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How does corporate social and environmental responsibility contribute to investment efficiency and performance? Evidence from the financial sector of China

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ABSTRACT

Corporate social responsibility (CSR) and corporate environmental responsibility (CER) are important determinants of a firm's investment efficiency and financial performance. However, there is scant literature using the financial sector, and studies have excluded the financial sector due to its different capital structure. Therefore, this study investigates the effect of corporate social and environmental responsibility on China's financial institutions' investment efficiency and financial performance from 2010 to 2019. The data analysis consists of multivariate Driscoll and Kraay regression analysis, while a two-stage least squares regression is also used for robustness purposes. The results show a significant positive relationship between corporate social responsibility, investment efficiency, and the performance of financial institutions. The results also show that environmentally responsible firms perform better in terms of investment efficiency and financial performance. Furthermore, for non-state-owned enterprises, this impact is higher as compared to state-owned enterprises. Therefore, managers should strategically consider corporate social and environmental responsibility to reduce agency problems and improve their investment efficiency and performance.

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1. Introduction

In 1924, Oliver Sheldon pioneered the concept of CSR and termed it the ethical responsibility of the enterprise. Later, it was further elaborated into social, economic, and environmental responsibilities (Damart & Adam-Ledunois, 2017; Hoffman, 2007; Mi et al., 2018). Now the focus is more on sustainability and sustainable development. Although corporate social responsibility (CSR) includes the firms' social, economic, and environmental responsibilities to all the stakeholders, regulators and the

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community are particularly sensitive to environmental damages caused by the businesses. Therefore, increasing businesses are focussing on corporate environmental responsibility (CER) to avoid backlash from the community and penalties from regulators.

Although financial firms are not directly involved in damaging the environment, their clients might have hazardous operations. Therefore, financial institutions should carefully choose their clients and spend on sustainable development. Why are financial firms involved in CSR/CER? and its influence on their financial performance is widely discussed but still unsettled. There are many responses to this fundamental question. First, schools of thought linked higher CSR/CER spending to lower financial performance and stem its rationale from the principal-agent relationship. Modern corporations face agency problems due to managers engaging in over-investment of CSR/CER, and doing so provides private benefits and builds repute (Barnea & Rubin, 2010), while this significantly costs the shareholders. Similarly, managers of underperforming firms use CSR strategically to attain the support of environmental and social activists to obscure their inefficiencies (Surroca & Tribó, 2008) and avoid the threat of takeover (Pagano & Volpin, 2005). Ultimately, spending on value-destroying activities will lower the firm's financial performance and valuation (Jensen & Meckling, 1976).

The other group of researchers supports higher CSR spending is associated with higher firm valuation and financial performance. Especially in competitive industries, firms require a heavy advertisement budget to influence their customers' buying behaviour (Falck & Heblich, 2007). A higher CSR/CER spending signals not only product quality but also shows a firm's care for customers and society, which helps in differentiating their offering from competitors and substituting CSR for advertising (Siegel & Vitaliano, 2007). In addition, CSR can play a significant role in conflict resolution between non-investing stakeholders and the managers like social and environmental activists (Harjoto & Jo, 2011). A perceived higher quality, differentiation, and conflict reduction among stakeholders lead to a higher financial performance of firms with aggressive engagement in CSR/CER.

This paper attempts to contribute to the existing discussion of CSR/CER and firm performance using an investment efficiency perspective. If the agency view and strategical use of CSR/CER are accurate, then higher CSR/CER should lead to lower investment efficiency due to investment in value-destroying activities and hence lower financial performance. In contrast, if CSR/CER as a tool of conflict resolution and signalling differentiation and a higher product quality view is correct, then higher CSR/CER spending should lead to efficient investment choices and superior financial performance.

