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The Impact of Public Disclosure of Corporate Social Responsibility Reports on Technological Innovation

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Abstract

Based on stakeholder theory, this paper uses data from A-share listed companies from 2008 to 2016 to explore whether corporate social responsibility disclosure behavior affects corporate technological innovation activities. The study found that public disclosure of social responsibility reports is significantly positively related to technological innovation. Further analysis found that the public disclosure of social responsibility has the strongest effect on the number of invention patents authorized, that is, the public disclosure of social responsibility promoted the company's innovation activities. Serious financing constraints inhibit the technological innovation of companies that disclose social responsibility reports, while companies with the second largest financial constraints have a less restrictive role in technological innovation, indicating that the disclosure of social responsibility reports eases the financing pressure on some corporate innovation projects.

Keywords

Corporate social responsibility; technological innovation; stakeholder theory; financing constraints.

1. INTRODUCTION

China has been regarded as the factory of the world, and low cost and imitation advantages have been regarded as the most important basis for competitiveness for years. However, with the continuous rise of China's manufacturing industry, the competitive advantages of Chinese companies have changed, and multinational companies have begun to emphasize the strategic deployment of intellectual property and control of core technologies to hinder the expansion of Chinese enterprises' markets. Facing the situation of demographic dividend and late imitation advantages gradually declining, the dilemma companies began to find a new way out-innovation. China's emphasis on innovation continues to increase, and it has achieved remarkable results in the field of innovation. According to data from the National Innovation Index Report and the Global Innovation Index Report, as of 2018, China's R & D expenditure reached 235.94 billion US dollars, ranking second in the world for four consecutive years, and the innovation index ranked 17th with a score of 53.06. However, the distribution of innovation capabilities of Chinese enterprises is highly uneven, and the quality of innovation results is generally low. Innovation is a key factor in the sustainable development of enterprises. How to promote enterprise innovation is an issue we urgently need to solve.

For companies to succeed in innovation, they must consider the interaction between their operating processes and the social environment, stimulate employee creativity, and work with suppliers, customers, and other business partners to design and develop new innovative products and services (Gadaf et al, 2013). Facts have proven that the more successful companies

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are, the more initiative they have to take on corporate social responsibility, but innovation is often risky. Companies often take corporate social responsibility as the starting point for active innovation, and take corporate social responsibility as a Low-risk approaches (MacGregor et al, 2008). Corporate social responsibility reflects the most basic value orientation and development concept of an enterprise. A company with a high sense of responsibility is an important condition for the healthy development of economy and society. Therefore, corporate social responsibility can promote innovation to a certain extent.

The academic circles have different views on corporate social responsibility, and many scholars have a negative attitude towards corporate social responsibility. For a modern society with a highly developed media, corporate social responsibility has a strong reputation effect. Social responsibility is only a “self-interest tool” for the company, it is a cover for management ’s ethical behavior, and there is a suspicion of “greenwashing” (Quan Xiaofeng Et al., 2015; Gao Yongqiang et al., 2012). Friedman (2007) pointed out that fulfilling social responsibility is an unnecessary cost for enterprises. According to this view, corporate social responsibility can inhibit innovation. Murad A. Mithani (2016) used data from 6,000 Indian companies to find that companies that value social responsibility will increase investment in ecology and the environment, which will weaken the effectiveness of R & D. Li Wenqian (2018) research found that CSR exceeding a certain level will inhibit corporate innovation. In addition, some scholars hold the opposite view. Scholars with opposite views consider the social and economic attributes of the company. From the perspective of stakeholder theory, they believe that fulfilling social responsibilities can form "reputational capital" and reduce the risk of investors, so as to meet the long-term capital needs of enterprises (Tang Pengcheng et al., 2012). Based on this view, corporate social responsibility promotes corporate innovation. Studies have found that maintaining good relationships with stakeholders can more quickly complement internal knowledge gaps in the company, thereby promoting innovation (Luo x et al, 2014). Li Chuntao (2017) research found that corporate social responsibility promotes corporate innovation, and this relationship is more obvious in regions with better economic development.

Based on this, this article begins to study the impact of corporate social responsibility disclosure on corporate technological innovation, and further explores the impact of corporate social responsibility disclosure on the output of different patent types based on the classification of patent types. Finally, combining the issue of corporate financing constraints, it explores the impact of corporate social responsibility on technological innovation activities under different financing constraints. Previous researches on corporate social responsibility and technological innovation are mostly based on the analysis of companies that have disclosed social responsibility (Li Chuntao et al., 2017; Li Wenqian et al., 2018). The analysis, combined with the status of corporate financing, explores the role of financing constraints in the disclosure of social responsibility reports and technological innovation, further enriching the research on the relationship between corporate social responsibility and technological innovation.

This article is divided into seven parts, the remaining parts are arranged as follows: the second part is a literature review and hypothesis; the third part is model design; the fourth part is statistical test and result interpretation; the fifth part is robustness test; Analysis; the last part is the appendix.

