HHI				0.6726*** (6.7764)
Top1	0.0114*** (4.0925)	0.0076*** (3.2322)	0.0016** (2.4472)	0.0122*** (4.7062)
Financial	0.7747*** (4.0894)	−0.3827** (−2.3898)	−0.1394*** (−3.2001)	0.1537 (0.8649)
ROE	3.2355*** (8.0244)	1.2731*** (3.6799)	2.9484*** (32.1393)	0.8974* (1.8920)

Continued

Inassets	−1.1179 (−1.2147)	−1.2192 (−1.5746)	−0.2507 (−1.1899)	−1.2551 (−1.4639)
Cash	0.1092 (0.4398)	−0.2002 (−0.9592)	0.0397 (0.7842)	−0.1516 (−0.7353)
Magin	−2.2942*** (−7.6958)	−0.8200*** (−3.2111)	0.3388*** (4.9964)	−2.0081*** (−7.2259)
State	0.4440*** (4.9950)	0.0826 (1.0968)	0.1271*** (6.2532)	0.1361 (1.6271)
Year/Industry	Control	Control	Control	Control
Constant	16.1369*** (45.9965)	8.2483*** (18.2570)	−0.2730*** (−3.3333)	15.9049*** (47.5688)
R-squared	0.3018	0.4378	0.5419	0.2724
Adj.R^2	0.2903	0.4281	0.5348	0.2607
N	1600	1600	1707	1707

Note: ***, ** and * are significant at the significant level of 1%, 5% and 10%, respectively, with t values in parentheses.

4.4. Robustness Test

1) In order to test the robustness of the empirical results, the "propensity score matching" method is used to control the endogenesis of social donation, as shown in Table 6. It can be seen that there is no significant difference between the treatment group (Treated) with social donation behavior and the control group (Control) without social donation behavior in variables-controlling shareholder shareholding ratio (Top1), financial debt ratio (Financial), return on net assets (ROE), intangible assets ratio (Inassets), cash ratio (Cash), operating gross margin (Magin) and the nature of the actual controller of the enterprise. After matching, the standardization deviation (% bias) of (Matched) variables is less than 10%. On the whole, the matching result is good. And the ATT is 0.643, which is significant at 1% level, which indicates that social donation by enterprises is beneficial to R & D investment.

Figure 2 and Figure 3 show the tendency score distribution between the matched post-processing group and the control group. Compared with before matching, the density curve of the matched control group is closer to that of the processing group, which provides an important guarantee for the comparison of the final explained variables.

Table 7 is the empirical result of propensity score matching. It can be seen from figure that enterprises' social donation activities are conducive to increasing R&D investment, and there is a significant positive correlation between the scale of social donation and R&D investment. This shows that with the increase of the scale of social donation, the R&D investment of enterprises is also further enhanced. It can be seen that the robustness test results are consistent with the main empirical results.

2) Considering the timeliness of the impact of social donation on enterprise

Table 6. Robustness test A (tendency score matching).

Variable name	Sample type	Average value		%bias (difference)	|bias|	t-test	
		Treated	Control			t	p > |t|
Top1	Unmatched	38.537	36.860	10.8	85.6	2.20	0.028
	Matched	38.528	38.286	1.6		0.28	0.781
Financial	Unmatched	0.466	0.453	5.2	70.0	1.04	0.299
	Matched	0.465	0.469	−1.6		−0.28	0.783
ROE	Unmatched	0.076	0.061	14.2	84.9	2.80	0.005
	Matched	0.076	0.074	2.2		0.43	0.669
Inassets	Unmatched	0.056	0.046	18.7	97.4	3.84	0.000
	Matched	0.055	0.055	−0.5		−0.08	0.937
Cash	Unmatched	0.188	0.211	−9.9	71.9	−1.96	0.050
	Matched	0.188	0.182	2.8		0.55	0.585
Magin	Unmatched	0.263	0.253	6.3	13.1	1.25	0.211
	Matched	0.263	0.271	−5.4		−0.98	0.325
State	Unmatched	0.538	0.549	−2.1	55.6	−0.42	0.672
	Matched	0.539	0.544	−0.9		−0.17	0.866

Table 7. Robustness test A.

