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Impact of CSR on systematic risk across Chinese listed firms: mediating effect of technological innovation and moderating effect of ownership

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Abstract

Firms' capability to manage risk is increasingly important when the world economy is faced with more uncertainties. The impact of corporate social responsibility (CSR) on systematic risks remains inconsistent so far. By taking the unbalanced panel data of Chinese listed firms from 2010 to 2020, the paper uses 2SLS estimation to examine the relationship between CSR and systematic risks, explores the mediating effect of technological innovation and the moderating effect of ownership structure. It is found that that in context of China, the CSR engagement is negatively related to systematic risks. The effect is partially mediated by technological innovation. Moreover, the state-owned ownership structure positively moderates the negative impact of CSR on systematic risk. It is the few studies that uncover the mechanism through which CSR impacts systematic risk by discussing technological innovation as a mediator after addressing the complicated reverse causalities among CSR, technological innovation and systematic risk. These findings enrich the body of literatures on CSR and risk management, respond to the exploration of inconsistency in relationship between CSR and systematic risk and encourage the firms to be more proactively engaged in CSR practice and technological innovation. These long-perspective-oriented business practices decrease the systematic risk and benefit the sustainable development of firms.

Keywords: CSR, systematic risk, technological innovation, ownership structure

Introduction

The implementation of corporate social responsibility (CSR) has obtained an increasing recognition by practitioners, policy-makers and regulators across the world. In recent years,

many unexpected events broke out successively, such as coronavirus pandemic, conflict between Russia and Ukraine, the tighten monetary policy of US Federal Reserve, acceleration of global warming. They put firms into more uncertain circumstances. The systematic risk caused by these events will bring great losses to firms and cannot be diversified by investment portfolios. Whether the firms can successfully handle these systematic risks or not are essential to their survival and development. Previous literatures argued that CSR practice has insurance-like effect and can protect firms from adverse environment. But some empirical studies showed that CSR increased the risk of firms(Sui et al., 2019a). Therefore, it calls the further exploration of the impact of CSR on systematic risk. Different contextual backgrounds, including cultural tradition, legal system and regulation, lead to different understanding, expectation and perspective on CSR issues (Gulzar et al., 2019). Contextual conditions should be considered in studying CSR's consequences. CSR practice was not introduced into China until its entry into WTO in 2001. In China, government plays a major role in promoting CSR practice through enacting legislation, cooperating with business and encouraging good CSR behaviour. Influence of CSR-related institutions is relatively weak, which strengthens role of government and shapes features of CSR in China (Chen & Zhang, 2021). These characteristics lead to the phenomenon that some Chinese firms are engaged in CSR practice to meet government legitimacy. CSR is viewed as a defensive measure rather than a strategic measure. In recent years, the Chinese government highlights the high-quality and green economic development, enterprises are responding with taking more proactive CSR than responsive CSR practice. The CSR implement enters into a new stage. Whether CSR practice generated negative or positive economic consequence was partially relied on the difference in CSR motivation and development stage. Therefore, the effect of CSR on systematic risk may show different picture in China. Furthermore, the systematic risk which the Chinese enterprises are faced with is increasing. Domestically, the average level of resident income is negatively influenced by COVID-19 pandemic and the consumption capability remains weak. Enterprises in manufacturing sector is losing advantages in terms of production cost in compared with other countries such as India and Vietnam. The non-state-owned enterprises need more equal treatment in financing access and policy support for further development. Internationally, OECD forecasted that the economic growth will be 2.65 percent, less than the trend level. The economic recession in worldwide negatively influences the export performance of Chinese enterprises. These economic uncertainties as well as other political and military factors bring great systematic risks to Chinese enterprises. These complicated macroeconomic circumstances combine with the new development stage of CSR practice in China, highlighting the significance to discuss the impact of CSR on systematic risk across Chinese firms.

The past literatures found that the relationship between CSR and firm risk can be positive and negative. The inconsistency in conclusion may be caused by the disparity in the types of CSR, the measurements and classification of firm risk and the applied theories. As the risks are various in their natures and the systematic risk impacts the firms in a more extensive and intensive way, the current study focuses on systematic risk and set the first research problem as the exploration of the impact of CSR on systematic risk.

Additionally, some literatures pointed out that the mixed relationship between CSR and firm is caused by the indirect effect of some variables, which calls the exploration of the mechanism with which CSR exerts influence on systematic risk (Herrera Madueño et al., 2016).

It is beneficial for practitioners to identify the mechanism and figure out an overall strategy to fully release the power of CSR in reducing systematic risk and maintain stability in operation.

The current study assumes that technological innovation plays a mediating role in accordance with the extant literatures on relationship between CSR, technological innovation and systematic risk (Chkir et al., 2021). Furthermore, previous studies showed that ownership structure shaped the corporate governance. Good corporate governance can reduce firm risk through minimizing the principle-agency conflict and monitoring the behavior of management more efficiently (Le et al., 2021). Firms with different ownership structure also varied in their CSR motivation and implementation. Therefore, the study further examines if ownership structure moderates the impact of CSR on systematic risk.

To test the framework, the current study uses the two widely used database, Hexun CSR ratings and China Stock Market and Accounting Database to explore the impact of CSR on systematic risk, the mediating effect of innovation practice and the moderating effect of ownership structure in context of China. The findings show that there is a significantly negative impact of CSR on systematic risk and partial mediating effect of technological innovation in the relationship. Additionally, the state-owned structure positively moderates the impact of CSR on systematic risk.