We investigate the Chinese financial sector because the financial sector holds centre stage in the financial system of any economy and ensures that the parties with surplus funds receive a return and those in need get the required capital for investment. Therefore, financial institutions are expected to improve sustainability by easing financial constraints in uncertain times, especially during financial crises. However, banks failed to absorb the repeated financial crisis shocks and were blamed

for causing the global financial crisis of 2008-09. Therefore, this study aims to explore several factors that could contribute to the financial system's sustainability through the efficient allocation of resources and increased profitability. Different ownership types are also linked with varying degrees of agency problems and hence can have a significant impact on CSR spending (Dam & Scholtens, 2012). Therefore, we also compared the state vs. non-state-owned institutions' CSR spending and their influence on the firm's financial performance and investment efficiency.

The present study contributes to the existing literature on CSR/CER in many ways; first, to the best of the authors' knowledge, this is the only study that investigates the linkage between CSR/CER, investment efficiency, and financial performance of China's financial sector from 2010 to 2019. Very few research studies have been conducted on the linkage between CSR and investment efficiency, and these studies have ignored and exempted financial institutions due to their different capital structure (e.g., Lin et al., 2021).

Second, this study examines the influence of a firm's environmental responsibility on investment efficiency and financial performance (ROA). No prior studies have been conducted examining the effect of environmental responsibility on the financial performance and investment efficiency of financial institutions in China. Studies have also shown that financial firms that invest in green technology and projects help manufacturing firms invest in advanced environmentally friendly technology to increase production, reduce carbon emissions, and improve environmental quality (Safi et al., 2021). Therefore, in this study, we compared the firms with high and low environmental responsibility scores to determine whether environmentally responsible firms have better investment efficiency and financial performance.

Third, this study uses Richardson's (2006) model to measure the investment efficiency of financial institutions in China. Additionally, we also determine CSR/CER's impact on investment efficiency and financial performance for China's state- and non-state-owned financial institutions.

The remaining research article is organised as follows: the proceeding section describes the relevant literature, which shapes the theoretical framework and formulation of hypotheses. The following section explains the analytical methods, followed by the empirical results and discussion. Finally, the last part discusses the conclusions and practical implications.

2. Literature review and hypotheses development

Oliver Sheldon introduced CSR in 1924 as an ethical responsibility of firms towards the community while chasing profits. Soon after, a historical debate called Berle-Dodd debate between two American lawyers, E. Merrick Dodd, Jr., and Adolf A. Berle, Jr., started to address the issue of accountability of management to shareholders (Masulis & Reza, 2015) vs. society and shareholders (Deng et al., 2013). This ethical orientation of CSR dominated for a few decades until the committee for economic development (CED) provided a three-faced framework in 1971 in their

publication 'Social Responsibility of Business Corporation'. This framework has an inner circle representing economic function, an intermediate function depicting social responsibilities towards the environment, customers, and employees, and an outer circle to improve the social environment by solving urban problems and poverty.

In the 1980s, the CSR concept shifted from ethical to business orientation. Stakeholder Theory by Edward Freeman was the popular outcome of that decade, which linked business success to its stakeholders' management. Stakeholder Theory fits with CSR and suggests catering to the needs of all stakeholders. Recently, the focus is shifted towards sustainability and sustainable development of firms and society. The European Commission (2001) defined two dimensions of CSR: the internal dimension stresses issues of employees, resource use, and protection of the environment, while the external dimension comprises business partners, customers, and the community. Recently, The International Organization for Standardization (ISO) defined CSR through its ISO 26000 standards as:

> The responsibility of an organization for the impacts of its decisions and activities on society and the environment, resulting in ethical behavior and transparency which contributes to sustainable development, including the health and well-being of society; takes into account the expectations of stakeholders; complies with current laws and is consistent with international standards of behavior; and is integrated throughout the organization and implemented in its relations.