2. LITERATURE REVIEW AND HYPOTHESIS

2.1. Corporate Social Responsibility (CSR) and Stakeholder Theory

Corporate social responsibility was first proposed by Oliver Sheldon (1924). Since then, multiple definitions of "corporate social responsibility" have emerged. Lord Holme (1999) believes that CSR is an enterprise that strictly abides by ethics, and contributes to economic

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development while improving the quality of life of workers and the family and even the whole society; Social Accountablity International defines corporate social responsibility as the company's increasing wealth for shareholders In addition to the responsibilities to shareholders, responsibilities must also be assumed. Archie B. Carroll (1991) summarized corporate social responsibility as the economic, legal, ethical and charitable responsibilities that a company should bear to society in a certain period of time. At present, this definition has been widely recognized by academic circles 17]. According to the perspective of traditional western economics, it is the sole responsibility of a company to pursue profit maximization, and it is the responsibility of the government to solve social problems (Levitt, 1958). So why do companies practice social responsibility? What benefits will corporate social responsibility bring to the company?

Traditional corporate theory has shareholders' interests as the core (Friedman, Zhang Weiying, etc.), who believe that corporate social responsibility is an excuse for "irresponsibility". Enterprises can attribute the losses caused by poor management to the protection of consumer rights and interests. The quality of the products can be evaded to balance the interests of shareholders and consumers. Therefore, the company's declaration of responsibility to the owner is actually not responsible to the owner [16], and the sole responsibility of the company is to create value for shareholders. Other scholars have combined stakeholder theory with the theory of new institutional economics (Freeman, 1983; Donaldson, 1994), and put forward different views. They believe that the enterprise is the carrier of a series of contracts, including a series of contracts between the enterprise and stakeholders such as employees, managers, owners, suppliers, customers, and communities [15]. These stakeholders provide different forms of personal resources, and each stakeholder wants their interests to be met. As a carrier of the contract, the enterprise must respond to the demands of the stakeholders. It is precisely because of the company's compliance with the contract spirit. The company began to not only pursue the goal of "maximizing shareholders' interests", but also began to pay attention to the demands of other stakeholders.

In recent years, scholars have carried out a more detailed classification of the motives of enterprises to fulfill social responsibilities, which are divided into legal motivation, economic motivation and altruistic motivation. Because ethics, cultural literacy, and other factors are difficult to measure in empirical research, most studies are mainly based on legal motivation and economic motivation. The legitimacy motivation considers that corporate behavior is firstly constrained by the external environment, especially the pressure of the institutional environment. The study of the legitimacy motivation is mainly based on the perspective of the nature of ownership and the pressure of public opinion. To achieve, we need to pay more attention to the realization of non-economic goals. Non-economic goals are mainly achieved through the implementation of CSR (Zhou Zhongsheng et al., 2012). Li Baixing et al. (2018) found that media supervision has a significantly positive correlation with the CSR performance of polluting enterprises. The greater the pressure on public opinion, the stronger the motivation for CSR performance. Song Xianzhong and Hu Yan (2017) used Shanghai and Shenzhen A-share listed companies as a sample, and found that corporate disclosure of social responsibility information would form a reputation insurance effect and thus suppress the risk of stock price crash. Economic motivation can be an extension of the stakeholder theory. Companies that want to obtain consumer loyalty, investor preferences and other intangible assets that are difficult to be copied or imitated by other companies in order to enhance their competitive advantages must meet their needs (Sunil Tiwari et al, 2018). Economic motivation is focused on financing needs and market competition. Financing needs are mainly reflected in reducing capital costs. Li et al. (2013) found that disclosure of corporate social responsibility reports can help reduce the cost of equity capital. In terms of market competition, if Regarding CSR as a tool for

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enterprise product differentiation, market competition will promote corporate social responsibility.

2.2. Agency Conflict, Financial Support and Technological Innovation

Innovation was first proposed by Schumpeter and has continued to grow since then. Schumpeter (1912) believed that innovation is a permutation and combination of new factors and production conditions. Drucker also enriched the theory of innovation and pointed out that innovation includes technological innovation and social innovation. Later, economists introduced the concept of institutional innovation. The innovation referred to in this article is mainly technological innovation. Technological innovation projects are different from other conventional investment projects. Technological innovation projects need to go through a long-term process accompanied by high risks and uncertainties. Due to the concentration of management's personal wealth and human capital, managers are more likely than shareholders The willingness to avoid risks [8], coupled with the strong positive externalities of the results of innovation activities. Therefore, managers may abandon their investment in high-risk projects by means of "free-riding". The existence of agency conflict is the key to management's choice of short-term benefits, but changes in the external environment will prompt management to adjust their behavior. David Autor, David Dorn (2016) research found that the pressure of international market competition from Chinese companies will promote innovation activities in the United States; Li Bing and Yue Yunsong (2016) proved that the export behavior of enterprises prompted enterprises to learn more advanced production technologies. The “export learning” effect promoted the independent technological innovation of enterprises; Dong Zhiqing and Wang Hui (2018) proposed that environmental regulations could easily lead to the transfer of polluting enterprises to neighboring areas, which would promote the economic income of enterprises in the region and the progress of green technologies in the short term; Regarding the system, the establishment of an intellectual property protection system has made it possible for companies to guarantee the benefits of innovation results, and free-riding behavior can be controlled by law. Li Chuntao, Song Min (2010) studied the impact of ownership and CEO incentives on innovation in manufacturing enterprises and concluded that State-owned enterprises carry out more R & D and innovation activities and CEO incentives than private enterprises are conducive to corporate innovation.

