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Does engaging in government initiated corporate social responsibility activities improve corporate innovation? Evidence from China

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ABSTRACT

The Chinese government initiated a nationwide poverty alleviation campaign in 2016. Many Chinese listed firms engaged in poverty alleviation campaign and made significant contributions. In this study, we investigate the relationship between firms' poverty alleviation campaign and firm innovation performance. Using a large sample of 3140 Chinese A-share listed firms on Shenzhen and Shanghai Stock Exchange from 2016 to 2019, this study demonstrates that firms' poverty alleviation campaign contribute to the improvement of firm innovation performance. These results are more pronounced for firms with higher internet search volume. Overall, our findings provide important support for listed firms to engage in CSR activities initiated by government.

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1. Introduction

In recent decades, an increasing number of firms are aware of the key role of corporate social responsibility (CSR) in maintaining good relationships between firms and stakeholders. CSR is considered crucial for part of the organization's strategy in order to achieve competitive advantage (Lu et al., 2020). Since the first annual CSR report issued by Chinese A-share listed firms in 2007, the number of listed firms issuing annual CSR report has increased every year. In 2019, a total of 941 Chinese A-share listed firms issued annual CSR report to provide detailed CSR activities information.¹ CSR is increasingly becoming an integral part of firms' development strategies, and the effect of CSR on shareholder value and firm performance has attracted the attention of substantial academics and businesses (Ferrell et al., 2016; Jiang et al., 2021; Tran & Adomako, 2021). With the increasingly turbulent business environment faced by firms and the increasing competition among firms, innovation is a key factor for firms to obtain core competitiveness and boost the long-term growth, and innovation therefore is vital to the survival of a business. Due to the limited resources, firm innovation has been increasingly relying on the engagement and cooperation of

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stakeholders such as governments, clients, employees and investors (Wu et al., 2020). Thus, understanding the relationship between CSR and firm innovation performance has become an importantly on-going research agenda (Luo & Du, 2015).

There has been some empirical studies that support both the positive and negative effect of CSR on firm innovation performance (Ko et al., 2020; Mithani, 2017; Santos-Jaén et al., 2021). Factors that contribute to conflicting discovery include applying different sample sizes, methods and using different proxies of CSR performance (Broadstock et al., 2020). The phenomenon of conflicting results may however also be attributed to the important fact that specific CSR activities may bring different economic consequences for the firm (Bereskin et al., 2016; Mithani, 2017). In this paper, given the above conflicts in the literature, we explore whether firms engage in CSR activities initiated by government can enhance firm innovation performance. More precisely, we discuss whether firms' poverty alleviation campaign affect firm innovation performance. In 2016, the Chinese government initiated a nationwide campaign of targeted poverty alleviation by 2020.² One characteristic of the event is that it mobilizes organizations and people from all parts of society, including listed firms, to engage in and contribute to the poverty alleviation campaign, and over 20% of listed firms in China have made significant contributions to the campaign (Chang et al., 2021). This offers a unique setting for us to investigate the relationship between listed firms' poverty alleviation campaign and firm innovation performance.

Using a large sample of 3140A-share listed firms on the Shanghai and Shenzhen Stock Exchanges between 2016 and 2019, this study makes the strong and robust conclusion that firms' poverty alleviation campaign has a significantly positive effect on firm innovation performance. This finding supports the view firms' poverty alleviation campaign can deepen the relationship with key stakeholders on the basis of mutual trust, and their stakeholders are likely to have stronger incentives to contribute resources and effort to the firm innovation activities (Deng et al., 2013). The positive relationship between firms' poverty alleviation campaign and firm innovation performance is also robust to a series of sensitivity tests.

Further, we discussed the effect of internet search volume on the relationship between firms' poverty alleviation campaign and firm innovation performance. We are interested in internet searches owing to the internet plays an important role in the capital market.³ After Ginsberg et al. (2009) use substantial Google search requests to analyzing the development trajectory of influenza symptoms for the first time, many scholars in the finance field have begun to pay attention to the important role of internet search in information transmission. For example, Da et al. (2011) use internet search frequency to measure investor attention and find that internet search frequency has a positive relationship with stock prices in the short term. Higher internet search volume suggests that firms' stakeholders pay more attention to the firm, and the firms' poverty alleviation campaign is more able to send positive messages, thereby more likely to receive a response from stakeholders. Therefore, we expect that internet search volume can positively moderate the relationship between firms' poverty alleviation campaign and firm innovation performance.

Our research contributes to the literature in the following ways. First, our research adds to the growing literature that link CSR to firm innovation (Ko et al., 2020; Luo

& Du, 2015; Santos-Jaén et al., 2021). We mainly explored that the effect of firms' engagement in CSR activities initiated by government on firm innovation performance, while the prior literature linking CSR and innovation focus on CSR activities initiated by firms such as philanthropy (Bereskin et al., 2016) and corporate environmental investment (Mithani, 2017). We suggest that the relationship between CSR and firm innovation performance varies with the specific CSR activities, which is consistent with Ko et al. (2020), as different CSR activities may bring different economic consequences.⁴ Our study establishes the positive relation between firms' poverty alleviation campaign and firm innovation performance, and our results provide support for firms engaging in CSR activities initiated by government.

Second, our study shows that the positive effects of firms' poverty alleviation campaign depend on firm characteristics. We identify the contingent effects of firms' internet search volume on the relationships between firms' poverty alleviation campaign firm innovation performance. Existing literature have demonstrated the importance of firm characteristics affect the relationship between CSR and firm innovation performance, such as industry heterogeneity (Ko et al., 2020), employee motivation (Liu et al., 2020) and firm visibility (Wu et al., 2020), while there is little literature that focuses on the effect of internet search volume on the relationship between CSR and firm innovation performance.

The remainder of this paper is structured as follows. Section 2 provides the institutional Background and develops the hypotheses. Section 3 includes research design and sample selection process. Section 4 presents the empirical results and Section 5 discusses and concludes the research.

2. Literature and hypotheses development

2.1. Institutional Background

Eliminating poverty across the world has always been a challenge (Glauben et al., 2012). The extreme poverty standard has been set at 1.90 USD per day by the World Bank and is acknowledged a world poverty line, and over 700 million people are still living below the extreme poverty line and struggle to survive under the scarcity of essential resources such as food, shelter, or clothing.⁵ Countries across the world have different degrees of poverty, and extreme poverty is still common in many Third World countries in Africa and Asia (Shi et al., 2022). According to the Sustainable Development Goals Report in 2021, in 2020, a total of about 255 million full-time jobs will be lost globally and the extreme poverty rate will rise to 9.5% from 8.4% in 2019, and more than one in five children worldwide will be stunted. Prior literature has widely documented that poverty damages children's mental, emotional and behavioural development (Yoshikawa et al., 2012), intensifies the mortality rate from diseases (Dorling et al., 2000), and is closely related to violent crimes (Guo & Harris, 2000), ultimately hindering social development. Poverty is still one of the world's greatest problems, such that poverty eradication is the first objective among the 17 Sustainable Development Goals (SDGs) proposed by the United Nations (Tollefson, 2015).

The Chinese government has made outstanding contributions to poverty alleviation in China and the world for a long time. For example, over the past 40 years, the Chinese government has greatly reduced the number of poor people in China through reform and opening up and large-scale poverty alleviation programs. According to the World Bank and the international poverty standard of 1.9 US dollars per person per day, the Chinese population living in poverty has decreased from 878 million in 1981 to 25.11 million at in 2013. In its thirteenth Five-Year Plan covering 2016 to 2020, the Chinese government committed 250 billion Yuan to poverty alleviation with the objective of eradicating poverty in China by 2020. To achieve the objective, the Chinese government launched a nationwide campaign to targeted poverty alleviation (Chang et al., 2021). A significant feature of the campaign is that it has mobilized people and organizations from all walks of life to participate, such as government officials, primary and secondary schools, universities, listed firms and other institutions. As of the end of 2020, a total of 832 national-level poverty-stricken counties in China have all eliminated poverty and 55.75 million rural poor people to achieve poverty alleviation, and the targeted poverty alleviation campaign has achieved full success. China's experiences could also be valuable for the formulation of development strategies in other developing countries.