The study contributes the current literature in several aspects. First, it focuses on the the consequence of CSR practice in developing countries (Bae et al., 2019). Second, the current study uncovers the complicated relationship between CSR, systematic risk, innovation and ownership structure. It provides an insight to evaluate how and when CSR practice can guide firms to go through systematic risks and make sustainable development. Most previous studies discussed the relationship between CSR and systematic risk and moderating effect of ownership structure, firm size and leverage, but did not address the mechanism through which CSR performance exerts its impact on systematic risk. The present study fills the gap by examining the mediating effect of technological innovation and address the endogeneity concern mainly caused by reverse causality between CSR and technological innovation, technological innovation and systematic risk.

The rest of the paper is organized as follows: the second section reviews the relevant literatures and develops hypotheses. The third section presents the data methodology and the fourth section shows the result of regression analysis. The last section makes conclusion and discusses the limitations of the current study.

Literature Review

The impact of CSR on financial performance has been widely studied, however, the impact of CSR on systematic risk remains underexplored. The management of systematic risk is an unreplaceable part of firm performance as it conveys more information on shareholder value protection. It is particularly significant when the world is confronted with systematic risk. The theoretical support for risk-reducing effect of CSR mainly comes from legitimacy theory, stakeholder theory and signal theory.

The legitimacy theory claims that the firms must follow the legitimacy demand granted by society. The failure to fulfill the responsibility to society will lose the legitimacy to operate business. CSR practice help firms to meet the legitimacy demand and reduce the risks of litigation, regulation and being removed from market (Lueg et al., 2019). The stakeholder

theory argues that the firms should serve the interest of stakeholder. CSR practice is effective in mitigating the conflict among stakeholders. The intangible assets induced by the CSR, such

as social capital and good reputation, will generate insurance-like effect and protect firm from being impacted by unexpected shocks and keep resilient in adversities. It leads to less volatility and reduce systematic risk. When firms are troubled with negative events, the public are inclined to attribute the reason to factors beyond the firm's control, decreasing the resistance from customers, investors and punishment for regulators. It is found that the insurance-like effect was more prominent when firms encounter crisis (Vanhamme & Grobben, 2009). In a food security crisis, the firms with better CSR performance generated the Halo effect when customers tried to attribute the reason, which implied that the customers judged the motivation of firm's improper behavior in according with their original impression on the firm. Additionally, the continuous and persistent commitment of CSR exhibits its insurance-like effect on the stock and bond price when the firm is in negative social responsibility-related events even if the protection effect will disappear when the negative events repeat (Sui et al., 2019b). The good relationship with stakeholders enables firms to access to capital market at a relatively low cost, decreasing the credit risk and probability of financial distress (Boubaker et al., 2020; Yeh et al., 2020).

In line with the signal theory, CSR report is an important non-financial information sources, it sends signals to investors, indicating that the firm have good management compared with its counterparts. It alleviates information asymmetry and increases credibility of firm information (Cho et al., 2013). These benefits generated by CSR disclosure enable investors to forecast future cash flow more accurately and reduces the uncertainty in judging the future development of the firm. Many literatures attribute the reason for stock price crash risk to information asymmetry (Dai et al., 2018; Hirshleifer et al., 2013) which leads to non-assurance of financial report quality, managerial opportunistic behavior and earning management (Hutton et al., 2008). CSR engagement provided shareholders with CSR information to investors, which greatly increased the degree of information transparency and monitored the management to serve interest of stakeholders (Zorofchi et al., 2021).

Based on the theoretical and empirical background in review of past literatures, the following hypothesis is put forward:

H1: CSR is negatively related to systematic risk

The mediator is an intervening variable transmitting the effect of an independent variable to dependent variable. An independent variable has causality relationship with the mediator, and the mediator is related to the dependent variable (MacKinnon et al., 2002). Therefore, the mediators in relationship between CSR and systematic risk should be the outcome of CSR practice and simultaneously, the determinant of systematic risk. The finding of mediators can explain the channel through which the CSR affects systematic risk, which deepens the understanding of how CSR practice exerts its influence on systematic risk.

With regard to the relationship between CSR and innovation, one streamline of opinion states that CSR improves innovation performance. To achieve the CSR target, firms redesign products and optimize the manufacturing processes to be more environmentally responsible, cost-saving, which motivates firms to be more innovative (Graafland, 2019). CSR practice is a kind of resource-consuming activity and demands the offset of cost so that it can be a

sustainable activity. One of the approaches is to take innovation to absorb the possible cost incurred by CSR engagement (Broadstock, 2019). In line with the resource-based theory, innovation is heavily dependent on a company's resources and capabilities (Salvadó et al., 2012) . CSR can strengthen firm's relation with stakeholders, helping firms to obtain various

kinds of resources and capability identify and grasp innovation opportunity. CSR practice enables managers to obtain more information from stakeholders when deciding adoption or abandoning innovation projects. The enhanced communication facilitates the turnovers of creative ideas. In line with innovation theory, the key part of innovation is the capability to integrate consumers' needs with the relevant technological options (Forcadell et al., 2019). Good relationship with consumer, as one of benefits CSR practice, improves firms' understanding of market demand and propels innovation activities. Employees are important internal stakeholders, CSR can increase the employee's job satisfaction, retention and commitment, which in turn fosters employees' long-term horizons and encourages creation of novel, valuable idea(Campa & Zijlmans, 2019). From the perspective of knowledge management, the acquirement of knowledge is a great promoter of innovation. The knowledge originates from both internal and external of the firms. The stakeholders play critical role as an external knowledge resource because they have more opportunities to contact useful and new knowledge which can be complementary to internal knowledge of firms and help to upgrade technological innovation (Zheng et al., 2021). Therefore, CSR practice is positively links to technological innovation by enlarging the scope and intensity of knowledge sharing and transmission. Stakeholders in the supply chain are more supportive to the innovation of firms since they know best the valuation of these technological innovations. CSR practice can defend the threat of knowledge leakage by mitigating employees' intention to join a competitive firm or to expose the firm's valuable knowledge even if they move to another firms. The benefit of CSR adoption helps to solve an important managerial problem concerning firms' innovation and improve the motivation and enthusiasm for technological innovation (Flammer, 2018).