For enterprises to carry out innovation activities, they also need the support of social capital, human capital, and physical capital. The difficulty and amount of raising capital are the key to the orderly progress of innovation activities. Allen (1999) research found that innovative projects can attract more supportive investors in the stock market. Brown (2013) research found that better stock financing channels lead to a higher proportion of R & D investment. Zhang Jinfan et al. (2017) also found that companies can promote corporate innovation through IPOs in the stock market. In addition, the government's research and development subsidies have also promoted corporate innovation. The government's research and development subsidies have reduced the risk expectations of enterprises for research and development investment, will attract universities and research institutions to join, increase knowledge spillovers, reduce the fixed costs of research and development activities, and encourage enterprises to carry out R & D spending.

The technological innovation activities of enterprises need the support of external environment and capital. With the reduction of public sector resources, the government expects the sustainable development of enterprises. Based on ethical factors, investors in financial institutions have also increased their socially responsible investment. The public pays more attention to corporate social responsibility, shareholders also expect sustainable development of enterprises, and consumers value green consumption, all of which encourage companies to innovate. The friendly relationship between the company and its stakeholders can enable the

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company to gain more knowledge and information (Choi, 2009). The fulfillment of responsibilities to internal stakeholders can also help companies obtain the technical and financial support needed for innovation. By improving the working conditions and training of employees, companies will attract better employees and help employees exert their creativity. In addition, enterprises receiving capital support are mainly affected by the asymmetry of information in the factor market. Public disclosure of information on fulfilling social responsibilities can reduce the cost of capital and help companies obtain more financial and technical support. Guan Yamei et al. (2013) found that the higher the corporate social responsibility, the lower the financing constraints faced by the company. On the other hand, public disclosure of information can reduce management's risk of illegal operations.

In summary, the expectations of stakeholders force companies to fulfill their social responsibilities. The fulfillment of social responsibilities promotes closer links between enterprises and stakeholders, and promotes the inflow of resources such as social capital and human capital required for technological innovation. On the other hand, Public disclosure of corporate social responsibility not only allows the public to see the company's determination to fulfill its social responsibility, but also reduces the cost of capital, allows management that focuses on short-term benefits to focus on the long-term development of the company, and eases agency conflicts. Finally, the disclosure of corporate social responsibility has reduced the space for management to conduct illegal operations such as earnings management, and improved the efficiency of corporate innovation; therefore, we have drawn the following assumptions:

Public disclosure of corporate social responsibility promotes technological innovation

3. MODEL DESIGN

3.1. Sample Selection and Data Source

In December 2008, the Shanghai Stock Exchange issued the "Guidelines for Environmental Information Disclosure of Listed Companies", which required some companies to compulsory disclosure of social responsibility reports, and the Shenzhen Stock Exchange subsequently issued similar documents. Since then, China's corporate social responsibility disclosure has officially entered an intensive and conventional disclosure situation [13]. Based on this, this article selects China A-share listed companies from 2008 to 2016 as a research sample to analyze the impact of corporate disclosure on corporate responsibility on corporate innovation. In the process of data collection and collection, referring to the existing literature, this article processed the sample data according to the following principles: (1) Excluding listed companies of S, ST, * ST, SST, S * ST (financial data of such companies) Disclosed after a certain treatment, it has no reference value; (2) Exclude listed companies in the financial industry; (3) Exclude samples with missing values after data matching; (4) Exclude the effect of abnormal values on the results, and Continuous variables were Winsorize at 1% and 99% levels. In the end, 14,105 samples were obtained from 2642 companies. The corporate social responsibility data used in this article comes from Juchao Information, Runling Global, Guotai'an Database, and the Shenzhen Stock Exchange and Shanghai Stock Exchange websites. Listed companies' patent application data, corporate governance and financial data are from Guotai'an Database and Juchao Information, Part of the data comes from the network.

