Research on the Inhibitory Effect of Digital Media Information Dissemination on Enterprise Innovation Acceptance

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Abstract. The government has issued various innovation incentive policies to inject innovative vitality into enterprises, but at the same time, it has tempted many companies to engage in innovation for compliance. This paper uses A-share listed companies from 2008 to 2020 as a sample, starting with the "Measures for the Administration of High-tech Enterprise Recognition," and finds that digital media information dissemination significantly inhibits corporate innovation compliance behavior.

Keywords: industrial policy, digital media, high-tech enterprises, innovation and catering

1 Introduction

Lach (2002) [1] pointed out that R&D activities have positive externalities, and innovation faces significant risks, which most companies cannot afford to bear. To encourage corporate innovation, the government often stimulates it through industrial policies. The "Measures for the Administration of High-tech Enterprises" (hereinafter referred to as the "Management Measures") is one of the effective means to incentivize R&D activities. According to the Management Measures, high-tech enterprises can apply for tax incentives based on relevant provisions of the Income Tax Law. However, being recognized as a high-tech enterprise requires meeting a series of conditions, with the most critical being that the total R&D expenses over the past three fiscal years must account for at least 6% of total sales revenue (this was revised to 5% in 2016). For enterprises with total sales revenue between 50 million and 200 million yuan in the most recent year, the ratio must be no less than 4%. For enterprises with total sales revenue exceeding 200 million yuan in the most recent year, the ratio must be no less than 3%.

However, research has found that some companies view industrial policies as tools to obtain tax incentives and subsidies, manipulating R&D expenditures to fraudulently claim government benefits (Wang, 2021) [2]. For example, Sun Zizhuan et al. (2021) [3]used the exogenous condition of "Management Measures" to determine the existence of innovation accommodation in enterprises. The research results show that high-tech

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enterprises do have innovation accommodation behavior, and it will significantly reduce innovation efficiency and output level. The debate over the retention or abolition of industrial policies has been ongoing among scholars. At its core, the controversy over the effectiveness of industrial policies stems from scholars 'understanding of the relationship between government and market. On one hand, proponents of industrial policy argue that government intervention can compensate for the externalities of corporate R&D activities and overcome market failures. On the other hand, critics of industrial policy believe that government involvement may distort the market and that government failure makes it difficult for industrial policies to achieve their intended outcomes (Zhang Weiying, 2016; Hou Fangyu and Yang Ruilong, 2019) [4], leading many companies to innovate to fraudulently claim government benefits. However, a more pressing issue is how to curb firms' opportunistic behavior.

Media is one of the powerful tools for alleviating information asymmetry and regulating enterprises. The efficiency of information dissemination through digital media has been significantly enhanced with the support of the Internet, making its external governance effects on enterprises more pronounced (Gillan, 2006) [5]. Specifically, as intermediaries in information transmission, media can break down "information silos," ease the information asymmetry between the government and enterprises, and prompt government intervention to supervise and investigate actual R&D investments by enterprises. They can also constrain enterprises and government officials through reputational pressure, reducing rent-seeking behavior. Although existing research indicates that media can curb firms 'innovation compliance behaviors, the development of digital media has increased the difficulty of extracting effective information, and media may engage in biased reporting to attract attention. Therefore, this paper further explores whether digital media effectively inhibits firms' innovation compliance behaviors based on previous studies.

2 Research Hypothesis

First, there is information asymmetry between the government and enterprises. The government cannot clearly know whether enterprises are engaging in "black box operations," nor can it identify all innovation-averse companies among numerous applicants. Media, as intermediaries for information dissemination, play a crucial role in breaking down "information silos" (Yu, 2008) [6]. New digital technologies have enhanced media's capabilities in information collection and processing, improving the level of information disclosure (He Feng and Liu Ganchun, 2022) [7]. Once negative behaviors of enterprises are exposed by digital media, they trigger public opinion and government investigations. Second, the reach of digital media information has transcended time and space. When improper actions by enterprises and executives are captured by the media, they leave traces on the internet that the public will "remember forever." The reputation of managers and the image of the enterprise will suffer irreversible damage[8]. To protect their professional reputations and corporate images, man-

agers will curb their motives for innovation-averse behavior. Based on the above analysis, this paper proposes the following hypothesis: H1a: Digital media information dissemination exerts a restraining effect on corporate innovation-averse behavior.

The development of digital media has increased the difficulty of extracting effective information. Internet users can receive information and also publish it through comments, reprints, and other means. Some netizens spread misinformation or exaggerate and fabricate facts to attract attention, leading to a coexistence of "truth and rumor." Some media outlets cater to the public's entertainment mindset by selecting eye-catching and sensational information for biased reporting. Media has lost its original supervisory function. Media can also become a tool for corporate collusion, using "smoke screens" to cover up improper behavior by companies and executives, rather than truly fulfilling its supervisory role. Based on the above analysis, this paper proposes the following hypothesis: H1b: Digital media information dissemination does not inhibit corporate innovation and compliance behavior.