2.1. CSR performance and investment efficiency

Investment efficiency represents the relation between risk & return and the cost of investment management subject to financial and non-financial constraints (Hodgson et al., 2000). Studies conducted on CSR and investment efficiency have shown that there is a positive linkage, and firms that show more responsibility have higher investment efficiency (see, for example, Benlemlih & Bitar, 2018; Bhandari & Javakhadze, 2017; Hai et al., 2022; Samet & Jarboui, 2017; Shahzad et al., 2018; Zhong & Gao, 2017). Moreover, studies have also shown that corporate socially responsible firms are engaged in efficient acquisitions (Deng et al., 2013), have a higher level of persistent earnings (Gregory et al., 2014), lower systemic risk (Cheung, 2016), lower cost of capital (El Ghoul et al., 2011), have a lower cost of debt (Hoepner et al., 2016) and suffer from overinvestment problem (Lin et al., 2021). In addition, several other research studies empirically support a positive relationship between CSR and investment efficiency and financial performance (Attig et al., 2016; Benlemlih & Girerd-Potin, 2017; Boubakri et al., 2016).

CSR can be linked with a firm's investment efficiency in several ways. The present study put forward three key arguments on why a high level of CSR performance can improve investment efficiency. Previous research studies (Cho et al., 2013; Cook et al., 2019; Krüger, 2015) confirm that less information asymmetry and fewer agency costs occur in firms with higher CSR performance. In addition, the Stakeholder Theory (Edmans, 2011; Gao et al., 2014; Khan et al., 2016) supports the existence of a positive association between CSR and a firm's investment efficiency.

2.1.1. Information asymmetry

Prior research has extensively shown that additional-financial information and important non-financial information disclosure decrease information asymmetry and shows the exact condition of the firm's performance. Higher CSR firms disclose more information than lower CSR firms, which helps build and maintain a positive reputation and increases investment efficiency (Anwar & Malik, 2020). Cho et al. (2013) suggests that CSR mitigates earnings management, reduces real operating activities manipulation, and helps to disclose more reliable and transparent information to stakeholders. If high CSR firms are associated with fewer earnings management, higher information quality, and increased transparency, this should be mirrored in their investment efficiency. High CSR performance helps improve a firm's investment efficiency by reducing information asymmetry.

2.1.2. Agency costs

Agency problems occur when managers or controlling shareholders pursue their personal objectives and benefit themselves using the firm's resources. Prior researches find that agency problems among the stakeholders and management, also amongst the minority and controlling shareholders, significantly affect a firm's investment decisions. The firm's managers and controlling shareholders utilise the firm's resources in projects that are beneficial to their personal interests. They favour spending on a project with free cash flow that has a negative net present value and avoids paying out dividends, which results in low investment efficiency. CSR strategies improve employee, shareholder, and community relations, which help enhance good management and improve monitoring and disciplining of managers. Cook et al. (2019) argues that reducing the agency costs of free cash flow mitigates the negative impact of CSR on financial investment inefficiency problems.

2.1.3. Stakeholders' theory

Failing to meet stakeholders' expectations may generate market fears costing potential profit openings for the firm. The firm's adoption of CSR activities pays more attention to various stakeholders (e.g., environment, product characteristics, diversity, and employee relations) in their strategies. Appropriate CSR activities help firms build a decent image and reputation that appeal to diverse stakeholders (Franco et al., 2020; Rhou & Singal, 2020). Edmans (2011) shows that CSR increases managers' incentives and abilities to make efficient investment decisions because firms with better CSR performance focus on long-term value maximisation under the monitoring of different primary firm stakeholders. The study of Gao et al. (2014) argues that firms that show a high level of CSR enjoy stronger reputations, and for managers, it is more difficult to make self-serving decisions under a more implied pact with a wide set of stakeholders. Khan et al. (2016) reveals that stakeholders demand implications of more CSR when they realise that CSR activities can increase value, which enhances the manager's disciplining and monitoring. Following previous research studies as discussed above, this study hypothesises a positive linkage between CSR performance and a financial firm's investment efficiency.

Hypothesis (H1): A firm's corporate social responsibility is positively associated with investment efficiency.