3.2. Variable Measurement and Processing

3.2.1 Technology innovation

Technological innovation variables are joint ventures of listed companies and subsidiaries, and the number of patents granted to associates. The data comes from the patent database of Guotai'an listed companies and subsidiaries, which is represented by $Grants_{it}$. Compared with

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the number of patents granted, the number of patent applications can only reflect the importance that enterprises attach to innovation, and the patent authorization data can reflect the improvement of the actual technology of the enterprise, so it can better reflect the degree of technological innovation [4]. With reference to the practice of Gu Xiaming, Chen Yongmin et al. (2018) and Yang Daoguang (2017), empirical studies use the number of patents granted by the company for the year plus 1 to take the natural number to measure innovation, that is, $Patent_{it} = \ln(Grants_{it} + 1)$. In order to further examine the heterogeneity of patent data, the amount of invention patent grants ($IGrants_{it}$), utility patent grants ($UGrants_{it}$)and appearance patent grants (D$Grants_{it}$) plus 1 are used to obtain natural numbers. Represented by$InvPatent_{it}$, $UtyPatent_{it}$ and $DesPatent_{it}$.

3.2.2 Corporate social responsibility

Based on the social responsibility data of Runling Global and Guotai'an, combined with corporate social responsibility reports and annual reports, dummy variables are used to indicate whether listed companies disclose social responsibility, 1 for disclosure, 0 for others, represented by CSR_{it}. In the robustness test, Runling Global Ratings score data is used to measure the quality of corporate social responsibility. Because of the lag in patent grants, variables other than the technological innovation variable lag one period [5].

3.2.3 Control variable

The control variables draw on the research on enterprise innovation and its influencing factors, such as Pan Ailing et al. (2019) and Gu Xiaming (2018) .Finally, the company's age, enterprise size, property rights, leverage ratio, return on net assets, cash flow ratio, and intangible asset ratio The Tobin Q value is the control variable. ① Age of the company (lnAge), many studies have found that the longer the year the company is established, the stronger the company's innovation, but there are also studies that confirm that the company has organizational inertia, and the older the company is, the more complicated the organizational processes and practices within the organization. As a result, the efficiency of technological innovation in enterprises has decreased [6]. This article uses the number of years of company establishment plus 1 to take the logarithm to indicate the age of the company. ② Enterprise size (large), large enterprises have a higher success rate in innovation activities due to their own capital advantages [10], this article uses the natural number of employees at the end of the company to measure the size of the enterprise; State-owned shares may have a negative impact on technological innovation of the enterprise, but it is more advantageous in obtaining subsidized government R & D subsidies and can promote corporate innovation. This article is divided by the nature of the actual controller. The leverage ratio (Lev) is related to the financial risk of the enterprise. The higher the leverage ratio, the higher the financial risk of the enterprise. This article uses the debt ratio of the company's total assets at the end of the year. This article uses the ratio of net profit to total assets to represent; ⑥ The cash flow ratio (Cash) is related to the company's capital status, and is expressed using the ratio of net cash flow from operating activities to total assets; Asset structure, expressed as the ratio of the net value of the intangible assets to the total assets; Tobin-Q represents the investment and growth opportunities of the company. The Tobin-Q value of this article = stock market value / (total assets-net intangible assets-goodwill impairment). ⑥ Market competition (HHI): Based on the operating income of the Herfindahl index of a listed company's industry, the larger the HHI value, the higher the market concentration, and the smaller the HHI value, the more intense the market competition. In addition, this article controls industry and annual effects.

3.2.4 Other variables

Corporate R&D activities are susceptible to funding constraints. Technological innovation does not happen overnight. It requires both the integration and development of knowledge acquired by enterprises, and the need for sustained and stable financial support [25]. Therefore,

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this paper constructs dummy variables of financing constraints and explores the impact of corporate disclosure of social responsibility reports on corporate technological innovation under different financing constraints. Commonly used measures of financing constraints include KZ index (Lamont et al, 2001), WW index (Whited & Wu, 2006) and SA index (Hadlock & Pierce). The KZ index and the WW index include endogenous variables such as cash flow and leverage, while the SA index uses only two variables that are highly exogenous and that do not change over time: firm size and firm age. Therefore, this paper draws on Sun Xuejiao and Zhai Shuping (2019) to use SA index to measure the financing constraints of enterprises. The expression of the SA index is:

$$SA = -0.737 \times \ln Asset + 0.043 \times (\ln Asset)^2 - 0.04 \times Age$$

Among them, Asset is equal to the logarithm of the total assets of the enterprise (in millions), Age is equal to the number of years of establishment of the enterprise, and the larger the negative and absolute value of the SA index, the more severely the enterprise is subject to financing constraints. This article constructs a dummy variable (FC1) based on the median of the SA index to measure the degree of corporate financing constraints, and further constructs dummy variables FC2, FC3, and FC4 based on the 1/4 /, 2/4, and 3/4 quantiles of the SA index . FC2 indicates weak financing constraints, FC3 indicates heavy financing constraints, and FC4indicates heavy financing constraints.