Whether there is relationship between innovation and systematic risk is another precondition for innovation to be a mediator in CSR-systematic risk connection. Technological innovation practice facilitates the information sharing and increases information transparency. Firms are required to disclose research and development information, which provides a feasible mechanism for investors to learn about the progress in innovation practice and the probability of success. Such regulation greatly improves the information transparency and refrains management from hoarding behavior (Hadj, 2020). Innovation investment of firms also attracts more attention of capital market. Such firms are expected to have more potentials and brighter prospect due to psychological anticipation of investors (Szutowski & Ratajczak, 2016). More innovation output proves that the firm has relatively high level of management. Analysts' attention tends to be attracted by firms proactively engaged in innovation. It is found that the active innovation engagement leads to less probability of default (Hsu et al., 2015). Patents,

one of the indicators to show innovation outcome, are negatively related to litigation risk, volatility of future operating performance and earning volatility, serving as a better predictor of future bankruptcies than typical measures such as credit ratings and Z-score (Pandit et al., 2011). The firms with high patent quality and citations are less likely to go bankrupt. Therefore, innovation can reduce the risk and volatility of firms.

In accordance with the literature review on the relationship between CSR, innovation and systematic risk, the following hypothesis is put forward:

H_2: Technological innovation positively mediates the relationship between CSR and systematic risk

Unlike a mediator which focuses on the exploration of mechanism to answer how the independent variable impacts the performance of dependent variable, a moderator discusses

the boundary condition which uncovers when the relationship between independent variable and dependent variable is strengthened or weakened. Specially, a mediator must be significantly correlated with independent variables and dependent variables，while a moderator doesn't have to significantly correlated to independent and dependent variables. Furthermore, a variable which has no relationship with independent and dependent variables is more suitable to be a moderator. Previous studies show that ownership structure is a boundary condition that might influence the relationship between CSR and firm performance (Chiou & Shu, 2019; Garde-Sanchez et al., 2018).

The basic criteria to categorize the ownership structure is who is the controlling shareholder (Zhang et al., 2020). In context of China, enterprises are usually partitioned into state-owned enterprise (SOE) and non-state-owned enterprise (non-SOE). SOEs are defined as firms in which state holds majority shares to acquire decisive voting rights. Ownership structure is closely related to financial performance and financial volatility in China. SOEs are argued to be lower in production efficiency. Their special position requires them to undertake policy burden such as creating job opportunity, protecting environment and maintaining social stability. They are naturally faced with agency problems which lead to information asymmetry between shareholders and managers, controlling shareholders and minority shareholders. The less monitored managers intend to be riskier in making investment decision. Therefore, SOEs have lower financial performance and higher financial risk (Farah et al., 2021). It implies that state-owned enterprises are faced with more systematic risk and the state-owned ownership structure will weaken the risk-reduction impact of CSR on systematic risk. When CSR is supposed to be negatively related to systematic risk, the sign of the cross item between the moderator and the independent variable should be opposite to the sign in the main regression if the moderator is hypothesized to weaken the relationship. Therefore, the following hypothesis is put forward:

H3: State-owned ownership structure positively moderated the impact of CSR on systematic risk

Based on the literature review and the hypotheses development, the conceptual framework is figured as follows:

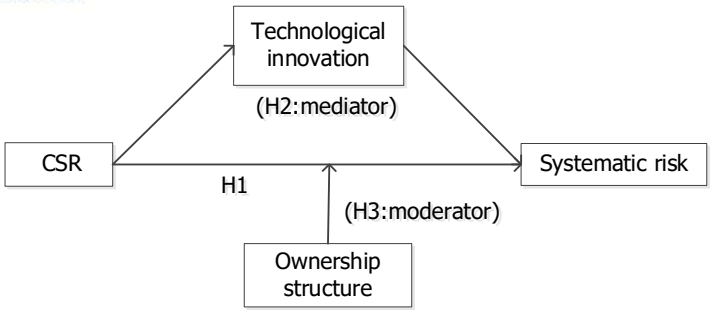

Figure1. Conceptual Framework

Research Methods

The sample is consisted of Chinese listed firms with CSR scores from 2010-2020. In recent years, the Chinese firms emphasize the implementation of CSR and encourage technological innovation to increase the competitiveness and achieve sustainable development, and they are faced with increasing risk from both domestic and abroad. Meanwhile, the state-owned enterprises play a more significant role in China economy than in other economies. Such characteristic facilitates the study on the moderating role of ownership structure in relationship between CSR and systematic risk. The study obtains data on CSR measures from Hexun CSR ratings (Lv et al., 2019). Financial data is extracted from Chinese Stock Market and Research database (CSMARS). After excluding the listed firms with missing data and firms in financial sectors, the final sample is consisted of 14,483 firm-and-year observations.