2.2. CSR and firm performance

Previous researches show relatively mixed findings about the influence of CSR on a firm's financial performance and value (Jiang et al., 2021; Lian, 2022; Margolis et al., 2009; Nguyen et al., 2022; Van Beurden & Gössling, 2008). CSR plays a positive role in improving the long-term financial performance of a firm but proves devastating in an industrial or financial crisis (Qiu et al., 2021). Other researchers (Flammer & Kacperczyk, 2016; Galant & Cadez, 2017; Li et al., 2021; Pham & Tran, 2020; Servaes & Tamayo, 2013) also confirm a positive association between CSR and a firm's value and financial performance. Firms are expected to increase their financial performance and value by means of high investment efficiency while responding to the implicit claims of stakeholders and considering their expectations. Research studies have shown that higher CSR performance is associated with a firm's value and profit, partly due to more efficient investments.

Hypothesis (H2): A firm's corporate social responsibility is positively associated with financial performance.

2.3. Firm's environmental responsibility and financial performance

Corporate environmental responsibility is defined as the set of activities to address the negative impacts of the corporation on the environment, promote efficient use of resources, and eliminate waste to improve productivity and sustainability (Mazurkiewicz, 2004). In today's world, the issue of environmental quality has become a major discussion point, as it is linked directly with human lives. Firms are directed to strictly follow environmental regulations to control the problem of environmental degradation and improve environmental quality (Safi et al., 2021). Stakeholders and regulatory uncertainty put pressure on firms to reduce hazardous emissions (Cadez et al., 2019). Following and implementing strict environmental regulations have an influence on the firm's efficiency and performance. Previously conducted research studies on the firm's environmental responsibility and financial performance are contradictory and have two different perspectives. Traditional economists believe that environmental regulations will increase the cost and there will be no benefit to the firms; therefore, it will have an adverse effect on the firm's financial performance (Nguyen et al. (2022). On the other hand, scholars argue that strict environmental regulations will force firms to adopt advanced eco-friendly technology, which will benefit the firm's performance in their production process and help improve the environment (Ervin et al., 2013; Nishitani & Kokubu, 2012). Several empirical investigations have been undertaken to investigate these two views. Some studies have revealed that there is no linkage between the firm's environmental responsibility and financial performance (Clarkson et al., 2011; Dang et al., 2019; Meng et al., 2014). In contrast, some studies conducted have shown that environmentally responsible firms perform better (Abbas et al., 2019; Gregory et al., 2014).

Environmentally responsible firms can build a positive image, which can help them in obtaining easy loans from stakeholders for investments and gain governmental and general community support (Nandy & Lodh, 2012). Moreover, firms with high environmental responsibility will be more productive and efficient by reducing waste and also improving carbon efficiency by adopting advanced eco-friendly technology. However, the greater growth in output compared to carbon efficiency gains leads to an increase in total carbon emission (Cadez & Guilding, 2017). The following hypothesis is developed based on the above discussion.

Hypothesis (H3): A firm's environmental responsibility is positively associated with investment efficiency

Hypothesis (H4): A firm's environmental responsibility is positively linked with financial performance.

3. Data & methodology

3.1. Data and sample

The present study examines the effect of corporate social responsibility (CSR) and corporate environmental responsibility (CER) on the investment efficiency and performance of financial institutions in China. The time span of this study is from 2010 to 2019, represented by the subscript 't' and the financial institutions of China are shown by the subscript 'i'. The reason for choosing the said period is because of the data availability issue. The data collected consists of 55 financial service institutions, 25 banks, and 5 insurance firms listed on the Shanghai and Shenzhen stock exchanges. The financial services firms include financial holding, futures, asset management, credit, leasing, and other diversified financial services firms. The CSR and the firm's environmental responsibility data have been taken from the Hexun database, and the data for the control variables are taken from the China Stock Market and Accounting Research (CSMAR). Our final sample yields 671 firm-year observations. In this study, to reduce the impact of outliers, we winsorize the variables at 1 percent and 99 percent.