3.2.5 Empirical model construction

This article sets corporate social responsibility disclosure (CSR) as a dummy variable and constructs a multiple regression model to verify the impact of corporate disclosure of social responsibility on technological innovation:

$$Patent_{i,t} = \beta_0 + \beta_1 CSR_{i,t-1} + \beta_2 Control_{i,t-1} + \beta_3 Industry_{i,t} + \beta_4 Year_t + \varepsilon_{i,t} \quad (1)$$

$Patent_{i,t}$ represents the technical innovation performance of enterprise i in t years, which is measured by the number of patents granted by the enterprise plus 1 in the current year. There is a certain time lag between the R & D and the obtaining of patent grants. There is a problem of self-selection of the interpreted variables and explanatory variables (some corporate social responsibility reports will disclose corporate R & D and innovation). This article refers to existing research to explain the variables Lag one period [5]. In model (1), if β is significantly positive, it indicates that disclosure of corporate social responsibility can promote corporate technological innovation.

4. STATISTICAL TEST AND INTERPRETATION OF RESULTS

4.1. Descriptive Statistical Analysis

Table 1 is the descriptive statistics of the variables selected in this paper. As can be seen from Table 1, the average value of technological innovation (Patent) of enterprises is 2.822, the maximum value is 6.710, the median is 2.708, and the minimum value is 0.693, indicating that there is a certain gap between the number of patents granted by different enterprises. The average value of corporate disclosure social responsibility (CSR) is 0.276, that is, only 27.6% of the sample companies disclosed social responsibility reports, indicating that corporate disclosure of social responsibility reports has not been universalized, which is consistent with realistic conclusions. In addition, the average leverage ratio (Lev) of the sample companies is 0.418, the average return on equity (Roa) is 0.0427, the average cash flow ratio (Cash) is 0.0435, and the median corporate financing constraint (SA) is -3.661, consistent with some existing research results (Li Baixing et al., 2018; Zhang Jinfan et al., 2017)

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Table 1. Descriptive statistics

Variable	N	Max	Min	Median	Mean	Standard Deviation
Patent	14088	6.710	0.693	2.708	2.822	1.339
InvPatent	14088	5.242	0	1.386	1.482	1.238
UtyPatent	14088	6.231	0	2.197	2.163	1.506
DesPatent	14088	4.890	0	0	0.793	1.203
CSR	14088	1	0	0	0.276	0.447
SA	14088	-2.995	-4.238	-3.661	-3.654	0.241
Lev	14088	0.868	0.0456	0.411	0.418	0.209
Roa	14088	0.188	-0.142	0.0397	0.0427	0.0495
Cash	14088	0.232	-0.149	0.0420	0.0435	0.0680
TobinQ	14088	11.99	0.210	1.891	2.554	2.217
Intangible	14088	0.257	0	0.0351	0.0460	0.0433
Size	14088	13.22	2.303	7.667	7.758	1.248
Soe	14088	1	0	1	0.607	0.488
HHI	14088	0.568	0.0167	0.0729	0.0994	0.0905
lnAge	14088	3.367	1.386	2.708	2.658	0.401

4.2. Group Difference Analysis

According to whether the company reports the responsibility report, the full sample is divided into a sample of undisclosed social responsibility report (CSR = 0) and a sample of social practice report (CSR = 1), and the two sub-samples are analyzed by the T test of the mean difference. Are there significant differences in innovation. The analysis results are shown in the figure below. In the sample of undisclosed social responsibility report, the average value of technological innovation (Patent) is 2.642, which is significantly lower than the sample of disclosed social responsibility report, that is, the number of patents granted by the company before the disclosure of the social responsibility report is significantly lower than the disclosure Sample group of social responsibility report. Compared with the full sample, it was found that the slight decline in patents was mainly due to the number of undisclosed social responsibility report samples. In addition, the average values of invention patents, patent grants, and appearance patent authorizations of the undisclosed social responsibility report sub-samples were significantly smaller than the average values of the disclosed social responsibility report sub-samples, which proved the hypothesis to a certain extent.

Table 2. Group difference analysis

	CSR=0			CSR=1			T-test
	Sample	Mean	Standard Deviation	Sample	Mean	Standard Deviation	Standard Deviation
Patent	10197	2.642	1.197	3891	3.296	1.558	-0.654***
InvPatent	10197	1.305	1.074	3891	1.943	1.494	-0.637***
UtyPatent	10197	1.987	1.375	3891	2.622	1.720	-0.634***
DesPatent	10197	0.723	1.121	3891	0.978	1.381	-0.255***

Note: **, **, *** indicate significant at 10%, 5%, and 1% levels, respectively.

4.3. Regression Analysis

Table 3 shows the basic regression results of the impact of corporate disclosure social responsibility reports on technological innovation. Column (1) reports the regression results of the mixed effect of corporate disclosure social responsibility report and technological innovation. The coefficient of CSR is positive and significant at the significance level of 1%. The results show that the disclosure of corporate social responsibility reports can significantly

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improve the technological innovation of enterprises, thereby verifying the hypothesis of this paper. Because the data used in this paper is non-equilibrium panel data, in order to reduce the endogenous nature of the model, this paper uses a fixed-effects model and a random-effects model to verify the hypothesis, and then uses Hasusman test to screen the two models. The results show that, thus rejecting the null hypothesis, that is, using a fixed-effects model to verify, the regression results are shown in Table 3, column (2), and the results prove the hypothesis of this article again. In addition, we also found that the larger the scale of the company, the higher the ROA, and the more patents granted to the company, which is basically consistent with the conclusions of Pan Ailing, Liu Xin et al. (2019).