2.2. Firms' poverty alleviation campaign and innovation performance

Compared with conventional activities, innovation is long-term, multi-stage and labour-intensive (Holmstrom, 1989). Following the resource-based view, the success of innovative projects are inseparable from the cooperation with stakeholders at all stages and the resources they contribute (Luo & Du, 2015; Pan et al., 2021). Correctly manage the relationship with stakeholders is an important condition for the firm to achieve long-term development (Ullah & Sun, 2021). But the expectations and interests of stakeholders are diverse and sometimes even conflicting (Chen & Roberts, 2010). Therefore, firms need to find ways to balance these conflicting expectations in order to gain support from stakeholders (Mahmood et al., 2021; Wu et al., 2020), and involved in CSR activities can be seen as a way for firms to balance these conflicting expectations among stakeholders.

Following stakeholder theory, firms' poverty alleviation campaign may sever as a signal that firms focus on social harmony and long-term orientation, which alleviate information asymmetries with stakeholders and establish extensive and in-depth relationships with them (Ko et al., 2020), and hence, help firms extract the resources from the network of relationships (Flammer, 2013). The relationship based on reciprocity and mutual trust will encourage stakeholders to provide firm crucial resources in turn facilitating the development of firm innovation (Wu et al., 2020). For example, Deng et al. (2013) argue that higher CSR firms tend to have a stronger reputation for delivering on commitments related to implicit contracts (e.g. improve employee welfare, protect community environment and continued service to customers), and firms' external stakeholders are likely to have stronger incentives to contribute resources and effort to the firm and accept less favourable explicit contracts (e.g. provide more commercial loans and lower loan interest rate). Therefore, the

stakeholders of the firms with poverty alleviation campaign are more likely to contribute to long-term corporate efficiency and earnings such as firm innovation (Ferrell et al., 2016).

In addition, firms' poverty alleviation campaign can build good relationships with the government to obtain access to critical resources related to innovation activities. One key characteristic of the poverty alleviation campaign is that it was initiated by the Chinese central government, engaging in poverty alleviation campaign can send a signal that firms can follow orders from the central government to fulfil the political commitment to eliminate poverty. Prior literature indicates that firms can build up political connections and maintain goodwill with the government by increasing their CSR practices (Muttakin et al., 2018; Shirodkar et al., 2018), thereby obtaining competitive advantages such as easier access to bank loans (Claessens et al., 2008), obtain greater tax preference and financial subsidy, and relaxed government oversight (Wu et al., 2012). Meanwhile, a good relationship between firms and government can provide the advantages of legality, patent approval convenience, and intellectual property protection for the firm's innovation projects, thus improving the performance of firms' technological innovation (Zhang & Guo, 2019). Based on the above discussions, we propose the following hypotheses:

H1: Firms engaging in poverty alleviation campaign have better innovation performance.

2.3. Moderating effects of internet search volume

We next discuss the effect of internet search volume on the relationship between firms' poverty alleviation campaign and firm innovation campaign. In recent years, internet attention has gradually become a new force that exerts public influence on listed firms, which played an important role in external corporate governance. Antweiler and Frank (2004) pointed out that the internet has changed the way of investors access and transmit information. Investors can search and compare information comprehensively through the internet before making investment decisions, thus the internet has played an increasingly key role in the financial market.

Further, internet engine search volume represents, to a certain extent, the internet attention received by listed firms. A wide range of stakeholders, including external stakeholders (e.g. investors and creditors) and internal stakeholders (e.g. employees and managers), use the internet engine to access information about listed firms. Drake et al. (2012) proposed that the internet is a channel for disseminating public information to investors, and internet search is one of the important ways for investors to express their demand for public information. The search engine is the main tool for stakeholders to obtain information about listed firms through the internet, and a higher internet search volume indicates the more attention the listed firms receive from stakeholders. Firms with high internet attention are more likely to receive a positive response from stakeholders for firms' poverty alleviation campaign (Flammer, 2013), and the value of poverty alleviation campaign to the firm seeking to improve innovation performance is amplified. Specifically, firms with a higher internet search volume can acquire more attention from stakeholders and amplify the signal transmission effect of firms' poverty alleviation campaign, facilitating the

establishment of mutual trust relationships between firms and stakeholders, and therefore to be more attractive to stakeholders to provide firms with key resources related to innovation. For instance, Wu et al. (2020) find that higher attention suggests that investors can timely respond to the firm's CSR activities and judge the value of the activities, and therefore firms are more likely to realize capital gains from investors. It then follows that firm innovation is more likely to benefit more from firms' poverty alleviation campaign for firms with higher internet search volume.

H2: Firms' internet search **volume** strengthens the positive effect of firm's poverty alleviation campaign on firm innovation.

3. Research design, data and sample

3.1. Research design

3.1.1. Model

To examine the relationships among firms' poverty alleviation campaign, internet search volume, and firm innovation, we estimated the following model using multi-variable OLS regression:

$$\begin{aligned} \text{Firm innovation}_{i,t} = & \beta_0 + \beta_1 \text{FPAC}_{i,t} + \alpha \text{Control}_{i,t} + \beta_1 \text{IndustryDummy} \\ & + \beta_y \text{YearDummy} + \varepsilon \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Firm innovation}_{i,t} = & \beta_0 + \beta_1 \text{FPAC}_{i,t} + \beta_2 \text{Search}_{i,t} + \beta_3 \text{Search}_{i,t} \times \text{FPAC}_{i,t} \\ & + \alpha \text{Control}_{i,t} + \beta_1 \text{IndustryDummy} + \beta_y \text{YearDummy} + \varepsilon \end{aligned} \quad (2)$$

Here, i and t represent the firm and time subscale indicators, respectively. In particular, Hypothesis 1 from Model (1) predicts that the coefficient of β_1 is significantly positive and Hypothesis 2 from Model (2) predicts that the coefficient of β_2 is significantly positive. where Firm innovation is firm innovation performance. FPAC captures a firm's engagement in and contributions to the poverty alleviation campaign. CONTROL indexes control variables. IndustryDummy and YearDummy represent industry and year fixed effects. The specific indicators are defined as follows:

3.1.2. Dependent variable

Following Chang et al. (2021) and Zhang et al. (2016) and Zheng et al. (2018), we use the number of patent applications as the first proxy variable for firm innovation performance. Because the distribution of patent applications deviates from normality, we take the natural logarithm of 1 plus patent applications, denoted as $\text{LN}(1 + \text{Patent_apply})$. We use the natural logarithm of 1 plus the total number of patents eventually granted as the second proxy variable for firm innovation performance, denoted as $\text{LN}(1 + \text{Patent_grant})$. Since firms' poverty alleviation campaign can attract stakeholders to contribute resources to the firm in the long term, it may take time to obtain better outputs. Hence, we adopt a firm's innovation performance in

year $t + 1$ and $t + 2$ to examine the effect of firms' poverty alleviation campaign on innovation performance in the long term.

3.1.3. Independent variables

Following Chang et al. (2021), we use FPAC to captures a firms' engagement in and contributions to the poverty alleviation campaign. Specifically, we define FPAC_dum as dummy variables. If firms engage in the poverty alleviation campaign in that year, FPAC_dum is equal to 1, and 0 otherwise. As the main form of contributing to the poverty alleviation campaign is capital investment, we take the natural logarithm of the amount invested in poverty alleviation campaign (denoted as FPAC_money) as a proxy variable for a firms' contributions to the campaign.

3.1.4. Moderating variable

We use the natural logarithm of one plus the firms' information search volume on the search engine in year t as a proxy variable for internet search volume, denoted as Search. the data of firms' information search volume on the search engine were from the China Research Data Service Platform (CNRDS) that contains data on the search volume of Chinese listed companies on major search engines.