3.2. Variables measurement

3.2.1. Measuring investment efficiency

Investment efficiency can be defined as the ability of the firm to undertake profitable projects. Generally, two models are employed to calculate a firm's investment efficiency. The first was proposed by Vogt (1994), which calculated investment efficiency using the investment possibilities (Tobin's Q) and the interactive term of cash flows. The second method to measure investment efficiency is put forward by Richardson (2006), who separated overall investment into expected and non-expected investment. The factors that affect investment include a firm's growth, size, leverage, cash, age, returns, industry, and year-fixed effect. In this study, we measured investment efficiency using Richardson's (2006) method and estimated through the following equation (Eq. (1))

$$Investment_{i,t} = \delta_0 + \delta_1 Growth_{i,t-1} + \delta_2 Size_{i,t-1} + \delta_3 Lev_{i,t-1} + \delta_4 Cash_{i,t-1} + \delta_5 Age_{i,t-1} + \delta_6 R_{i,t-1} + \delta_7 Investment_{i,t-1} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (1)$$

In the above Eq. (1), $Investment_{i,t}$ shows the total investment expenditure of the firm 'I' at the time 't', $Growth_{i,t-1}$ shows the firm's growth measured by the growth rate of the operating income, $Size_{i,t-1}$ shows firms size measured as a log of assets, $Lev_{i,t-1}$ is the debt to equity ratio, $Cash_{i,t-1}$ shows the total cash holding of the firm, $Age_{i,t-1}$ indicates the firm's age which has been taken in log form, $R_{i,t-1}$ indicates the returns of the firm, $Investment_{i,t-1}$ indicates the last year's investment expenditure, industry and year are the dummy variable for industry and year fixed effects, respectively.

Based on the study of Richardson (2006), in Eq. (1), the predicated values give the expected investment in the year t. The positive values of the residuals indicate overinvestment, whereas the negative residuals indicate underinvestment. For the regression analysis in this study, based on the study of Cao et al. (2020), investment efficiency is calculated by the absolute value of the residuals multiplied by −1, where a high value gives higher investment efficiency and shows a lower deviation from the expected investment and vice versa.

3.2.2. Corporate social responsibility (CSR)

There are two CSR ratings (Rankins and Hexun) widely used in the research related to China's capital market. These rankings measure CSR performance and a firm's financial disclosure quality. In this study, we have taken Hexun.com's CSR score as a measure of CSR performance. Hexen's CSR ratings have gained prominence in recent Chinese CSR research (see, for example, An, 2021; Pan et al., 2021; Shou et al., 2020; Zhang et al., 2021). Hexun began releasing yearly CSR ratings in 2010 by using information from the firm's CSR reports and annual reports. This has an advantage over Rankins's CSR ratings, even if a company doesn't publish a separate CSR report, the Hexun database may analyse its CSR actions using data from its annual report.

Several earlier research on business CSR in China relied on Rankins CSR Ratings (RKS), which calculate CSR disclosure ratings purely based on firms' stand-alone CSR reports (see, for example, Li et al., 2013; McGuinness et al., 2017; Xu & Liu, 2017; Zhong & Gao, 2017). Only 21.39 percent of listed businesses in China release stand-alone CSR reports, therefore, this metric may be biased. The CSR disclosure is also lacking. Some companies 'clone' prior years' CSR reports, while others omit unfavourable information (Quan et al., 2015). CSR-based evaluations may be prejudiced. Hexen's CSR ratings may assist avoid the concerns described since they're based on CSR and yearly reports.