The dependent variable is systematic risk. Following the previous literature (Farah et al., 2021), the present study uses beta coefficient to measure systematic risk of a stock. Beta coefficient is a measure of sensitivity of a company's stock price to movement in the market. It is an indicator of a stock's systematic risk which is the undiversifiable risk inherent in the financial system as a whole. The value of Beta coefficient is calculated by dividing the covariance of a stock's return with market returns by the variance of market return, reflecting the difference of each stock's reaction to the same systematic risk. When beta coefficient is less than 1, it implies that the stock has a systematic risk lower than the market, otherwise, the stock has an above-average risk. The commonly used CSR ratings in studying Chinese firms' CSR performance is Hexun CSR ratings. In order to promote CSR practice, the government encourages relevant institutions to establish evaluation system to appraise CSR implementation of Chinese listed firms. One of the most popular evaluation systems is Hexun CSR rating index (HX). In accordance with stakeholder theory, HX evaluation system sets up five individual dimensions, namely, shareholder, employee, business including supplier and customer, environment and society dimension, and assigns different weights to each dimension to reflect heterogeneity in sector before aggregating into a total CSR score (Zhong et al., 2019). The rating system discloses information on CSR and individual dimensions from 2010. Compared to other rating systems, it covers more listed firms as CSR-related information are collected not only from CSR report or sustainability report, but also from relevant parts in annual report. Following prior literatures, the control variables and their measurements are formulated in the Table1 (Harjoto & Laksmana, 2016; Hu et al., 2019).

Table 1. Description and Measurement of Control Variables

Control variables	Symbol	Description and measurement
Return on asset	ROA	Ratio of net profit over total assets
Firm size	SIZE	Logarithm of total asset
Leverage	LEV	Ratio of total liabilities over total assets
Slack resource	SLACK	Ratio of cash and cash equivalents over total assets
Sale expense	SALE	Logarithm of sale expense
Dividend ratio	DIVIDEND	Ratio of dividend per share over earnings per share
Fixed asset	FIXED	Ration of fixed asset over total asset
Market concentration	HHI	The square sum of the fifty largest firms' market share calculated by asset in a certain market

The mediator in the present study is technological innovation (INN). Following previous literature, it is measured by the ratio of R&D expense over total asset (Broadstock, 2019). The moderator is ownership structure (OWN). It is measured by the dummy variable. If the firm is state-owned enterprise, the value of the dummy variable is 1, otherwise, it is 0.

In studying the impact of CSR on systematic risk, firms with risky business practice was inclined to report CSR performance for window dressing purpose, meanwhile, the CSR disclosure increased information transparency and reduced firm risk (Lueg et al., 2019). The finding implied that there may exist the reverse causality between CSR and systematic risk. Therefore, the study employs 2SLS estimation to construct regression model. Such estimation introduces the instrumental variable to address the endogeneity concern caused by omitted variables, and reverse causality between CSR and systematic risk. Following the previous studies, the instrumental variables are average CSR performance in the same sector ($CSR\text{sector}_{it}$) and the average CSR performance in the same region ($CSRregion_{it}$) (Cheng et al., 2014). Equation (1) is the model specification of the first stage regression, in which CSR_{it}, the endogenous variable regresses on instrumental variables. The fitted value of CSR_{it} is determined by instrumental variables which have no reverse causality relationship with systematic risk as a firm cannot control the average score of a sector and a certain region. Therefore, the fitted value of CSR derived from the first stage regression is an exogenous variable and can be used in Equation (2) to get unbiased estimation.

$$CSR_{it} = \alpha_0 + \beta_1 CSR\text{sector}_{it} + \beta_2 CSRregion_{it} + \sum_{k=1}^{8} \beta_k control_{kit} + u_i + \varepsilon_{it} \quad (1)$$

The model specification of the second stage model specification is listed in Equation (2):

$$RISK_{it} = \alpha_0 + \beta_1 CSR_{it} + \sum_{k=1}^{8} \beta_k control_{kit} + u_i + \varepsilon_{it} \quad (2)$$

Where CSR_{it} is the CSR score of the firm *i* in the year of *t*, it is an endogenous variable, $CSR\text{sector}_{it}$ is the average CSR score of the sector, $CSRregion_{it}$ is the average CSR score of geographically closed regions. Both of them are instrumental variables. CSR_{it} is the fitted value of endogenous variable CSR_{it}.

To examine the mediating effect of technological innovation in the effect of CSR on systematic risk, the present study uses the serial test to examine the mediating effect of

technological (Ruggiero & Cupertino, 2018). The method is illustrated by Figure 2 and performed by the following steps:

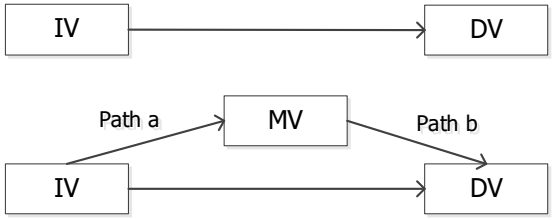

Figure 2. The Causal Steps for Mediating Effect Analysis

The first step is to regress DV (systematic risk) on IV (CSR) to examine the total effect of IV on DV. The coefficient of IV(CSR) is equal to the value of c in path c. The regression specifications are listed in Equation (1) and Equation (2).

The second step is to regress MV (technological innovation) on IV (CSR). The coefficient of IV (CSR) is the value of a in path a. As previous literatures showed that CSR and innovation practice in the same firms are interactive. In the second step, the current study uses 2sls estimation to examine the relationship between CSR and technological innovation. The model

specification in the second step is listed in Equation (3). Following previous literatures, the control variables in examining the impact of CSR on innovation include firm size, leverage, slack resource and market concentration (Bocquet et al., 2017; Mithani, 2017).

$$INN_{it} = \alpha_0 + \beta_1 CSR_{it} + \beta_1 SIZE_{it} + \beta_2 LEV_{it} + \beta_3 SLACK_{it} + \beta_4 HHI_{it} + \beta_5 EDU_{it} + u_i + \varepsilon_{it} \qquad (3)$$