3.1.5. Control variables

Following previous studies (Chang et al., 2021; Yuan & Wen, 2018), we controlled several factors that may affect firm innovation. Firm size (Size) was measured as the log of total assets, firm age (Age) was measured as the log of corporate IPO year, firm profitability (Roa) was measured as the ratio of earnings to total assets, firm cash holdings (Cash) was measured as the ratio of cash holdings to total assets, leverage (Lev) was measured as the ratio of total debt to total assets, Expense was defined as the ratio of administrative expense to operating income, Fix was defined as the ratio of fixed assets to total assets, Top was defined as the proportion of the largest shareholder's shareholding, Indrate was defined as the ratio of independent directors, Duality was defined whether the chairman is also the CEO. Soe was defined whether the firm is a state-owned enterprise. Detailed definitions of all variables are provided in [Appendix A](#).

3.2. Sample and data collection

We used a sample of A-share firms listed on the Shanghai and Shenzhen Stock Exchanges between 2016 and 2019. The sampling period starts in 2016, as the first year in which listed firms were required by the stock exchanges to disclose information about their contributions to the poverty alleviation campaign. Firms' poverty alleviation campaign, the amount invested in poverty alleviation campaign, ownership, corporate governance, and financial variables are taken from the China Securities Market and Accounting Research (CSMAR) database. Patents and internet search volume variables are taken from the China Research Data Service Platform (CNRDS) database. In line with common practice, we excluded firms in the financial industry owing to their unique disclosure requirements and accounting rules. We

Table 1. Year distributions of firm's poverty alleviation campaign.

	N	Number of Events	Percentage of Total Number of Firms (%)
2016	2526	447	17.70
2017	2755	668	24.25
2018	2612	794	30.40
2019	2620	856	32.67

Note: The above table reports the year distribution for Chinese listed firms engage in poverty alleviation campaign. Source: generated by Stata software according to authors' collected data.

Table 2. Industry distributions of firm's poverty alleviation campaign.

Industry	Number	Percentage of Total Events (%)	Percentage of total number of firms in the industry (%)
A. Agriculture, Forestry, Animal Husbandry, and Fishery	62	2.24	49.60
B. Mining	114	4.12	46.91
C. Manufacturing	1641	59.35	23.69
D. Electricity, Gas and Water	172	6.22	52.92
E. Construction	108	3.91	33.64
F. Wholesale and Resale Trade	157	5.67	33.9
G. Transportation	127	4.59	42.33
H. Accommodation and Catering	4	0.14	14.81
I. Information transmission and Technical services	114	4.12	14.82
K. Real Estate	101	3.65	30.06
L. Leasing and Business services	24	0.87	16.44
M. Scientific research and Technical services	13	0.47	10.16
N. Water conservancy, Environment and Public facilities	45	1.63	31.69
Q. Health and Social work	13	0.47	44.83
R. Culture, Sports and Entertainment	65	2.35	40.12
S. Comprehensive	6	0.22	10.91

Note: The above table reports the industry distribution for Chinese listed firms engage in poverty alleviation campaign.

Source: generated by Stata software according to authors' collected data.

further exclude firms designated as financially distressed by the regulatory authorities^[6]. Observations with missing values for the variables employed in the regressions are also excluded. Thus, we obtained 10531 firm-year observations representing 3140 unique firms.

3.3. Descriptive statistics

Table 1 reports the year distribution for Chinese listed firms engage in poverty alleviation campaign, which shows that the number of listed firms engage in poverty alleviation campaign is rising across years, changing from 447 listed firms in 2016 to 856 listed firms in 2019.

Table 2 reports the industry distribution. About 52.92% of the firms in the Electricity, Gas and Water sector adopt poverty alleviation campaign, with Agriculture, Forestry, Animal Husbandry, and Fishery industry comes second, and Mining industry comes third. Three industries are all sensitive to CSR and are susceptible to public attention.

Table 3 reports the descriptive statistics of our key variables. The mean (standard deviation) of patent application $\text{LN}(1 + \text{Patent_apply})$ is 1.849 (1.559), suggesting that the number of patent applications varies dramatically among firms. Similarly, the mean (standard deviation) of patent eventually granted $\text{LN}(1 + \text{Patent_grant})$ is

Table 3. Descriptive statistics.

variables	N	Mean	Median	S.D	Min	Max
LN(1 + Patent_apply)	10513	1.849	1.792	1.559	0.000	8.663
LN(1 + Patent_grant)	10513	1.267	1.099	1.301	0.000	7.759
FPAC_dum	10513	0.263	0	0.440	0.000	1.000
FPAC_money	10513	10.286	0	11.442	0.000	22.883
Search	10513	12.519	12.494	0.910	0	17.293
Age	10513	2.127	2.197	0.881	0.000	3.401
PAC	10513	0.263	0	0.440	0.000	1.000
PAO	10513	1.076	0	2.232	0.000	13.673
Size	10513	22.350	22.198	1.329	17.545	28.636
Roa	10513	0.051	0.041	0.040	0.001	0.195
Lev	10513	0.409	0.400	0.196	0.008	0.996
Mange	10513	0.107	0.090	0.099	0.001	3.876
Cash	10513	0.174	0.143	0.120	0.001	0.891
Duality	10513	0.287	0	0.453	0.000	1.000
Dndrate	10513	0.377	0.364	0.056	0.231	0.800
Fix	10513	0.202	0.166	0.158	0.001	0.954
Top	10513	0.34.01	0.3193	0.1468	0.3003	0.89093
Soe	10513	0.317	0	0.465	0.000	1.000

Note: The above table reports the descriptive statistics for our variables. All variables are defined in [Appendix A](#).
Source: generated by Stata software according to authors' collected data.

1.267 (1.099), suggesting that the number of patent eventually granted varies dramatically among firms. The mean of FPAC_dum is 0.263, suggesting that about 26% of the N in our sample participate in poverty alleviation campaign.

3.4. Correlation analysis

Table 4 presents the Pearson correlation matrix for our key variables. The main dependent variables LN(1 + Patent_apply) and LN(1 + Patent_grant) are significantly positively correlated with FPAC_dum and FPAC_money, which tentatively validates H1 in that a positive relation exists between corporate innovation and firm's poverty alleviation campaign. We find that Search Size, Lev, Age and are significantly positively correlated with LN(1 + Patent_apply) and LN(1 + Patent_grant). We also find that Fix, Cash, and Duality are significantly negatively correlated with LN(1 + Patent_apply) and LN(1 + Patent_grant). In addition, we did not observe serious concerns of multicollinearity among the control variables.

4. Empirical results

4.1. Multivariate regression analysis

Table 5 presents the results of OLS estimations for the relationship between firms' poverty alleviation campaign and firm innovation performance. As shown in column (1) and column (2), firms' poverty alleviation campaign had a positive and significant relationship with firm innovation performance ($\beta = .163$ at $p < .01$), and the amount invested of firms' poverty alleviation campaign also had a positive and significant relationship with firm innovation performance ($\beta = .029$ at $p < .01$), which provided strong support for Hypothesis 1. In column 3, the interaction term between firms' poverty alleviation campaign and firm internet search volume was included and its coefficient was positive and significant ($\beta = .098$ at $p < .01$), and in column 4, the interaction term between the



Table 4. Pearson correlation matrix.