Table 3. Social responsibility disclosure and technological innovation

	(1) Patent	(2) Patent
CSR	0.314*** (0.022)	0.145*** (0.044)
Lev	0.240*** (0.060)	0.193* (0.104)
Roa	3.170*** (0.225)	1.063*** (0.245)
Cash	-0.165 (0.152)	-0.246* (0.136)
TobinQ	-0.031*** (0.006)	-0.020*** (0.006)
Intangible	0.327 (0.226)	0.719* (0.370)
Size	0.451*** (0.011)	0.254*** (0.029)
Soe	-0.0190 (0.022)	-0.0910 (0.089)
HHI	0.0730 (0.352)	0.137 (0.400)
lnAge	-0.160*** (0.025)	0.218 (0.141)
cons	-2.382*** (0.174)	0.210 (0.425)
Industry fixed effect	Yes	Yes
Year fixed effect	Yes	Yes
N	14088	14088
R-sq	0.437	0.243

Note: The standard error of clustering is in parentheses, * p <0.10, ** p <0.05, *** p <0.01.

5. ROBUSTNESS TEST

(1) Runling Global CSR rating score: This article uses the methods of Li Chuntao (2017) and Li Wenqian (2018) to retest the hypothesis using Runling Global CSR rating data (CSR1). The test results are consistent with Li Chuntao (2017) 's conclusion, that is, the higher the social responsibility disclosure score, the more The stronger the ability to innovate. Run Ling Global's CSR rating data only includes a sub-sample when the social responsibility disclosure in this article is 1. The dummy variable of social disclosure information is used in this article. Therefore, the company that did not disclose the social responsibility report is set to 0 (CSR2). Finally, it was concluded that the higher the score of corporate social responsibility information

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disclosure, the better the effect of corporate technological innovation. The results are shown in column (1) and column (2) of Table 4.

Table 4. Robustness test

	(1) Patent	(2) Patent	(3) Patent
CSR	0.0137*** (7.8415)		
CSR2		0.0041*** (3.6844)	
CSR			0.1141** (2.3269)
Lev	0.2385* (1.7363)	0.1973* (1.8992)	0.0814 (0.6318)
Roa	4.1339*** (8.4483)	1.0660*** (4.3605)	0.8409*** (2.7877)
Cash	-0.0365 (-0.1104)	-0.2486* (-1.8256)	-0.210 (-1.2310)
TobinQ	-0.0587*** (-3.8476)	-0.0188*** (-2.9424)	-0.0170* (-1.7974)
Intangible	1.2578*** (2.7565)	0.7091* (1.9173)	0.641 (1.2749)
Size	0.4552*** (24.5063)	0.2527*** (8.7343)	0.2550*** (7.2063)
Soe	-0.0458 (-1.0773)	-0.0874 (-0.9837)	-0.102 (-0.8810)
HHI	-1.2555* (-1.7470)	0.141 (0.3534)	-0.0352 (-0.0656)
lnAge	-0.2001*** (-3.6514)	0.230 (1.6286)	0.221 (1.1285)
cons	-2.8009*** (-7.6493)	0.185 (0.4361)	-0.993 (-1.5162)
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
N	3891	14088	9233
R-sq	0.572	0.244	0.255

Note: The standard error of clustering is in parentheses, * p <0.10, ** p <0.05, *** p <0.01.

(2) Analysis of PSM model: The regression model (1) suffers from endogenous problems. Because some companies' social responsibility reports will disclose the company's technological innovation and sustainable development, there may be cases where the company that discloses the social responsibility report itself is highly innovative, that is, the problem of self-selection, so we use the tendency matching model To solve this problem. The result variable is technological innovation, and the characteristic variable is the previous control variable. We record the company that disclosed the social responsibility report as the processing group, and the matched company that did not disclose the social responsibility report is set as the control group, using the near matching method logit The model estimates that the result ATT = 0.259, which is significant at the 1% level, which also validates our conclusions. Through the balance robustness, the standardization deviation of the matched data is within 10%, and the T test results do not reject the null hypothesis that there is no significant difference between the

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treatment group and the control group and passed the balance test. Finally, we use the matched data to return again, and the conclusion is the same as before. The regression results are shown in column 4 (3) of Table 4 and the balance test results are shown in Table 1 of the Appendix.