The third step is to regress DV (systematic risk) on IV (CSR) and MV (technological innovation). The coefficient of MV is the value of b in path b, and the coefficient of CSR is the value of c'. If the value of a, b, c is significant, it can be concluded that MV plays mediating role between IV and DV. When the value of a, b, c is significant, but the value of c' is insignificant, MV is a full mediator. If the value of a, b, c is significant, the value of c' is insignificant and the value of c' is less than that of c, MV is a partial mediator. In using 2sls estimation, the model specifications in the first and second stage regression model are listed in Equation (1) and Equation (4) respectively.

$$RISK_{it} = \alpha_0 + \beta_1 CSR_{it} + \beta_2 INN_{it} + \sum_{k=3}^{10} \beta_k control_{kit} + u_i + \varepsilon_{it} \qquad (4)$$

The mediating intensity is calculated by Sobel-Goodman tests with Equation (5) (SOBEL & M., 1987).

$$\frac{indirecteffect}{totaleffect} = \frac{patha * pathb}{pathc} \qquad (5)$$

The model specification in examining the moderating role of ownership structure in relationship between CSR and systematic risk is listed in equation (6) (Bae et al., 2019). By using the predicted value of CSR generated in Equation (1), the moderating effect test can exclude the influence of endogeneity.

$$RISK_{it} = \alpha_0 + \beta_1 CSR_{it} + + \beta_2 OWN + \beta_3 CSR_{it} * OWN + \sum_{k=1}^{8} \beta_k control_{kit} + u_i + \varepsilon_{it} \quad (6)$$

Results and Discussion

Regression results related to H1, H2 and H3 are reported in Table 2. Model 1 and Model 2 in Table 4 list the result of first-stage regression with Equation (1) and the result of second-stage regression with Equation (2) in examining the effect of CSR on systematic risk. The diagnostic tests show that CSR is an endogenous variable, the instrumental variables including $CSRregion$ and $CSRsector$ are highly related to CSR. Besides, the two instruments are exogenous after conducting the overidentification test. Therefore, it is suitable and valid to use 2SLS estimation. The result shows that CSR is significantly negatively related to systematic risk with coefficient as -0.0135. The finding is consistent with previous studies (Boubaker et al., 2020; Bouslah et al., 2018; Lueg et al., 2019). The result supports Hypothesis H1. The finding is consistent with previous literatures which suggest that CSR has insurance-like effect. It may not increase the financial performance proxied by ROA or Tobin's Q, but it can protect firms from being seriously affected by negative event, natural disasters or economic uncertainties due to firms' good relationship with stakeholders including shareholders, customers and business partners (Albuquerque et al., 2020; Lueg et al., 2019). For control variables, firm size and HHI index is helpful to reduce systematic risk while leverage level is significantly positive related to systemic risk.

Table 2. Regression Result of Testing H1, H2 and H3

Variable	Model 1 First-stage regression	Model 2 Second-stage regression	Model 3 Direct effect of CSR on risk	Model 4 CSR-innovation	Model 5 CSR-innovation-risk	Model 6 Moderating effect
CSR		-0.0135***	-0.0135***	0.0726***	-0.0069***	-0.0039***
RD					-0.0273***	
OWN						-0.0254***
CSR*OWN						0.0056***
ROA	0.6521***	-0.0976	-0.0976	0.2825***	0.1661**	0.0387
SIZE	0.6826***	-0.0259***	-0.0259***	0.4728***	0.0860**	-0.0113***
LEV	-0.7506***	0.0196***	0.0196***	0.0456***	-0.0434***	0.0030
FIX	1.8965	-0.0995*	-0.0995*	-0.0241	-0.0981	-0.0299
DIVIDEND	0.3599	0.0017	0.0017	0.0084***	-0.0161	0.0014
SLACK	0.0144**	0.0014	0.0014	0.0140	-0.0053	0.0019***
SALE	0.3475	-0.0142	-0.0142	0.2411***	-0.0151	-0.0139***
HHI	1.1323	-0.1390***	-0.1390***	0.0692	0.0916	-0.0253 ***
CSR*region*	0.6705***					
CSR*sector*	0.6852***					
F-statistics	323.8789	42.1544		124.1254	128.5462	38.1215
P-value	0.000	0.000		0.000	0.000	0.0000
R square	0.2352	0.1704		0.2181	0.2263	0.1712

*Notes: The table reports the regression results on impact of CSR on systematic risk with 2SLS estimation (Model 1 and model 2), the mediating effect of technological innovation (Model 3 to Model 5) and the moderating effect of ownership structure (Model 6). CSR is the independent, Beta coefficient is the dependent variable. Other variables are defined in Table 1. ***, **,*

*and * indicate significance at the 1%, 5%, and 10% levels respectively.*

In examining the mediating effect of technological innovation (H2), Model 3 is the direct effect of CSR on systematic risk, which is similar to Model 2. Model 4 is the result when regressing technological innovation on CSR. The coefficient of CSR in Model 4 is significantly positive related to innovation. Model 5 is the indirect effect of CSR on systematic risk after introducing technological innovation as the mediator into regression. CSR and technological innovation are both significantly negative related to systematic risk while the size of coefficient of CSR is -0.0069, less than the value in its direct effect of -0.0135 in Model 3. It implies that part of the effect of CSR is transmitted by technological innovation in reducing systematic risk. The mediating effect calculated by equation (3) is 0.1468. It indicates that 14.68 percent of CSR' impact on systematic risk is generated by technological innovation. It implies CSR can promote firms to more active in engaging in innovation to meet CSR requirements. Both CSR and technological innovation benefit firms in dealing with systematic risk. The conclusion is supported by any previous literatures in the field of CSR and innovation relationship and innovation and systematic risk relationship (Bocquet et al., 2015; Goods, 2008; Zheng et al., 2021). Previous findings argued that CSR and innovation practice are competing for firms' resources, more CSR investment decreases the input in technological innovation. However, the current study finds that CSR promotes the development of technological innovation. It