3 Research Design

(1) Sample selection

This paper selects A-share listed companies from 2008 to 2020 as the initial research sample and makes the following adjustments to the initial sample: removing samples with ST, *ST, or PT status; excluding financial sector samples; eliminating samples with missing data; and removing samples with revenue below 50 million yuan. Furthermore, all continuous variables that were not logarithmically transformed were truncated at the 1% level. The financial data used in this study come from the CSMAR database; digital media report data are sourced from the CNRDS database.

(2) Variable definition

Innovation Catering for Enterprises: This article defines it as the R&D investment intensity being just below the regulatory threshold. Specifically, with 0.5% and 1% as critical points, when sales revenue is below 200 million yuan, the ratio of R&D investment to sales revenue falls between [4.0%,4.5%] or [4.0%,5%]; when sales revenue is no less than 200 million yuan, the ratio of R&D investment to sales revenue falls between [3.0%,3.5%] or [3.0%,4%]. In these cases, the enterprise is defined as engaging in innovation catering behavior, with a value of 1; all other scenarios are assigned a value of 0.

Digital media information dissemination: This paper uses the natural logarithm of the total number of online financial news reports to represent it. The data are from the online financial news section of CNRDS database, which not only covers mainstream online financial media such as finance network, but also includes more than 400 large websites.

Control variables: Size, Age, ROA, LEV, SOE, TOP1, CEODulity, BODSize, Sales, CFO.

(3) Model design

This paper adopts the following regression model to test the influence of digital media information dissemination on corporate innovation and compliance, while controlling the fixed effects of years and industries. The details are as follows:

$$\begin{aligned} Logit(Lnca_{i,t}) = {} & \alpha_0 + \alpha_1 Media_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Age_{i,t} + \alpha_4 LEV_{i,t} + \alpha_5 ROA_{i,t} \\ & + \alpha_6 SOE_{i,t} + \alpha_7 TOP_{i,t} + \alpha_8 COEDulity_{i,t} + \alpha_9 BODSize_{i,t} + \\ & \alpha_{10} Sales_{i,t} + \alpha_{11} CFO_{i,t} + \sum Year + \sum Industry + \varepsilon \end{aligned} \quad (1)$$

In model (1), the explained variable Lnca is a dummy variable, indicating whether an enterprise has innovative accommodation behavior or not. Therefore, this paper adopts Logit model for regression; the explanatory variable is digital media information dissemination (Media).

4 Empirical Results and Analysis

(1) Regression analysis

Table 1 shows the regression results of model (1). Columns (1) and (2) do not include control variables, while columns (3) and (4) do. The results show that digital media information dissemination significantly inhibits corporate innovation compliance behavior, supporting hypothesis H1a.

Table 1. The influence of digital media information dissemination on corporate innovation compliance behavior

variable	(1) Lnca_1	(2) Lnca_2	(3) Lnca_1	(4) Lnca_2
Media	-0.141***	-0.164***	-0.0943**	-0.132***
	[0.0274]	[0.0215]	[0.0316]	[0.0249]
_cons	-2.080***	-1.636***	0.787	0.357
	[0.3981]	[0.3214]	[0.6781]	[0.5379]
Fixed effects for years	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes
N	19088	19088	19088	19088
adj. R^2	0.069	0.076	0.0753	0.0821

Note: * p <0.05, ** p <0.01, *** p <0.001, etc.

(2) Robustness test

1. Innovation to cater or optimal R&D intensity?

The ratio of R&D expenses to sales revenue near the regulatory threshold may be an optimal economic choice for enterprises to innovate and cater to the regulations. In order to rule out this hypothesis, this paper constructs the following model:

$$\begin{aligned} Logit(Lnca_{i,t}) = {} & \beta_0 + \beta_1 TobinQ_{i,t} + \beta_2 Size_{i,t} + \beta_3 Age_{i,t} + \beta_4 LEV_{i,t} + \beta_5 ROA_{i,t} \\ & + \beta_6 SOE_{i,t} + \beta_7 TOP_{i,t} + \beta_8 COEDulity_{i,t} + \beta_9 BODSize_{i,t} + \beta_{10} Sales_{i,t} + \\ & \beta_{11} CFO_{i,t} + \sum Year + \sum Industry + \varepsilon \end{aligned} \quad (2)$$

The research found that the intensity of R&D investment was significantly negatively correlated with TobinQ, indicating that the ratio of R&D expenditure to sales revenue near the regulatory threshold was not the optimal R&D intensity for enterprises, but innovation compliance. See Table 2 for details.