Variables	LN(1 + Patent_ apply)	LN(1 + Patent_ grant)	FPAC_ dum	FPAC_ money	Search	Size	Roa	Lev	Age	Fix	Cash	Manage	Duality	Indrate	Top	Soe
LN(1 + Patent_ apply)	1															
LN(1 + Patent_ grant)	0.787***	1														
FPAC_dum	0.110***	0.117***	1													
FPAC_money	0.141***	0.142***	0.807***	1												
Search	0.186***	0.212***	0.133***	0.175***	1											
Size	0.345***	0.344***	0.320***	0.399***	0.406***	1										
Roa	0.014	-0.003	-0.012	-0.005	-0.052***	-0.124***	1									
Lev	0.124***	0.113***	0.156***	0.179***	0.174***	0.529***	-0.387***	1								
Age	0.036***	0.071***	0.173***	0.158***	0.296***	0.416***	-0.243***	0.312***	1							
Fix	-0.035***	-0.032***	0.154***	0.157***	0.046***	0.115***	-0.061***	0.053***	0.103***	1						
Cash	-0.051***	-0.038***	-0.058***	-0.056***	-0.062***	-0.195***	0.244***	-0.257***	-0.158***	-0.297***	1					
Manage	-0.005	0.014	-0.110***	-0.120***	-0.055***	-0.308***	0.01	-0.244***	-0.089***	-0.137***	0.119***	1				
Duality	-0.036***	-0.047***	-0.091***	-0.088***	-0.099***	-0.191***	0.087***	-0.134***	-0.244***	-0.082***	0.067***	0.091***	1			
Indrate	0.006	0.023**	-0.00300	0.025**	0.025***	0.006	-0.009	-0.001	-0.024**	-0.039***	0.013	0.042***	0.117***	1		
Top	0.001	0.017*	0.113***	0.122***	0.00300	0.200***	0.107***	0.062***	-0.087***	0.093***	0.046***	-0.150***	-0.029***	0.055***	1	
Soe	0.045***	0.069***	0.258**	0.230***	0.173***	0.350***	-0.163***	0.252***	0.408***	0.194***	-0.030***	-0.121***	-0.287***	-0.038***	0.233***	1

Note: The above table reports the Pearson correlation matrix of the key variables used in our paper. All variables are defined in Appendix A. * $p < .10$; ** $p < .05$; *** $p < .01$. Source: generated by Stata software according to authors' collected data.

Table 5. Firm's poverty alleviation campaign and firm innovation.

Variables	LN(1 + Patent_apply)				LN(1 + Patent_grant)			
	(1)	(2)	(3)	(4)	(5)	(8)	(7)	(8)
FPAC_dum	0.163*** (5.495)		0.149*** (5.075)		0.148*** (5.771)		0.132*** (5.229)	
FPAC_money		0.029*** (4.714)		0.022*** (3.491)		0.024*** (4.414)		0.016*** (2.985)
Search			0.039** (2.053)	0.051*** (2.862)			0.074*** (4.849)	0.083*** (5.819)
FPAC_dum* Search			0.098*** (3.181)				0.091*** (3.194)	
FPAC_moeny* Search				0.017** (2.519)				0.018*** (2.810)
Size	0.636*** (47.184)	0.632*** (45.469)	0.613*** (43.466)	0.608*** (41.904)	0.517*** (41.653)	0.514*** (40.206)	0.484*** (38.406)	0.481*** (36.921)
Roa	1.268*** (3.636)	1.273*** (3.647)	1.239*** (3.554)	1.244*** (3.567)	0.281 (0.963)	0.288 (0.988)	0.232 (0.799)	0.241 (0.829)
Lev	-0.130 (-1.620)	-0.125 (-1.562)	-0.108 (-1.349)	-0.102 (-1.269)	-0.253*** (-3.690)	-0.249*** (-3.630)	-0.226*** (-3.300)	-0.219*** (-3.191)
Age	-0.076*** (-4.487)	-0.073*** (-4.341)	-0.086*** (-5.038)	-0.083*** (-4.862)	-0.020 (-1.462)	-0.019 (-1.323)	-0.037*** (-2.634)	-0.035** (-2.447)
Fix	-0.895*** (-9.258)	-0.899*** (-9.287)	-0.899*** (-9.291)	-0.905*** (-9.339)	-0.678*** (-8.426)	-0.678*** (-8.411)	-0.684*** (-8.490)	-0.686*** (-8.492)
Cash	-0.038 (-0.349)	-0.046 (-0.415)	-0.039 (-0.353)	-0.051 (-0.467)	0.105 (1.142)	0.100 (1.083)	0.106 (1.162)	0.096 (1.040)
Manage	1.111*** (4.723)	1.106*** (4.708)	1.080*** (4.664)	1.071*** (4.632)	1.143*** (5.289)	1.140*** (5.268)	1.096*** (5.208)	1.088*** (5.171)
Duality	-0.017 (-0.616)	-0.017 (-0.607)	-0.018 (-0.651)	-0.016 (-0.595)	-0.035 (-1.491)	-0.035 (-1.479)	-0.035 (-1.516)	-0.034 (-1.454)
Indrate	-0.261 (-1.177)	-0.289 (-1.302)	-0.321 (-1.443)	-0.358 (-1.600)	0.198 (1.025)	0.174 (0.900)	0.126 (0.651)	0.089 (0.458)
Top	-0.003*** (-3.328)	-0.003*** (-3.284)	-0.003*** (-3.112)	-0.003*** (-3.033)	-0.001 (-0.668)	-0.000 (-0.620)	-0.000 (-0.282)	-0.000 (-0.190)
Soe	0.107*** (3.385)	0.116*** (3.722)	0.106*** (3.376)	0.117*** (3.765)	0.126*** (4.695)	0.136*** (5.092)	0.125*** (4.696)	0.137*** (5.159)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-12.123*** (-33.286)	-12.023*** (-32.307)	-12.075*** (-29.521)	-12.117*** (-29.615)	-10.272*** (-31.714)	-10.214*** (-30.801)	-10.457*** (-29.283)	-10.498*** (-28.927)
Observations	10513	10513	10513	10513	10513	10513	10513	10513
R ²	0.423	0.422	0.424	0.424	0.400	0.399	0.404	0.403
Adjust_R ²	0.419	0.419	0.421	0.420	0.396	0.396	0.400	0.400
F	123.6	124.4	122.3	122.8	95.41	95.96	95.20	95.73

Note: The above table reports the regression results for our hypotheses. Variables are defined in Appendix A. The results are from OLS regression. The *t*-statistics are reported in parentheses. **p* < .10; ***p* < .05; ****p* < .01.

Source: generated by Stata software according to authors' collected data.

amount invested of firms' poverty alleviation campaign and firm internet search volume was included and its coefficient was positive and significant ($\beta = .017$ at $p < .05$), which was consistent with Hypothesis 2. To achieve a more reliable conclusion, we use patents eventually granted to measure firm innovation performance. The regression results of columns (5)–(8) are consistent with the above-mentioned benchmark regression results, which proves that our research conclusions have good robustness.

4.2. Sustained CSR and innovation performance

To explore the impact of firms' poverty alleviation campaign on firm innovation performance in the long term, we use $T + 1$ and $T + 2$ periods of firm innovation as the

Table 6. Results of Lagging effect regression firm innovation.**Panel A.** Lag one period of firm innovation