Variables	RD	RD	RD
	(1)	(2)	(3)
$Donate_{t-1}$			0.0564***
			(6.0381)
Dum_{t-1}		0.6743***	
		(5.0608)	
Top1	0.0135***	0.0140***	0.0137***
	(2.9051)	(3.0737)	(3.0376)
Financial	0.1022	0.1023	0.1113
	(0.3143)	(0.3216)	(0.3533)
ROE	2.9645***	2.9366***	2.8362***
	(3.9966)	(4.0500)	(3.9483)
Inassets	−0.5575	−0.3510	−0.5478
	(−0.3275)	(−0.2109)	(−0.3325)
Cash	0.2784	0.1716	0.1283
	(0.6677)	(0.4205)	(0.3174)
Magin	−2.0333***	−2.0915***	−2.0852***
	(−3.9889)	(−4.1966)	(−4.2253)
State	0.3910**	0.3492**	0.3459**
	(2.5564)	(2.3320)	(2.3334)
Year/Industry	Control	Control	Control
Constant	15.5129***	15.2352***	15.2085***
	(21.6935)	(21.7293)	(21.9123)
R-squared	0.2349	0.2704	0.2845
Adj.R^2	0.1987	0.2344	0.2491
N	554	554	554

Note: ***, ** and * are significant at the significant level of 1%, 5% and 10%, respectively, with t values in parentheses.
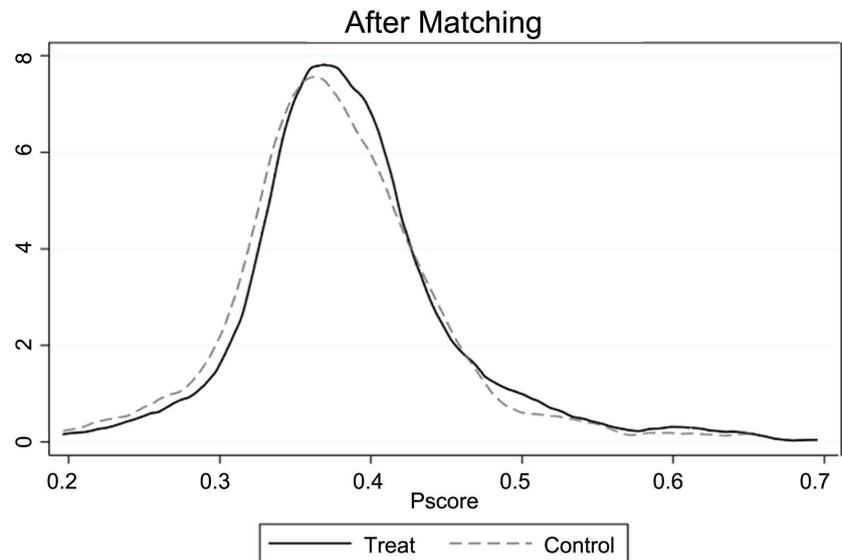
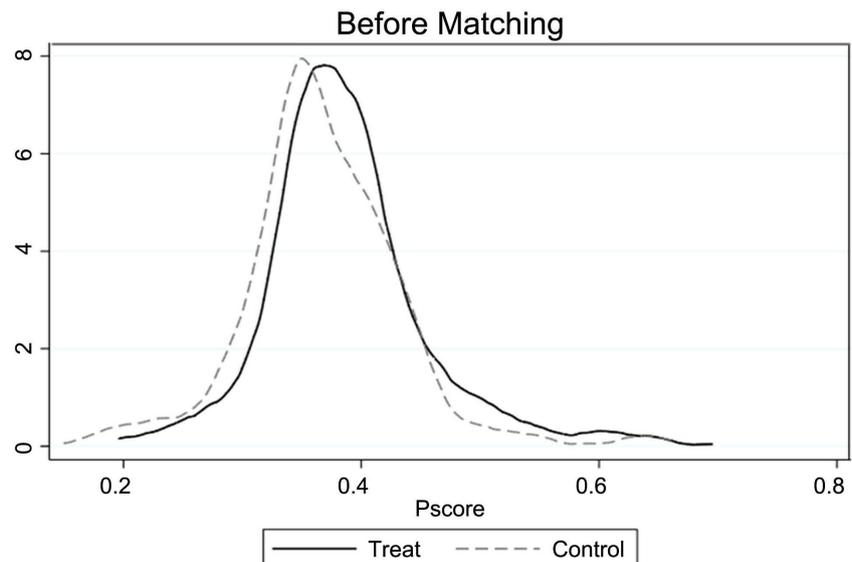Body page with two figures.

Figure 2. After matching.

Figure 3. Before matching.

R&D investment, the data of enterprise R&D investment in the future is taken as the explained variable for robust regression. The specific robustness results are shown in Table 8. From the results of figure, we can see that the coefficients of social donation, formal institutional environment and informal institutional environment are significantly positive. This shows that social donation and institutional environment play a significant positive role in promoting R&D investment. On the other hand, the coefficient of the cross term $Donate_{t-1}$*Market does not pass the significance level test, and the formal institutional environment (Market) does not play an effective regulatory role. $Donate_{t-1}$*Inmarket passed the significance level test of 5%, which indicates that the informal institutional environment has a positive regulatory effect on the relationship between

Table 8. Robustness test B.