Table 2. The impact of R&D intensity on enterprise value

variable	(1)	(2)
	Lnca_1	Lnca_2
TobinQ	-0.129***	-0.120***
	[0.0318]	[0.0256]
Controls	Yes	Yes
_cons	1.480	1.632*
	[0.8431]	[0.6977]
Fixed effects for years	yes	yes
Industry fixed effects	yes	yes
N	15524	1524
adj. R^2	0.185	0.2609

2. R&D manipulation or average R&D intensity?

In order to rule out the possibility that relevant departments set the average R&D investment ratio of listed companies as the threshold for the recognition of high-tech enterprises, this paper studies and finds that the distribution of R&D investment ratio to sales revenue does not conform to the normal distribution with a range width of 1%. Thus, the average R&D intensity hypothesis is excluded. See Figure 1 for details.

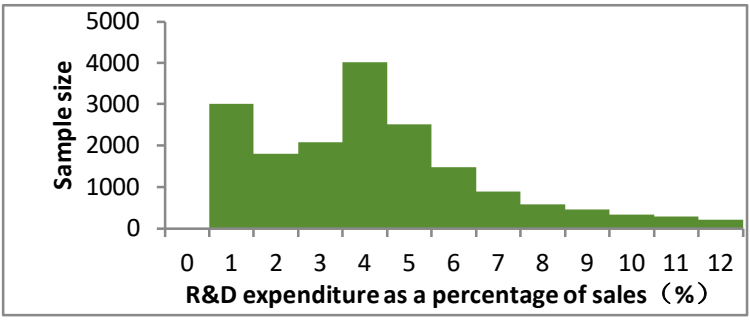

Fig. 1. Proportion of R&D investment

3. Keep only negative digital media reports

This paper excludes positive and neutral reports, and uses negative reports (Media_1) to re-run the regression. The results are shown in Table 3. It can be seen that negative digital media news has a significant negative correlation with corporate innovation compliance behavior, which supports the research conclusion of this paper.

Table 3. The influence of negative digital media information dissemination on corporate innovation compliance behavior

variable	(1)	(2)
Lnca_1	Lnca_2	Lnca_2
Media_1	-0.0735***	-0.128***
	[0.0282]	[0.0223]
Controls	Yes	Yes
_cons	0.891	0.399
	[0.6745]	[0.5356]
Fixed effects for years	yes	Yea
Industry fixed effects	yes	yes
N	19088	19088
adj. R^2	0.0752	0.0824

4. Digital media lagging one period

This paper reverts to the digital media lag by one period, and the results still show that there is a significant negative correlation between digital media information dissemination and enterprise innovation compliance behavior, which supports the research conclusion of this paper. See Table 4 for the regression results.

Table 4. The influence of digital media information dissemination in the first lag period on enterprise innovation compliance behavior

variable	(1)	(2)
Lnca_1	Lnca_2	Lnca_2
Media_2	-0.104**	-0.113***
	[0.0358]	[0.0280]
Controls	Yes	Yes
_cons	1.021	1.108
	[0.7421]	[0.5862]
Fixed effects for years	yes	Yes
Industry fixed effects	yes	yes
N	15524	15524
adj. R^2	0.0740	0.0804

5. The endogenous problem of digital media news

This paper uses the number of company announcements and the number of shareholders as instrumental variables for regression analysis. Companies primarily rely on digital media to publicly release information; the number of company announcements has no direct relationship with corporate innovation alignment behavior. The more shareholders there are, the more investors need relevant information about the company, which leads to greater attention from digital media. However, the number of shareholders does not have a direct relationship with corporate innovation alignment behavior. The regression results are shown in the table below (Table 5). The impact of digital media on corporate innovation alignment remains significantly negative.

Table 5. Instrumental variable method

variable	(1) Phase I Media	(2) two-stage Lnca_1	(3) Phase I Media	(4) two-stage Lnca_2	(5) Phase I Media	(6) two-stage Lnca_1	(7) Phase I Media	(8) two-stage Lnca_2
Media		-0.276***		-0.332***		-0.417*		-0.519**
		[0.0740]		[0.0637]		[0.2109]		[0.1779]
Announcement	0.496***		0.496***					
	[0.0157]		[0.0157]					
Shareholders					1.45***		1.45***	
					[1.01]		[1.01]	
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Fixed effects for years	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Wald F	*255.75*		255.75		231.32		231.32	
N	18935	18935	18935	18935	19074	19074	19074	19074

5 Conclusion

This paper uses the regulatory threshold of the "Management Measures" as a starting point, and takes A-share listed companies from 2008 to 2020 as a sample to study the impact of digital media information dissemination on corporate innovation compliance behavior. The research results show that digital media information dissemination can significantly inhibit corporate innovation compliance behavior. After various robustness tests, the results remain valid.

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