motivates firms to engage in technological innovation so as to meet the environmental protection demand and simultaneously control the cost as adopting technological innovation is an effective way to improve efficiency. Firms adopt CSR practice tend to invest in the long-term relationship with their stakeholders. Such relationship is crucial to improve innovation and competitiveness because firms are more sensitive to changing situation and strategic opportunities in order to be more responsive to stakeholders' expectations (Zheng et al., 2021). Acquirement of knowledge is a great promoter of innovation. The stakeholders play critical role as an external knowledge resource because they have more opportunities to contact useful and new knowledge which can be complementary to internal knowledge of the firms and help the upgrading of innovation. CSR practice alleviates information asymmetry and facilitates financing for innovation. One of the essential benefits of CSR activities is to transmit information to stakeholders. By alleviating information asymmetry, CSR can reduce cost of capital and offer more access to financial support for innovation practice (Husted et al., 2016). Additionally, CSR practice defends the threat of knowledge leakage by mitigating employees' intention to join a competitive firm or to expose the firm's valuable knowledge even if they move to another firms. The benefit of CSR adoption helps to solve an important managerial problem concerning firms' innovation and improve the motivation and enthusiasm for innovation (Flammer, 2016). As CSR promotes development of technological innovation, its risk-reduction effect is partially transmitted through technological innovation particularly when technological innovation is found to be negatively related to systematic risk in the current study. Proactive adoption of technological innovation stabilizes the expectation of investors, increases flexibility and resilience in dealing with systematic risk. It also conveys to the market that the firms are sound in management. CSR promotes technological innovation development and technological development decreases systematic risk. The mechanism enables technological to be a mediator. It uncovers one of the mechanisms for CSR practice to display its influence on systematic risk.

With regard to H3, the result in Model 6 shows that the coefficient of the interaction item

of CSR*OWN is positive and significant related to systematic risk, which indicates that the ownership structure weakens the impact of CSR on systematic risk. The result support H3, suggesting that the extent of risk reduction effect generated by CR practice is diminished by state-owned ownership structure. It may be explained by the fact that that SOEs in China hold more social responsibility in stabilizing society and economy, maintaining employment rate than the non-state-owned enterprises. Another possible explanation of the positively moderating effect of state-owned ownership structure is that there is a substitution effect between CSR and state-owned ownership structure. It implies that the state-owned ownership structure replaces a part of risk-reduction effect of CSR. Both of the cases lead to the positive moderating effect although the explanation is opposite. It needs further exploration by adding up more observations.

Conclusions

Firms are confronted with more uncertainties come from natural environment and human society. When the existed risks are eliminated, new risks will emerge. The management of systematic risk is the inevitable task for firms to maintain sustainable development. In line with stakeholder theory, whether CSR practice decrease systematic risk or not remains underexplored. The study takes the 14,483 firm-and-year observations of Chinese listed firms as samples and uses 2SLS estimation to address the endogeneity concern in examining the

impact of CSR on systematic risk. Furthermore, it explores if technological innovation is the mechanism through which CSR transmits its influence on risk reduction. In context of China where state-owned enterprises hold great social responsibility, the study takes it as the background and try to find if ownership structure moderates the impact on CSR on systematic risk. It is found that CSR reduces the systematic risk and the technological innovation transmits 14.68 percent of the impact of CSR on systematic risk. The state-owned ownership structure weakens the impact of CSR on systematic risk. One possible explanation of the effect is that the implementation of CSR increases the burden and decreases the flexibility firms, making firms less resilient to the unexpected risks. another possible explanation is that the state-owned ownership structure can decease the systematic risk as it gives firms a preferential position in accessing resources and gaining support from society and government, which substitutes some of risk-reduction effect of CSR and weakens the negative effect of CSR on systematic risk. It requires further exploration to examine the effect of ownership structure by supplementing more observations.

The study enriches the body of literatures on consequence of CSR, uncovers the mechanism through which CSR impacts the systematic risk and discusses the ownership structure as the boundary condition between CSR and systematic risk, responding to the research call to further explore how and when the CSR practice is beneficial to firms. These findings encourage the CSR practitioners to take long-term perspective since CSR practice can stimulate the development of technological innovation, and both of them contribute to the management of systematic risks. For the investors, firms with higher CSR performance tend to be less shocked by systematic risks and are more resilient in face of uncertainties.

However, there are some limitations in the current study. First, the context is in China, the findings may not be suitable to extend to other developing countries. The impact of CSR is

closely related to the types of CSR practice. Responsive and proactive CSR practice lead to different consequence. In China, the CSR development is in line with its national policies such as peak carbon dioxide emissions, carbon neutrality, high-quality economic development and harmonious development between man and nature, which promotes firms to be more active in engaging CSR practice. In relation to technological innovation, China is in the stage where motivation of development is shifting to innovation practice. Many firms increase R&D investment and are stimulated by innovation-support tax preferential policies. In 2022, China has ranked second in R&D investment worldwide. Guided by these policies, CSR and technological innovation performance in China are different from other emerging economies, which, to some extent, shapes the characteristics in their impacts on systematic risk. Additionally, in studying the moderating effect of ownership structure, state-owned enterprises in China hold more proportion in national economy than other emerging economies. They are entrusted with more social responsibility and form tight political connections with government and society. These practices complicate the effect of ownership structure in moderating the relationship between CSR and systematic risk and differentiates the effect from other countries. Other developing countries can be considered and make a comparative study on the impact of CSR on systematic risk. Second, the ownership structure in the study mainly focuses on two types, namely the state-owned and non-state-owned. It can involve the institutional investors into the discussion and get more findings on the moderating effect of ownership structure. Third, the CSR performance comes from Hexun CSR ratings. Other sources of CSR ratings should be used to test the robustness of the conclusion.