Table 5. Impact of disclosure of social responsibility reports on different patent types

	(1) InvPatent	(2) UtyPatent	(3) DesPatent
CSR	0.232***	0.210***	0.125***
	(0.035)	(0.038)	(0.035)
Lev	0.0330	0.314***	0.00800
	(0.081)	(0.092)	(0.081)
Roa	0.543**	1.728***	0.652***
	(0.215)	(0.264)	(0.234)
Cash	-0.0860	-0.0650	-0.121
	(0.127)	(0.147)	(0.122)
TobinQ	-0.015***	-0.029***	-0.00400
	(0.006)	(0.007)	(0.006)
Intangible	0.446	0.294	-0.181
	(0.287)	(0.336)	(0.300)
Size	0.282***	0.345***	0.221***
	(0.020)	(0.022)	(0.017)
Soe	-0.131***	-0.087*	0.094**
	(0.044)	(0.045)	(0.045)
HHI	0.362	-0.0350	-0.0960
	(0.327)	(0.390)	(0.395)
lnAge	0.0150	-0.105**	-0.0280
	(0.048)	(0.051)	(0.052)
cons	-2.307***	-2.469***	-1.089***
	(0.343)	(0.273)	(0.258)
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
N	14088	14088	14088
R-sq	0.3249	0.4553	0.2150

Note: The standard error of clustering is in parentheses, * p <0.10, ** p <0.05, *** p <0.01.

6. FURTHER ANALYSIS

6.1. Analysis By Patent Heterogeneity

We subdivide according to the types of patent applications applied by enterprises to examine the impact of corporate social responsibility on patent heterogeneity. $InvPatent_{it}$, $UtyPatent_{it}$, and $DesPatent_{it}$ indicate the invention patent authorization amount, utility patent authorization amount, and appearance patent authorization amount plus 1 to take natural numbers. The results are shown in Table 5. The results show that the company's disclosure of social responsibility reports has significant positive correlations with the number of invention patents granted, utility patents granted, and appearance patents granted. Among them, the disclosure of social practice reports has a maximum impact of 0.232 on invention patents. Compared with other types of patents, invention patents are more stringent. They are the highest-quality and most valuable patents among the three types of patents [9]. Therefore, the results in column (1) of Table 5 verify this article again. Assumptions. From the descriptive

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statistics in Table 1, it can be known that the minimum value of $InvPatent_{it}$, $UtyPatent_{it}$, and $DesPatent_{it}$ is 0, which is the "merged data" with 0 as the offline, so we use the Tobit model to estimate The results are basically consistent with Table 5. The results are shown in Table 2 of the Appendix.

6.2. The Regulatory Role of Financing Constraints

Through the above empirical research, it is concluded that the disclosure of corporate social responsibility reports will promote technological innovation in enterprises, but the stable development of innovative activities cannot be achieved without the continuous support of a large amount of funds. As the financing constraints become severe? In order to verify the role of financing constraints, the interaction between the dummy variable on the degree of financing constraints and the disclosure of the corporate social responsibility report was added to the model (1) to build models (2) and (3). Model (2) and model (3) are as follows:

$$Patent_{i,t} = \beta_0 + \beta_1 CSR_{i,t-1} + \beta_2 CSR_{i,t-1} \times FC_1 + \beta_3 FC_1 + \beta_4 Control_{i,t-1} + \beta_5 Industry_{i,t} + \beta_6 Year_t + \varepsilon_{i,t} \quad (2)$$

$$Patent_{i,t} = \beta_0 + \beta_1 CSR_{i,t-1} + \beta_2 Control_{i,t-1} + \beta CSR_{i,t-1} \times \sum_{k=2}^{4} FC_k + \beta_3 Industry_{i,t} + \beta_4 Year_t + \varepsilon_{i,t} \quad (3)$$

We set the financing constraint index as a dummy variable. Enterprises below the median face more severe financing constraints, with a value of 1 and the rest being 0, expressed as FC1. The results are shown in Table 6 column (1): CSR ×FC1 coefficient It is -0.228, which is significantly negative at a significance level of 1%, which indicates that among the companies that disclose social responsibility reports, the heavier the financial constraints are, the less the company's technological innovation activities.

In order to further analyze the technological innovation of socially responsible reporting companies under different financing constraints, this paper refers to the method of Xiaosheng Ju and Lu Yan (2013), according to the 1/4 /, 2/4, and 3/4 quantiles of the SA index. , The degree of financing constraints of the company is divided into 4 levels, less than 1/4 quantile is considered to be subject to heavy financing constraints, 1 / 4-2 / 4 quantiles are considered to be more severe financing constraints, 2 / 4-3 / 4 quantiles are considered to be weakly subject to financing constraints, and above 3/4 quantiles are considered to be weak financing constraints. Three dummy variables FC2 FC3, and FC4 are set to indicate weak financing constraints and financing constraints, respectively. Heavier and more financing constraints, the results are shown in Table 6 column (2). It was found that the interaction terms were significantly negative, with coefficients of -0.291, -0.258, and -0.309, respectively. The absolute value of the coefficient of CSR × FC4 was the largest, indicating that among the companies that disclosed social responsibility reports, the most severely restricted by the companies were the technological innovation activities of financing constraints. Less. In addition, this article finds that the absolute value of the CSR ×FC3coefficient is slightly smaller than the absolute value of the CSR × FC2 coefficient. According to the theory of the stakeholder, the author guesses that after the company discloses the social responsibility report, the company gets the attention of the stakeholders, and the financing constraints of the company are alleviated. , Thereby increasing the technological innovation activities of enterprises.