Variables	LN(1 + Patent_apply) _{t-1}				LN(1 + Patent_grant) _{t-1}			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FPAC_dum	0.148*** (3.977)		0.134*** (3.645)		0.131*** (4.038)		0.114*** (3.542)	
FPAC_money		0.026*** (3.413)		0.020*** (2.639)		0.020*** (2.961)		0.014** (2.087)
Search			0.034 (1.587)	0.040* (1.867)			0.058*** (3.178)	0.066*** (3.569)
FPAC_dum* Search			0.119** (2.561)				0.136*** (3.154)	
FPAC_moeny* Search				0.015* (1.863)				0.016* (1.877)
Size	0.636*** (37.343)	0.632*** (36.232)	0.611*** (32.970)	0.612*** (32.710)	0.542*** (34.143)	0.541*** (33.097)	0.508*** (30.628)	0.512*** (30.053)
Roa	2.068*** (4.713)	2.081*** (4.735)	2.035*** (4.632)	2.055*** (4.672)	0.859** (2.271)	0.875** (2.310)	0.806** (2.131)	0.828** (2.185)
Lev	0.050 (0.453)	0.057 (0.516)	0.080 (0.715)	0.082 (0.735)	-0.168* (-1.785)	-0.163* (-1.721)	-0.131 (-1.382)	-0.132 (-1.395)
Age	-0.070*** (-3.546)	-0.067*** (-3.412)	-0.075*** (-3.757)	-0.073*** (-3.631)	-0.028 (-1.644)	-0.026 (-1.527)	-0.037** (-2.169)	-0.036** (-2.090)
Fix	-0.984*** (-8.291)	-0.987*** (-8.321)	-0.994*** (-8.375)	-0.998*** (-8.403)	-0.833*** (-8.193)	-0.832*** (-8.173)	-0.847*** (-8.296)	-0.846*** (-8.284)
cash	-0.111 (-0.823)	-0.117 (-0.867)	-0.117 (-0.868)	-0.123 (-0.908)	-0.012 (-0.108)	-0.016 (-0.139)	-0.017 (-0.147)	-0.018 (-0.157)
Manage	1.459*** (3.820)	1.459*** (3.819)	1.429*** (3.759)	1.427*** (3.753)	1.599*** (5.302)	1.601*** (5.297)	1.553*** (5.195)	1.552*** (5.186)
Duality	-0.029 (-0.832)	-0.028 (-0.806)	-0.029 (-0.844)	-0.027 (-0.794)	-0.020 (-0.684)	-0.019 (-0.655)	-0.020 (-0.693)	-0.019 (-0.634)
Indrate	-0.287 (-1.058)	-0.314 (-1.155)	-0.340 (-1.248)	-0.369 (-1.349)	0.373 (1.571)	0.353 (1.483)	0.307 (1.288)	0.289 (1.207)
Top	-0.003*** (-2.808)	-0.003*** (-2.780)	-0.003*** (-2.664)	-0.003*** (-2.656)	-0.000 (-0.444)	-0.000 (-0.420)	-0.000 (-0.200)	-0.000 (-0.213)
Soe	0.107*** (2.719)	0.116*** (2.970)	0.107*** (2.732)	0.118*** (3.018)	0.136*** (4.059)	0.145*** (4.358)	0.137*** (4.092)	0.147*** (4.435)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-12.030*** (-25.872)	-11.957*** (-25.256)	-11.891*** (-22.938)	-11.985*** (-23.055)	-10.943*** (-26.004)	-10.919*** (-25.398)	-10.902*** (-23.674)	-11.104*** (-23.582)
Observations	6979	6979	6979	6979	6979	6979	6979	6979
R ²	0.420	0.420	0.421	0.421	0.406	0.406	0.409	0.408
Adjust_R ²	0.415	0.415	0.416	0.416	0.401	0.401	0.404	0.403
F	84.67	85.00	83.92	83.68	68.52	68.90	68.33	68.07

Panel B. Lag two periods of firm innovation

Variables	LN(1 + Patent_apply) _{t+2}				LN(1 + Patent_grant) _{t+2}			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FPAC_dum	0.164*** (3.413)		0.153*** (3.211)		0.139*** (3.217)		0.121*** (2.820)	
FPAC_money		0.027*** (2.713)		0.021** (2.136)		0.023*** (2.593)		0.016* (1.833)
Search			0.013 (0.396)	0.021 (0.673)			0.035 (1.408)	0.051** (1.993)
FPAC_dum* Search			0.132** (2.133)				0.199*** (3.308)	
FPAC_moeny* Search				0.018* (1.660)				0.022* (1.891)
Size	0.627*** (30.319)	0.625*** (29.457)	0.608*** (26.675)	0.609*** (26.530)	0.540*** (26.346)	0.538*** (25.724)	0.505*** (23.480)	0.511*** (23.347)
Roa	2.511***	2.523***	2.512***	2.522***	1.750***	1.759***	1.742***	1.744***

(continued)

Table 6. Continued.**Panel B.** Lag two periods of firm innovation

Variables	LN(1 + Patent_apply) _{t+2}				LN(1 + Patent_grant) _{t+2}			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lev	(4.515)	(4.529)	(4.508)	(4.521)	(3.582)	(3.597)	(3.562)	(3.560)
	-0.098	-0.091	-0.072	-0.069	-0.154	-0.148	-0.112	-0.116
	(-0.743)	(-0.692)	(-0.545)	(-0.517)	(-1.312)	(-1.263)	(-0.951)	(-0.980)
Age	-0.076***	-0.072***	-0.076***	-0.075***	-0.017	-0.015	-0.021	-0.021
	(-3.153)	(-3.024)	(-3.147)	(-3.070)	(-0.833)	(-0.699)	(-0.980)	(-0.974)
Fix	-0.864***	-0.865***	-0.865***	-0.868***	-0.843***	-0.846***	-0.845***	-0.849***
	(-5.808)	(-5.810)	(-5.820)	(-5.831)	(-6.604)	(-6.611)	(-6.585)	(-6.608)
cash	-0.066	-0.071	-0.072	-0.076	-0.032	-0.037	-0.038	-0.038
	(-0.392)	(-0.420)	(-0.428)	(-0.449)	(-0.224)	(-0.254)	(-0.262)	(-0.259)
Manage	0.955**	0.949**	0.941**	0.931**	1.351***	1.345***	1.320***	1.309***
	(2.497)	(2.476)	(2.461)	(2.431)	(4.052)	(4.026)	(3.953)	(3.923)
Duality	-0.027	-0.027	-0.027	-0.027	0.026	0.026	0.025	0.026
	(-0.637)	(-0.626)	(-0.643)	(-0.626)	(0.689)	(0.697)	(0.678)	(0.693)
Indrate	-0.041	-0.067	-0.092	-0.109	0.428	0.404	0.348	0.350
	(-0.120)	(-0.197)	(-0.271)	(-0.321)	(1.417)	(1.339)	(1.152)	(1.156)
Top	-0.004***	-0.004***	-0.004***	-0.004***	-0.001	-0.001	-0.001	-0.001
	(-2.812)	(-2.813)	(-2.722)	(-2.745)	(-0.929)	(-0.929)	(-0.746)	(-0.795)
Soe	0.147***	0.155***	0.148***	0.157***	0.148***	0.154***	0.149***	0.156***
	(3.009)	(3.187)	(3.029)	(3.218)	(3.371)	(3.533)	(3.411)	(3.579)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-11.411***	-11.370***	-11.129***	-11.273***	-10.553***	-10.508***	-10.227***	-10.538***
	(-20.196)	(-19.730)	(-17.188)	(-17.536)	(-20.146)	(-19.712)	(-17.503)	(-17.849)
Observations	4428	4428	4428	4428	4428	4428	4428	4428
R ²	0.419	0.418	0.420	0.419	0.400	0.399	0.403	0.401
Adjust_R ²	0.411	0.411	0.412	0.411	0.392	0.392	0.395	0.393
F	57.41	57.57	56.57	56.52	44.68	44.82	44.53	43.95

Note: The above table reports the results of the sustained effect of firms' poverty alleviation campaign on innovation performance. LN(1 + Patent_apply + 1) and LN(1 + Patent_grant + 1), LN(1 + Patent_apply + 2) and LN(1 + Patent_grant + 2) denote the natural logarithm of one plus the firm's total number of patent applications and the firm's total number of patents eventually granted in year t + 1 and t + 2, respectively. Other Variables are defined in Appendix A. The results are from OLS regression. The t-statistics are reported in parentheses. *p < .10; **p < .05; ***p < .01.

Source: generated by Stata software according to authors' collected data.

dependent variable in Table 6, respectively. Again, the coefficients of firms' poverty alleviation campaign are significantly positive in both cases, and the corresponding values are .148 and .164, suggesting that innovation of firms with poverty alleviation campaign is 14.8% raise in year t + 1 and 16.4% raise in year t + 2. Furthermore, we find that the interaction terms between FPAC_dum and Search, FPAC_money and Search are still positively significant for LN(1 + Patent_apply)_{t+1} and LN(1 + Patent_apply)_{t+2}, suggesting that the moderating effect of internet search on the relationship between firms' poverty alleviation campaign and firm innovation performance is a long-term existence. When we use LN(1 + Patent_grant)_{t+1} and LN(1 + Patent_grant)_{t+2} as the dependent variables, the regression results are consistent with the above-mentioned regression results, which proves that our research conclusions have good robustness.

4.3. Endogeneity

the relationship between firms' poverty alleviation campaign on firm innovation performance may encounter some endogenous problems. For example, the causal

relationship between firms' engagement in CSR activities and firm performance is difficult to identify, and research on the relationship between firms' poverty alleviation campaign and firm innovation performance is susceptible to reverse causation. In addition, some common factors (or omitted variables) that determine firm engage in poverty alleviation campaign and firm innovation simultaneously may exist, leading to the self-selection of samples in our research. We use the difference-in-differences model (DID) to address potential reverse causal endogeneity concerns, and use the propensity score matching (PSM) method to solve self-selection of our samples. We discuss these analyses in detail below.