References

Albuquerque, R., Koskinen, Y., Yang, S., & Zhang, C. (2020). Resiliency of Environmental and Social Stocks: An Analysis of the Exogenous COVID-19 Market Crash. *The Review of Corporate Finance Studies*, *9*(3), 593–621. https://doi.org/10.1093/rcfs/cfaa011

Bae, K.-H., El Ghoul, S., Guedhami, O., Kwok, C. C. Y., & Zheng, Y. (2019). Does corporate social responsibility reduce the costs of high leverage? Evidence from capital structure and product market interactions. *Journal of Banking & Finance*, *100*, 135–150. https://doi.org/10.1016/j.jbankfin.2018.11.007

Bocquet, R., Le Bas, C., Mothe, C., & Poussing, N. (2015). CSR, Innovation, and Firm Performance in Sluggish Growth Contexts: A Firm-Level Empirical Analysis. *Journal of Business Ethics*, *146*(1), 241–254. https://doi.org/10.1007/s10551-015-2959-8

Bocquet, R., Le Bas, C., Mothe, C., & Poussing, N. (2017). CSR, Innovation, and Firm Performance in Sluggish Growth Contexts: A Firm-Level Empirical Analysis. *Journal of Business Ethics*, *146*(1), 241–254.

Boubaker, S., Cellier, A., Manita, R., & Saeed, A. (2020). Does corporate social responsibility reduce financial distress risk? *Economic Modelling*, *91*, 835–851. https://doi.org/10.1016/j.econmod.2020.05.012

Bouslah, K., Kryzanowski, L., & M'Zali, B. (2018). Social performance and firm risk: impact of the financial crisis. *Journal of Business Ethics*, *149*(3), 643–669.

Broadstock, D. C. (2019). *Does corporate social responsibility impact firms' innovation capacity? The indirect link between environmental & social governance implementation and innovation performance*. https://doi.org/10.1016/j.jbusres.2019.07.014
Campa, D., & Zijlmans, E. W. A. (2019). Corporate social responsibility recognition and support for the arts: Evidence from European financial institutions. *European Management Journal*, *37*(6), 818–827. https://doi.org/10.1016/j.emj.2019.01.003
Chen, B., & Zhang, A. (2021). How Does Corporate Social Responsibility Affect the Cost of Equity Capital through Operating Risk? *Borsa Istanbul Review*. https://doi.org/10.1016/j.bir.2021.01.005
Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate Social Responsibility and Access to Finance. *Strategic Management Journal*, *35*(1), 1–23.
Chiou, C.-L., & Shu, P.-G. (2019). How does foreign pressure affect a firm's corporate social performance? Evidence from listed firms in Taiwan. *Journal of Multinational Financial Management*, *51*, 1–22. https://doi.org/10.1016/j.mulfin.2019.04.006
Chkir, I., El Haj Hassan, B., Rjiba, H., & Saadi, S. (2021). Does corporate social responsibility influence corporate innovation? International evidence. *Emerging Markets Review*, *46*. https://doi.org/10.1016/j.ememar.2020.100746
Cho, S. Y., Lee, C., & Pfeiffer Jr, R. J. (2013). Corporate social responsibility performance and information asymmetry. *Journal of Accounting and Public Policy*, *32*(1), 71–83.
Dai, J., Lu, C., Yang, Y., & Zheng, Y. (2018). Is the Social Responsibility Information Disclosed by the Companies really Valuable?—Evidence from Chinese Stock Price Synchronicity. *Sustainability*, *10*(10). https://doi.org/10.3390/su10103578
Farah, T., Li, J., Li, Z., & Shamsuddin, A. (2021). The non-linear effect of CSR on firms' systematic risk: International evidence. *Journal of International Financial Markets, Institutions and Money*. https://doi.org/10.1016/j.intfin.2021.101288
Flammer, C. (2016). *The Impact of Stakeholder Orientation on Innovation:Evidence from a Natural Experiment*. https://doi.org/10.1287/mnsc.2015.2229
Flammer, C. (2018). *Corporate Social responsibility as a defense against knowledge spillover: evidence from the inevitable disclousre doctrine*.
Forcadell, F. J., Aracil, E., & Úbeda, F. (2019). The Influence of Innovation on Corporate Sustainability in the International Banking Industry. *Sustainability*, *11*(11). https://doi.org/10.3390/su11113210
Garde-Sanchez, R., López-Pérez, M., & López-Hernández, A. (2018). Current Trends in Research on Social Responsibility in State-Owned Enterprises: A Review of the Literature from 2000 to 2017. *Sustainability*, *10*(7). https://doi.org/10.3390/su10072403
Goods, I. E. on F. V. and R. I. from C. P. (2008). *Innovation's Effect on Firm Value and Risk: Insights from Consumer Packaged Goods*. https://doi.org/10.1509/jmkg.72.2.114
Graafland, J. (2019). Economic freedom and corporate environmental responsibility: The role of small government and freedom from government regulation. *Journal of Cleaner Production*, *218*, 250–258. https://doi.org/10.1016/j.jclepro.2019.01.308
Gulzar, M. A., Cherian, J., Hwang, J., Jiang, Y., & Sial, M. S. (2019). The Impact of Board Gender Diversity and Foreign Institutional Investors on the Corporate Social

Responsibility (CSR) Engagement of Chinese Listed Companies. *Sustainability*, *11*(2). https://doi.org/10.3390/su11020307

Hadj, T. B. (2020). Effects of corporate social responsibility towards stakeholders and environmental management on responsible innovation and competitiveness. *Journal of Cleaner Production*, *250*. https://doi.org/10.1016/j.jclepro.2019.119490

Harjoto, M., & Laksmana, I. (2016). The Impact of Corporate Social Responsibility on Risk Taking and Firm Value. *Journal of Business Ethics*.