Variables	RD_{t+1}	RD_{t+1}	RD_{t+1}	RD_{t+1}
	(1)	(2)	(3)	(4)
$Donate_{t-1}$	0.0496***	0.0494***	0.0503***	0.0506***
	(7.2973)	(7.2506)	(7.3732)	(7.4590)
Markket	0.1107***	0.1083***		
	(3.7817)	(3.6843)		
$Donate_{t-1}$*Markket		0.0033		
		(0.8278)		
Inmarket			0.0336**	0.0290**
			(2.3165)	(2.0057)
$Donate_{t-1}$*Inmarket				0.0073***
				(3.6593)
Top1	0.0133***	0.0133***	0.0128***	0.0130***
	(4.1766)	(4.1645)	(3.9283)	(4.0022)
Financial	0.0557	0.0555	0.0285	0.0021
	(0.2553)	(0.2541)	(0.1301)	(0.0097)
ROE	2.7295***	2.7411***	2.9438***	2.9933***
	(5.8885)	(5.9100)	(6.3816)	(6.5225)
Inassets	−0.6672	−0.6640	−0.5900	−0.5486
	(−0.6041)	(−0.6011)	(−0.5313)	(−0.4968)
Cash	0.4475	0.4710	0.4317	0.4647
	(1.1087)	(1.1638)	(1.0627)	(1.1500)
Magin	−1.8761***	−1.8784***	−1.9250***	−1.9203***
	(−5.4993)	(−5.5050)	(−5.6185)	(−5.6361)
State	0.2051**	0.2046**	0.1341	0.1250
	(1.9932)	(1.9878)	(1.3094)	(1.2269)
Year/Industry	Control	Control	Control	Control
Constant	15.0810***	15.1075***	15.9086***	15.9090***
	(32.2429)	(32.2195)	(37.9529)	(38.1671)
R-squared	0.2558	0.2562	0.2497	0.2588
Adj.R^2	0.2382	0.2380	0.2320	0.2406
N	1127	1127	1127	1127

Note: ***, ** and * are significant at the significant level of 1%, 5% and 10%, respectively, with t values in parentheses.

social donation and R&D investment. The robust results are consistent with the main part, indicating that the empirical results are stable.

4.5. Discussion

This paper empirically analyzes the relationship among institutional environment, social donation and enterprise R&D investment, and divides the institutional environment into formal institutional environment and informal institutional environment. Enterprises' social donation activities are conducive to enterprises' more innovative activities. The reason behind this is that donation activities help enterprises obtain more government subsidized resources and im-

prove their competitive advantages. Both formal institutional environment and informal institutional ring can improve the R&D investment of enterprises, and informal institutional environment can significantly regulate the relationship between social donation and R&D investment. Enterprises should actively carry out social donation activities to help enterprises create a positive image, improve social influence and enhance the information of potential investors. At the same time, the government should also pay attention to the construction of institutional environment, and a good business environment is the prerequisite for enterprises to operate and produce.

5. Conclusion and Suggestions of the Study

5.1. Conclusion

Taking Shanghai and Shenzhen A-share listed companies as the research object, this paper empirically analyzes the impact of social donation on R&D investment, and examines whether the relationship between them is affected by the institutional environment. The empirical results show that: 1) The social donation activities of enterprises are beneficial to enhance the R&D investment, and have a significant positive relationship with the scale of donation. 2) Both formal and informal institutional environment can encourage R&D investment. 3) There are obvious differences in the regulatory effect of institutional environment on social donation and R&D investment. Specifically, the formal institutional environment has no obvious regulatory effect on the relationship between the two, while the informal institutional environment is of positive significance.

5.2. Suggestions

Based on the conclusions of this paper, the following relevant suggestions are put forward: 1) in reality, the internal resources of enterprises are often limited, and management needs to balance the relationship between social donation and R&D innovation. As far as the relevant research conclusions of this paper are concerned, enterprises' social donation activities are to obtain more social capital. Although donation activities reduce the cash flow within the enterprise, it is still conducive to increasing R&D investment on the whole. Enterprises should actively participate in social donation activities and have the courage to assume responsibility. Enterprises should incorporate social donation and R&D innovation into the same development strategy, so as to achieve win-win cooperation between enterprises and society. 2) To establish an appropriate regional formal institutional environment and give full play to the role of the market in allocating resources. Improve the competitive consciousness of enterprises and make resources flow reasonably to all enterprises. Reduce the cost of R&D investment, and implement an effective intellectual property protection system to provide appropriate soil for the development of innovative activities of enterprises. At the same time, the region should give full play to the role of soft constraints of non-institutional environment. Influence entrepreneurs through traditional