4.3.1. *Difference-in-differences model*

To better establish the causal relationship between firms' poverty alleviation campaign and firm performance innovation to mitigate the biased estimation caused by missing variables that simultaneously influence firms with and without engagement in poverty alleviation campaign, we followed previous studies (Jiang et al., 2019) and employed a staggered DID method to estimate the difference in CSR before and after engage in poverty alleviation campaign. Specifically, we used the firms that engage in poverty alleviation campaign and the firms that never engage in poverty alleviation campaign during the entire sample period for the DID model test. Firms with poverty alleviation campaign were included in the 'treatment group' ($TREAT = 1$), and we identified a 'control group' ($TREAT = 0$) of firms without engagement in poverty alleviation campaign for the entire sample period. The DID model is expressed as follows:

$$\begin{aligned} \text{Firm innovation}_{i,t} = & \beta_0 + \beta_1 AFTER_{i,t} * TREAT_{i,t} + \beta_2 TREAT_{i,t} \\ & + \alpha CONTROL_{i,t} + \varepsilon_i \end{aligned} \quad (3)$$

Here, *AFTER* is an indicator for the period after engaged in poverty alleviation campaign, which equals 1 if firm *i* engages in poverty alleviation campaign in year *t*; otherwise, 0. Thus, the interaction of *AFTER* and *TREAT* (*AFTER***TREAT*) measures the absolute effect of firms' poverty alleviation campaign on firm innovation^[7]. Further, *CONTROL* is the control variables that is the same as in the main regression. We also included annual and industry dummy variables to control for the effects of time trend factors, such as macro policies and industry factors. β_1 measures the difference in firm innovation performance before and after the firms' engagement in poverty alleviation campaign. The results are reported in Table 7. The coefficients of *AFTER***TREAT* are significantly positive for $LN(1 + Patent_apply)$ and $LN(1 + Patent_grant)$, suggesting that firm innovation performance can significantly increase for firms with poverty alleviation campaign. In summary, the results suggest a positive causal effect of firms' poverty alleviation campaign on firm innovation performance.

4.3.2. *Propensity score matching*

A firm's choice of poverty alleviation campaign may not be random, but rather determined by certain firm characteristic factors. To mitigate concerns about sample selection bias, we adopted PSM to compare the difference of firm innovation in firms

Table 7. Endogeneity test.

Variables	DID				PSM			
	LN(1 + Patent_apply)	LN(1 + Patent_grant)	LN(1 + Patent_apply)	LN(1 + Patent_grant)	LN(1 + Patent_apply)	LN(1 + Patent_grant)	LN(1 + Patent_apply)	LN(1 + Patent_grant)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AFTER	0.072** (2.015)	0.072** (2.016)	0.083*** (2.627)	0.082*** (2.614)				
Treated	0.176*** (4.358)	0.152*** (3.735)	0.126*** (3.536)	0.099*** (2.750)				
FPAC_dum					0.179*** (5.750)	0.139*** (3.708)	0.152*** (5.673)	0.138*** (5.246)
Search		0.042** (2.180)		0.076*** (4.935)		0.148*** (4.657)		0.097*** (4.500)
AFTER*Search		0.080*** (2.599)		0.080*** (2.793)				
FPAC_dum*Search						0.087* (1.734)		0.056* (1.788)
Size	0.631*** (46.836)	0.610*** (43.326)	0.513*** (41.393)	0.482*** (38.319)	0.640*** (37.660)	0.499*** (21.764)	0.540*** (34.903)	0.501*** (31.819)
RoA	1.256*** (3.616)	1.228*** (3.536)	0.272 (0.936)	0.225 (0.777)	1.093** (2.514)	0.889* (1.772)	-0.192 (-0.527)	-0.263 (-0.725)
Lev	-0.132* (-1.659)	-0.112 (-1.409)	-0.255*** (-3.723)	-0.229*** (-3.347)	-0.175* (-1.664)	-0.402*** (-3.159)	-0.346*** (-3.802)	-0.312*** (-3.421)
Age	-0.082*** (-4.844)	-0.091*** (-5.334)	-0.025* (-1.774)	-0.041*** (-2.868)	-0.064*** (-2.954)	-0.228*** (-8.967)	-0.018 (-0.971)	-0.037** (-2.011)
Fix	-0.906*** (-9.347)	-0.908*** (-9.367)	-0.686*** (-8.504)	-0.690*** (-8.550)	-1.154*** (-10.086)	-0.943*** (-7.798)	-0.851*** (-8.952)	-0.859*** (-9.051)
Cash	-0.039 (-0.359)	-0.039 (-0.357)	0.105 (1.135)	0.106 (1.160)	-0.113 (-0.798)	-0.172 (-1.025)	0.106 (0.870)	0.104 (0.860)
Manage	1.099*** (4.720)	1.071*** (4.660)	1.135*** (5.289)	1.090*** (5.206)	0.898*** (3.249)	1.486*** (2.632)	0.998*** (3.742)	0.948*** (3.665)
Duality	-0.016 (-0.578)	-0.017 (-0.608)	-0.034 (-1.460)	-0.034 (-1.483)	0.016 (0.450)	0.038 (0.883)	-0.034 (-1.099)	-0.035 (-1.142)
Indrate	-0.283 (-1.277)	-0.333 (-1.499)	0.182 (0.942)	0.117 (0.609)	-0.178 (-0.653)	0.147 (0.456)	0.367 (1.516)	0.288 (1.190)
Top	-0.003*** (-3.287)	-0.003*** (-3.086)	-0.000 (-0.632)	-0.000 (-0.262)	-0.003*** (-2.956)	-0.008*** (-6.174)	-0.001 (-1.174)	-0.001 (-0.762)
Soe	0.103*** (3.271)	0.103*** (3.280)	0.123*** (4.599)	0.123*** (4.623)	0.103*** (2.819)	-0.053 (-1.194)	0.128*** (4.081)	0.126*** (4.033)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-11.972*** (-32.839)	-12.013*** (-29.410)	-10.164*** (-31.384)	-10.417*** (-29.226)	-11.899*** (-23.121)	-10.363*** (-17.951)	-10.356*** (-22.434)	-10.687*** (-21.293)
Observations	10513	10513	10513	10513	6919	6919	6919	6919
R ²	0.424	0.425	0.401	0.404	0.450	0.194	0.432	0.437
Adjst_R ²	0.420	0.422	0.397	0.401	0.446	0.190	0.427	0.432
F	122.3	120.7	94.24	93.84	103.4	37.56	79.90	79.43

Note: The above table reports the regression results of endogenous test. Variables are defined in Appendix. The results of panel A are from Difference-in-difference model and the results of panel B are from PSM model. The t-statistics are reported in parentheses. * $p < .10$; ** $p < .05$; *** $p < .01$.

Source: generated by Stata software according to authors' collected data.

with and without engagement in poverty alleviation campaign that have similar firm characteristics. The matched samples obtained using the method include all of the matchable firms with and without engagement in poverty alleviation campaign. Moreover, no significant difference exists in corporate characteristics between the two types of samples. We started with the set of characteristics used in the main logistic regression, which include all the control variables in our paper, to predict the propensity of a firm to engage in poverty alleviation campaign. Subsequently, we used the predicted probability (propensity score) to match each firm with to those without

engagement in poverty alleviation campaign, where control firms are drawn without replacement. Specifically, we matched samples by using the nearest matching method according to 1:3 ratios without replacement. To satisfy the common support hypothesis, we only retained the samples within the intersection of experimental and control group propensity score values. The results are reported in columns (5)–(8) of [Table 7](#). We continued to find that the coefficients of firms' poverty alleviation campaign are significantly positive for $\text{LN}(1 + \text{Patent_apply})$ and $\text{LN}(1 + \text{Patent_grant})$. In summary, our results are consistent with our previous findings after addressing potential concerns related to sample selection bias.