Herrera Madueño, J., Larrán Jorge, M., Martínez Conesa, I., & Martínez-Martínez, D. (2016). Relationship between corporate social responsibility and competitive performance in Spanish SMEs: Empirical evidence from a stakeholders' perspective. *BRQ Business Research Quarterly*, *19*(1), 55–72. https://doi.org/10.1016/j.brq.2015.06.002

Hirshleifer, D., Hsu, P.-H., & Li, D. (2013). Innovative efficiency and stock returns. *Journal of Financial Economics*, *107*(3), 632–654. https://doi.org/10.1016/j.jfineco.2012.09.011

Hsu, P.-H., Lee, H.-H., Liu, A. Z., & Zhang, Z. (2015). Corporate innovation, default risk, and bond pricing. *Journal of Corporate Finance*, *35*, 329–344. https://doi.org/10.1016/j.jcorpfin.2015.09.005

Hu, D., Feng, C., Liang, L., Wu, P., & Du, Y. (2019). Environmental performance of Chinese listing manufacturing enterprise: from investment perspective. *Environ Sci Pollut Res Int*, *26*(7), 6625–6635. https://doi.org/10.1007/s11356-018-04112-y

Husted, B. W., Jamali, D., & Saffar, W. (2016). Near and dear? The role of location in CSR engagement. *Strategic Management Journal*, *37*(10), 2050–2070.

Hutton, A. P., Marcus, A. J., & Tehranian, H. (2008). Opaque Financial Reports, R-Square, and Crash Risk. *Social Science Electronic Publishing*, *94*(1), 67–86.

Le, A. T., Doan, A. T., & Phan, T. (2021). Institutional development and firm risk from a dynamic perspective: Does ownership structure matter? *Economic Analysis and Policy*, *72*.

Lueg, K., Krastev, B., & Lueg, R. (2019). Bidirectional effects between organizational sustainability disclosure and risk. *Journal of Cleaner Production*, *229*, 268–277.

Lv, W., Wei, Y., Li, X., & Lin, L. (2019). What Dimension of CSR Matters to Organizational Resilience? Evidence from China. *Sustainability*, *11*(6). https://doi.org/10.3390/su11061561

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, *7*(1), 83–104. https://doi.org/10.1037/1082-989x.7.1.83

Mithani, M. A. (2017). Innovation and CSR — Do They Go Well Together? *Long Range Planning*, *50*(6), 699–711. https://doi.org/10.1016/j.lrp.2016.08.002

Pandit, S., Wasley, C. E., & Zach, T. (2011). The Effect of Research and Development (R&D) Inputs and Outputs on the Relation between the Uncertainty of Future Operating Performance and R&D Expenditures. *Journal of Accounting, Auditing & Finance*, *26*(1), 121–144. https://doi.org/10.1177/0148558x11400583

Ruggiero, P., & Cupertino, S. (2018). CSR Strategic Approach, Financial Resources and Corporate Social Performance: The Mediating Effect of Innovation. *Sustainability*, *10*(10). https://doi.org/10.3390/su10103611

Salvado, J. A., de Castro, G. M., Verde, M. D., & López, J. E. N. (2012). *Environmental innovation and firm performance: A natural resource-based view*. Palgrave Macmillan.

SOBEL, & M., E. (1987). Direct and Indirect Effects in Linear Structural Equation Models. *Sociological Methods & Research*, *16*(1), 155–176.

Sui, Yang, & Zhang. (2019a). Is Corporate Social Responsibility Used to Mask Corporate Speculation? Evidence from Emerging China. *Sustainability*, *11*(12), 3375.

Sui, Yang, & Zhang. (2019b). Is Corporate Social Responsibility Used to Mask Corporate Speculation? Evidence from Emerging China. *Sustainability*, *11*(12). https://doi.org/10.3390/su11123375

Szutowski, D., & Ratajczak, P. (2016). Exploring the relationship between CSR and innovation. *Sustainability Accounting Management & Policy Journal*, *7*(2), 295–318.

Vanhamme, J., & Grobben, B. (2009). "Too Good to be True!". The Effectiveness of CSR History in Countering Negative Publicity. *Journal of Business Ethics*, *85*, 273–283.

Yeh, C.-C., Lin, F., Wang, T.-S., & Wu, C.-M. (2020). Does corporate social responsibility affect cost of capital in China? *Asia Pacific Management Review*, *25*(1), 1–12. https://doi.org/10.1016/j.apmrv.2019.04.001

Zhang, N., Lin, X., Yu, Y., & Yu, Y. (2020). Do green behaviors improve corporate value? An empirical study in China. *Journal of Cleaner Production*, *246*. https://doi.org/10.1016/j.jclepro.2019.119014

Zheng, Y., Li, C., & Liu, Y. (2021). Impact of environmental regulations on the innovation of SMEs: Evidence from China. *Environmental Technology & Innovation*, *22*. https://doi.org/10.1016/j.eti.2021.101515

Zhong, M., Xu, R., Liao, X., & Zhang, S. (2019). Do CSR Ratings Converge in China? A Comparison Between RKS and Hexun Scores. *Sustainability*, *11*(14). https://doi.org/10.3390/su11143921

Zorofchi, G. H., Hanzaee, A. H., & Hassani, M. (2021). *Investigating the Effect of Business Strategy and Stock Price Synchronicity on Stock Price Crash Risk*.