culture, vigorously carry forward excellent traditional cultures such as win-win cooperation, altruism and honesty and friendship, and realize the development model of "charity promoting innovation". 3) The government should mobilize the enthusiasm of enterprises to carry out innovative activities and give more resources to those enterprises that carry out social donation activities, such as preferential tax policies, government subsidies and a good external governance environment. Form a good social atmosphere in the local area, so as to relieve worries for the people. Enterprises should also actively assume part of the social responsibility for the government, which not only helps to enhance their positive image, but also provides a new direction for the long-term development strategy of enterprises.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Ahn, J. M., Lee, W., & Mortara, L. (2020). Do Government R&D Subsidies Stimulate Collaboration Initiatives in Private Firms? *Technological Forecasting and Social Change, 151,* 1-14. https://doi.org/10.1080/1540496X.2014.998905

Alam, A., Uddin, M., & Yazdifar, H. (2019). Institutional Determinants of R&D Investment: Evidence from Emerging Markets. *Technological Forecasting & Social Change, 138,* 34-44. https://doi.org/10.1016/j.techfore.2018.08.007

Breuer, H. P., Laine, E. M., & Piilo, J. (2009). Measure for the Degree of Non-Markovian Behavior of Quantum Processes in Open Systems. *Physical Review Letters, 103,* Article ID: 210401. https://doi.org/10.1103/PhysRevLett.103.210401

Chen, J. H. (2005). Institutional Environment and Corporate Governance. *Advances in Financial Economics, 11,* 75-93. https://doi.org/10.1016/S1569-3732(04)11004-9

Hall, B. H., & Oriani, R. (2006). Does the Market Value R&D Investment by European Firms? Evidence from a Panel of Manufacturing Firms in France, Germany, and Italy. *International Journal of Industrial Organization, 24,* 971-993. https://doi.org/10.1016/j.ijindorg.2005.12.001

Han, S. R., Li, P., Xiang, J. J. et al. (2020). Does the Institutional Environment Influence Corporate Social Responsibility? Consideration of Green Investment of Enterprises—Evidence from China. *Environmental Science and Pollution Research (international),* 1-18. https://doi.org/10.1007/s11356-020-09559-6

Hsueh, M.-H., Pu, D. L., & Hong, Y. (2015). Chief Financial Officers' Power, Institutional Environment, and Corporate Effective Tax Rate: Evidence from China. *Emerging Markets Finance & Trade, 51,* 196-213. https://doi.org/10.1080/1540496X.2014.998905

Jin, X., Lei, G.-Y., & Wang, W.-Z. (2014). Corporate Social Donation: Political Capital or Agency Costs? *Journal of Finance and Economics, 40,* 122-132.

Qian, L. (2017). Review of Studies on Financing Constraints, Financial Subsidies and Enterprise R&D Investments. *Journal of Xi'an Aeronautical University, 35,* 25-31.

Schout, A., & North, D. C. (1990). Institutional Change and Economic Performance. *Economic Journal, 101,* 1587-1589. https://doi.org/10.2307/2234910

Shen, H.-B., Pan, F., & Gao, X.-Z. (2012). Institutional Environment and the Incentive Effects of Managerial Ownership. *China Industrial Economics, 8,* 96-108.

Su, Z., Xie, E., & Peng, J. (2010). Impacts of Environmental Uncertainty and Firms' Capabilities on R&D Investment: Evidence from China. *Innovation: Organization & Management, 12,* 269-282. https://doi.org/10.5172/impp.12.3.269

Wang, Y.-M., & Liu, Y.-M. (2018). Charitable Donation, Political Connection and Financing Choices of Chinese Private-owned Enterprises. *Public Finance Research, No. 6,* 54-69.

Ye, Y., & Li, K.-Y. (2019). R&D Spending, Social Trust and Corporate Charitable Donation. *Journal of Harbin University of Commerce, 2,* 62-75.

Yin, Q., & Jiang, L. (2015). On the Effects of Encouraging Policy for the Independent Innovation of SMEs. *Journal of Nanjing University of Posts and Telecommunications, 17,* 27-36.

Yu, T. Y., Subramaniam, M., & Cannella, A. A. (2013). Competing Globally, Allying Locally: Alliances between Global Rivals and Host-Country Factors. *Journal of International Business Studies, 44,* 117-137. https://doi.org/10.1057/jibs.2012.37

Zhao, H., Ding, L.-Y., & Feng, T.-L. (2008). Research on the Incentive Mechanism for Technological Innovation Diffusion Based on Enterprise Cluster. *Chinese Journal of Management Science, 16,* 175-181.