4.4. Robustness tests

4.4.1. Alternative proxies of firm innovation performance

In this section, we explore whether our results are robust to different measures of firm innovation performance. Following [Ko et al. \(2020\)](#), we use four alternative proxies of firm innovation performance: UTL, UTLG, DES, DESG. UTL is a firm's total number of utility patent applications in year t . UTLG is a firm's total number of utility patent grants in year t . DES is a firm's total number of design patent applications in year t . DESG is a firm's total number of design patent grants in year t . We replace the dependent variable with each of the four proxies and report the estimation results in columns (1)–(4) of [Table 8](#). We find the main estimation results are consistent with our findings in [Table 5](#), suggesting the relationship between firms' poverty alleviation campaign and firm innovation performance are not affected by the way we measure firm innovation performance.

4.4.2. Alternative proxies of firms' contribution to poverty alleviation campaign

We next explore whether our results are robust to different measures of firms' contribution to poverty alleviation campaign. We use the ratio of a firm's amount invested in poverty alleviation campaign to total assets to capture a firm's contributions to the poverty alleviation campaign, denoted as FPAC_AR. By replacing the independent variable of firms' contribution to poverty alleviation, the estimation results reported in columns (5) and (6) of [Table 8](#) are consistent with our findings in [Table 5](#), suggesting the relationship between firms' poverty alleviation campaign and firm innovation performance are not affected by the measure of firms' contribution to poverty alleviation campaign.

4.4.3. Different econometric models

Some firms in our sample had no patent applications or patent grants and may resulting in the zero-inflation problem. To deal with the zero-inflation problem, we run regressions using the Tobit model in column (7)–(10) of [Table 8](#). We find that the estimation results in columns (7)–(10) of [Table 8](#) are consistent with our findings in [Table 5](#), suggesting that the relationship between firms' poverty alleviation campaign and firm innovation performance remains robust after using alternative models.

Table 8. Robustness tests.

variables	(1) LN (1 + UTL)	(2) LN (1 + DES)	(3) LN (1 + UTLG)	(4) LN (1 + DESG)	(5) LN (1 + Patent_ apply)	(6) LN (1 + Patent_ grant)	(7) LN (1 + Patent_ apply)	(8) LN (1 + Patent_ grant)	(9) LN (1 + Patent_ apply)	(10) LN (1 + Patent_ grant)
FPAC_dum	0.128*** (2.890)	0.048* (1.837)	0.136*** (3.168)	0.046* (1.795)	1.026** (2.369)	1.179*** (2.753)	0.161*** (5.596)	0.147*** (6.001)		
FPAC_AR										
FPAC_moeny									0.024*** (3.816)	0.018*** (3.434)
Search	0.018 (0.875)	0.143*** (8.659)	0.031 (1.631)	0.135*** (7.961)	0.072*** (2.909)	0.039** (2.038)	0.065*** (4.275)	0.098*** (7.592)	0.069*** (4.485)	0.102*** (7.867)
FPAC_dum*Search	0.121*** (2.897)	0.094*** (2.655)	0.117*** (2.763)	0.093*** (2.598)			0.099*** (3.419)	0.092*** (3.750)		
FPAC_AR*Search					2.946** (2.336)	4.467*** (4.726)				
FPAC_moeny*Search									0.016*** (2.798)	0.017*** (3.495)
Size	0.557*** (25.900)	0.269*** (21.780)	0.524*** (24.442)	0.255*** (20.787)	0.634*** (29.374)	0.542*** (25.991)	0.615*** (47.412)	0.487*** (44.187)	0.611*** (45.852)	0.484*** (42.759)
Roa	1.054** (1.986)	2.398*** (7.217)	0.395 (0.773)	2.048*** (6.352)	1.163** (2.348)	0.406 (0.791)	1.147*** (3.419)	0.124 (0.434)	1.143*** (3.404)	0.123 (0.432)
Lev	0.312** (2.574)	0.125* (1.909)	0.270** (2.262)	0.121* (1.905)	-0.101 (-0.836)	0.261** (2.176)	-0.095 (-1.194)	-0.211*** (-3.117)	-0.087 (-1.094)	-0.203*** (-2.986)
Age	-0.109*** (-4.247)	-0.049*** (-3.331)	-0.100*** (-4.058)	-0.043*** (-2.947)	-0.070*** (-2.797)	-0.102*** (-4.098)	-0.069*** (-4.252)	-0.018 (-1.279)	-0.064*** (-3.945)	-0.013 (-0.948)
Fix	-0.420*** (-2.615)	-0.966*** (-12.762)	-0.400*** (-2.581)	-0.873*** (-11.825)	-0.829*** (-5.576)	-0.369** (-2.394)	-0.868*** (-9.087)	-0.648*** (-7.982)	-0.870*** (-9.090)	-0.646*** (-7.943)
Cash	-0.348** (-2.240)	0.282*** (2.901)	-0.356** (-2.372)	0.299*** (3.164)	0.026 (0.165)	-0.335** (-2.230)	0.001 (0.007)	0.153* (1.664)	-0.007 (-0.067)	0.147 (1.595)
Manage	0.200 (1.207)	0.208** (2.288)	0.231 (1.429)	0.203** (2.355)	1.086*** (4.219)	0.230 (1.413)	1.084*** (8.252)	1.100*** (9.862)	1.075*** (8.176)	1.092*** (9.780)
Duality	-0.049 (-1.209)	0.105*** (4.126)	-0.038 (-0.973)	0.110*** (4.359)	-0.035 (-0.874)	-0.038 (-0.971)	-0.034 (-1.275)	-0.055** (-2.382)	-0.035 (-1.286)	-0.055** (-2.401)
Indrate	-0.645** (-1.973)	-0.087 (-0.454)	-0.570* (-1.807)	-0.045 (-0.234)	-0.310 (-0.934)	-0.544* (-1.718)	-0.333 (-1.579)	0.111 (0.622)	-0.372* (-1.762)	0.072 (0.401)
Top	-0.000 (-0.040)	0.000 (0.056)	0.000 (0.228)	0.000 (0.127)	-0.002 (-1.367)	0.001 (0.355)	-0.002** (-2.551)	0.001 (0.784)	-0.002** (-2.374)	0.001 (0.994)

(continued)

Table 8. Continued.

variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	LN (1 + UTL)	LN (1 + DES)	LN (1 + UTLG)	LN (1 + DESG)	LN (1 + Patent_ apply)	LN (1 + Patent_ grant)	LN (1 + Patent_ apply)	LN (1 + Patent_ grant)	LN (1 + Patent_ apply)	LN (1 + Patent_ grant)
Soe	0.086*** (3.849)	0.054* (1.827)	0.017 (0.786)	0.086*** (3.015)	0.078*** (3.559)	0.033 (1.532)	0.062* (1.864)	0.001 (0.038)	0.068** (2.058)	0.008 (0.273)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-10.302*** (-18.030)	-7.161*** (-21.896)	-10.039*** (-18.074)	-6.850*** (-21.116)	-12.998*** (-21.943)	-10.555*** (-19.145)	-12.462*** (-38.354)	-10.834*** (-39.248)	-12.417*** (-37.462)	-10.824*** (-38.430)
Observations	10,513	10,513	10,513	10,513	10,513	10,513	10,513	10,513	10,513	10,513
R-squared	0.482	0.258	0.480	0.247	0.421	0.478	0.147	0.153	0.147	0.152

Note: The above table reports the regression results of the robustness test. UTL is a firm's total number of utility patent applications in year *t*. UTLG is a firm's total number of utility patent grants in year *t*. DES is a firm's total number of design patent applications in year *t*. DESG is a firm's total number of design patent grants in year *t*. FPAC_AR is the ratio of a firm's amount invested in poverty alleviation campaign to total assets. Other variables are defined in Appendix A. The results of column (1)–(6) are from OLS model and the results of columns (7)–(10) are from Tobit model. The t-statistics are reported in parentheses. * $p < .10$; ** $p < .05$; *** $p < .01$.

Source: generated by Stata software according to authors' collected data.