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Table 6. Moderating role of financing constraints

	(1) Patent	(2) Patent
CSR	0.450*** (0.062)	0.547*** (0.090)
FC1	0.0780 (0.048)	
CSR×FC1	-0.228*** (0.075)	
CSR×FC2		-0.291*** (0.101)
CSR×FC3		-0.258** (0.101)
CSR×FC4		-0.309*** (0.106)
Control	Yes	Yes
Industry fixed effect	Yes	Yes
Year fixed effect	Yes	Yes
N	14088	14088
R-sq	0.438	0.439

Note: The standard error of clustering is in parentheses, * p <0.10, ** p <0.05, *** p <0.01.

7. CONCLUSION AND INSPIRATION

This article uses 2008-2016 listed company data as a sample to empirically study the impact of corporate disclosure of social responsibility reports on corporate technological innovation. It was found that corporate disclosure of social responsibility reports promoted corporate technological innovation activities, and further classified according to the type of patent application. As a result, it was found that corporate disclosure of social responsibility reports had the greatest promotion effect on corporate invention patent activities. At the same time, considering the constraints of corporate financing, this paper concludes that disclosure of the technological innovation activities of enterprises reporting social responsibility is subject to corporate financing constraints. The heavier the constraints on corporate financing, the greater the inhibitory effect on corporate technological innovation activities.

This paper studies the impact of corporate disclosure of social responsibility reports on technological innovation, provides new evidence for corporate transformation and upgrading and sustainable development under the new economic normal, and also provides new micro-mechanics between corporate social responsibility, financing constraints and innovation Empirical evidence.

The policy implications of this article are: the government should encourage companies to disclose social responsibility reports to improve corporate technological innovation; at the same time, the government should improve financial development, increase corporate financing channels, reduce corporate financing constraints, and promote technological innovation.

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APPENDIX

Table 1. Balance test

Corvariates	Unmatched U / Matched M	Treat group	Control group	%deviation	T-value	P-value
Lev	U	0.488	0.392	47.30	24.81	0
	M	0.486	0.487	-0.600	-0.280	0.781
Roa	U	0.0458	0.0415	8.600	4.640	0
	M	0.0457	0.0466	-1.900	-0.800	0.426
Cash	U	0.0543	0.0394	22.20	11.71	0
	M	0.0535	0.0566	-4.600	-1.960	0.050
TobinQ	U	1.888	2.808	-44.70	-22.42	0
	M	1.910	1.933	-1.100	-0.580	0.564
Intangible	U	0.0462	0.0460	0.600	0.320	0.751
	M	0.0464	0.0478	-3.100	-1.310	0.190
Size	U	8.567	7.449	91.70	51.90	0
	M	8.503	8.484	1.600	0.670	0.506
Soe	U	0.386	0.691	-64.40	-34.59	0
	M	0.392	0.380	2.600	1.120	0.262
HHI	U	0.109	0.0958	14.10	7.750	0
	M	0.105	0.107	-1.600	-0.740	0.457
Age	U	2.725	2.632	23.80	12.28	0
	M	2.730	2.726	0.900	0.430	0.671

Table 2. Impact of Disclosure of Social Responsibility Reports on Different Patent Types-Tobit Model

	(1) InvPatent	(2) UtyPatent	(3) DesPatent
CSR	0.408***	0.281***	0.233***
	(0.027)	(0.028)	(0.052)
Lev	0.0540	0.380***	-0.0850
	(0.074)	(0.076)	(0.145)
Roa	2.397***	3.254***	4.346***
	(0.280)	(0.290)	(0.558)
Cash	-0.116	-0.232	-0.744**
	(0.184)	(0.188)	(0.361)
TobinQ	-0.018**	-0.045***	0.00100
	(0.007)	(0.007)	(0.014)
Intangible	0.274	0.0220	1.490***
	(0.280)	(0.288)	(0.552)
Size	0.414***	0.461***	0.597***
	(0.012)	(0.012)	(0.024)
Soe	-0.159***	-0.079***	0.196***
	(0.027)	(0.028)	(0.052)
HHI	0.775**	0.194	-0.811
	(0.394)	(0.394)	(0.733)
Age	-0.117***	-0.196***	0.0710
	(0.031)	(0.032)	(0.059)
cons	-3.854***	-3.893***	-5.207***
	(0.241)	(0.252)	(0.444)
σ cons	1.217***	1.262***	2.055***
	(0.009)	(0.008)	(0.022)
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
N	14088	14088	14088
Pseudo R^2	0.1172	0.1642	0.0968

Note: The standard error of the cluster is in parentheses, * p <0.10, ** p <0.05, *** p <0.0