5. Discussion

Our study contributes to the literature on factors affecting firm innovation. The association between CSR and firm innovation has received extensive attention (Ko et al., 2020; Santos-Jaén et al., 2021). However, the evidence is still not clear. We investigate the effect of firms' engagement in poverty alleviation campaign initiated by government on firm innovation performance, while the prior literature linking CSR and innovation focus on CSR activities initiated by firms (Bereskin et al., 2016; Mithani, 2017). Our results reveal that firms' poverty alleviation campaign can build good relationships with key stakeholders (especially the government) and attract stakeholders to provide key resources for firms' innovation activities, thus improving firm innovation performance. The above results are consistent with the finding of Bereskin et al. (2016), who argued that CSR can attract stakeholder collaboration and improve firm innovation. Our study also finds that the impact of firms' poverty alleviation campaign on innovation performance is long-term and sustainable. This result is consistent with the finding of Ko et al. (2020), who find that CSR continues to have a positive effect on firm innovation. Our result ties in with the viewpoints based on stakeholder theory and resource dependence theory, which suggests that firms' engagement in poverty alleviation campaign initiated by government successfully develop positive relations with key stakeholders, and these relationships help get access to critical resources related to development. Thus, firms' consideration of its stakeholders' interests has a positive impact on firm innovation performance.

In addition, our study has some critical practical implications for firms' poverty alleviation campaign. This study identifies the contingent effects of internet search volume on the relationships between firms' poverty alleviation campaign and firm innovation. We find that internet search volume strengthens these relationships significantly, suggesting that firms' characteristics play an important role in determining the extent to which it can benefit from firms' poverty alleviation campaign. The above result is in line with the findings of Wu et al. (2020), who suggest that firm visibility positively moderated the relationship between corporate environmental responsibility and firm innovation performance. Our findings delimit the effect of firms' engagement in CSR initiated by government and help paint a complete picture of the relationship between firms' poverty alleviation and firm innovation.

6. Conclusion

In 2016, the Chinese government launched a national campaign of targeted poverty alleviation by 2020, mobilizing the participation of organizations and entities from all sectors of society, including many listed firms. Prior literature reveals that more than 20% of listed firms actively engage in the poverty alleviation campaign, and engaging firms make significant contributions (Chang et al., 2021), which provides us a unique setting to explore the economic consequences of firms' engagement in poverty alleviation campaign. Using a large sample of Chinese A-share listed firms from 2016 to 2019, we examine the effect of firms' poverty alleviation campaign on corporate innovation performance, and whether this effect will be moderated by firms' internet search volume. Our empirical results strongly support firms' poverty alleviation

campaign is positively related to firm innovation performance. In addition, we also find that the effects of firms' poverty alleviation campaign on firm innovation performance are generally stronger for firms with higher internet search volume. Our result consist with the viewpoints based on stakeholder theory and resource dependence theory, which suggests that firms' poverty alleviation campaign contribute to develop positive relations with key stakeholders, and these relationships help get access to critical resources related to development.

This study has some managerial implications. First, our results suggest that managers should devote firm resources to engaging in CSR activities initiated by government, which are an important way to deepen relationships with key stakeholders such as government. we contend that firms' poverty alleviation campaign can help firms gain positive responses from their stakeholders. Thus, firms aiming to improve their innovation performance should voluntarily integrate engagement in CSR activities initiated by government into their strategies and operations and actively make the plans of undertaking social responsibility. Second, managers should know that internet attention is playing an important role in the external governance of firms. Firms with higher internet search volume participating in poverty alleviation are more likely to receive responses from a wide range of stakeholders. Firms that are actively involved in poverty alleviation campaign should try to increase their internet search volume, such as disclosing detailed information on poverty alleviation campaigns so that stakeholders can understand the firm's specific contribution to poverty alleviation and further gain positive responses from them. Moreover, our result has important social implications for governments that aim to reduce poverty around the world as well. In practice, it might be more effective to motivate firms engage in addressing poverty challenges if their contributions can be rewarded with positive publicity.

Although this paper provides some important insights, this paper has several limitations that should be addressed in future research. First, the relationship between firms' poverty alleviation campaign and firm innovation is largely driven by the political structure of China and the dominant role of government in the economy. It is a question whether firms' engagement in government initiated CSR activities in other countries will have positive economic consequences. We thus suggest that future research may examine the effect of firms' engagement in government initiated CSR activities on firm performance under different political structures of country. Second, although we consider that the role of the external stakeholders (eg: government) and internal stakeholders (eg: employee) of firms in the relationship between firms' poverty alleviation campaign and firm innovation performance, our empirical research only focus on the direct effect of firms' poverty alleviation campaign on firm innovation performance. We thus suggest that future research may use mediating factors to explore the effect mechanism of firms' poverty alleviation campaign on firm innovation performance.

Disclosure statement

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Notes

1. The data is provided by the CSMAR database.
2. The idea of targeted poverty alleviation was first raised in 2013 by President Xi Jinping inspect in Hunan Province. On November 23, 2015, the Politburo of the CPC Central Committee deliberated and approved the "Decision on Winning the Fight against Poverty", China's targeted poverty alleviation campaign officially kicked off. (see the official news report at https://www.gov.cn/xinwen/2015-12/07/content_5020963.htm). As of the end of 2020, a total of 832 national-level poverty-stricken counties in China have all eliminated poverty, and the targeted poverty alleviation campaign has achieved full success.
3. China Internet Network Information Center (CNNIC) released the 47th "Statistical Report on China's Internet Development Status" in Beijing. As of December 2020, the number of internet users in China has reached 989 million, an increase of 85.4 million from March 2020, and the Chinese internet penetration rate has reached 70.4%.
4. For example, Barnea and Rubin (2010) propose that the effect of CSR activities investment on corporate performance depends on the costs and earnings of CSR activities investment, and CSR activities with smaller investments are more likely to have a positive effect on corporate performance.
5. Please see <https://worldpoverty.io/headline>.
6. According to the law of China Securities Regulatory Commission, firms marked Special Treatment (ST) indicating that it has suffered losses for two consecutive years (or more) and firms marked *Special Treatment (*ST) indicating that the firm is in the delisting procedure. Both firms marked ST or *ST are under stricter regulatory supervision by China Securities Regulatory Commission. We thus exclude these firms from our sample.
7. The complete specification of the model should also include After. However, because firms in the control group have not adopted ESOPs during the whole sample period, the After dummy takes the value of 1 only for the treatment group and in the ESOPs period. Thus, AFTER would become redundant and is dropped since AFTER and AFTER*Treat are empirically the same.

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Appendix A. Variable definitions

Variables	Definitions
LN(1 + Patent_apply)	The natural logarithm of 1 plus patent applications in year t + 1.
LN(1 + Patent_grant)	The natural logarithm of 1 plus the total number of patents eventually granted in year t + 1.
FPAC_dum	Equal to 1 if firms engage in the poverty alleviation campaign in year t, and 0 otherwise.
FPAC_money	The natural logarithm of the amount invested in poverty alleviation campaign.
Search	The natural logarithm of one plus the firms' information search volume on the search engine in year t.
Soe	Equal to 1 if firms are state-owned enterprises, and 0 otherwise.
Size	The natural logarithm of the book value of total assets.
Age	The natural logarithm of 1 plus firm IPO year.
Roa	The ratio of earnings to total assets.
Cash	The ratio of cash holdings to total assets.
Lev	The ratio of total debt to total assets.
Expense	The ratio of administrative expense to operating income.
Fix	The ratio of fixed assets to total assets.
Top	The proportion of the largest shareholder's shareholding.
Indrate	The proportion of independent directors on the board.
Duality	Equal to 1 if the chairman is also the CEO, and 0 otherwise.
AFTER	equals 1 if the firm engage in poverty alleviation campaign in year t or thereafter, and 0 otherwise.
Treated	Equals 1 if the firm has ever experienced engagement in poverty alleviation campaign, and 0 otherwise.
UTL	The firm's total number of utility patent applications in year t.
UTLG	The firm's total number of utility patent grants in year t.
DES	The firm's total number of design patent applications in year t.
DESG	The firm's total number of design patent grants in year t.
FPAC_AR	The ratio of a firm's amount invested in poverty alleviation campaign to total assets.

Source: generated by Stata software according to authors' collected data.