3.2.3. Corporate environmental responsibility (CER)

The CER ratings were extracted from the HeXun CSR report in accordance with (An, 2021; Pan et al., 2021). This shows how effectively businesses perform their

environmental obligations and how much they spend on environmental governance. CER actions are evaluated based on five criteria: environmental management system certification, environmental awareness, kinds of sewage, environmental investment, and the number of energy conservation types. The indications are further classified into two categories: numerical and logical. A computation methodology is used to obtain the scores for the numerical indicators. The ratings for the logical indicators are calculated based on qualitative evaluations of CSR filings. Industry-specific adjustments are made to each indicator's weight. For instance, a perfect score for environmental responsibility would be 30 points in the industrial sector, whereas, in the service sector, it would be just 10. The value of CER varies from 0 to 30 according to the Hexun algorithm.

3.2.4. Control variables

The control variables selected in this study are: the firm's growth measured as a change in revenue/loans of the firm divided by the lag of revenue/loans ($Growth_{i,t}$), the firm's size measured as a log of assets ($Size_{i,t}$), leverage ratio ($Lev_{i,t}$) measured as total debt to equity, firm's cash ($Cash_{i,t}$), firm's age ($Age_{i,t}$), and book to market value ($BM_{i,t}$).

3.3. Empirical model

The present study attempts to determine the impact of CSR and the firm's environmental responsibility on investment efficiency and the performance of financial institutions. Following Safi et al. (2022) and Safi et al. (2021), the basic econometric models are given as follows:

$$inveff_{i,t} = \beta_0 + \beta_1 CSR_{i,t} + \sum Controls_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (2)$$

$$ROA_{i,t} = \beta_0 + \beta_1 CSR_{i,t} + \sum Controls_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (3)$$

$$inveff_{i,t} = \beta_0 + \beta_1 CER_{i,t} + \sum Controls_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (4)$$

$$ROA_{i,t} = \beta_0 + \beta_1 CER_{i,t} + \sum Controls_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (5)$$

In the above equations, $inveff_{i,t}$ indicates the investment efficiency of the firm calculated using Eq (1), $ROA_{i,t}$ indicates the returns on assets used as a proxy for the firm's performance, $CSR_{i,t}$ indicates the corporate social responsibility of the firm, $CER_{i,t}$ shows the firm's environmental responsibility, $\sum Controls_{i,t}$ indicates the control variables (i.e., growth, size, leverage, cash, age, the book to market value), $\sum Year$ and $\sum Industry$ are the dummy variables included to capture year and industry fixed effects, whereas $\varepsilon_{i,t}$ indicates the error term.

Table 1. Descriptive statistics.

	N	Mean	Std. dev.	min	p50	Max
CSR	671	39.481	21.670	−11.060	33.210	86.700
CER	671	2.268	3.788	0.000	0.000	26.000
Inveff	612	0.00012	0.1579	−1.052	0.0004	3.0965
Growth	671	1.532	1.190	0.755	1.104	19.094
Size	671	25.409	2.886	19.189	25.311	31.036
Lev	671	0.710	0.228	0.020	0.760	0.966
Cash	671	0.462	5.411	0.000	0.149	138.831
Age	671	2.285	0.745	0.693	2.485	3.367
ROA	671	0.020	0.037	−0.245	0.014	0.346
BM	667	0.805	0.242	0.144	0.907	1.324

Note: CSR is corporate social responsibility, Inveff shows the investment efficiency calculated using Richardson (2006), CER shows the environmental responsibility of the firm, growth shows the growth of the firm calculated as the revenue/loans divided by the lag of revenue/loans, and size shows the firm's size calculated as a log of total assets, cash indicates the cash and short-term investments by lagged total assets, Lev is the leverage ratio calculated using debt to equity ratio, age shows the firm's age, ROA shows the return on assets whereas BM is the book to market value.
Source: Authors.

3.4. Research methods

In this study, we employed the (Driscoll & Kraay, 1998) regression estimator to analyse the data obtained from various sources. The Driscoll and Kraay (DK) analysis method consider the problems of a cross-sectional dependency across firms, autocorrelation, and heteroscedasticity in the panel data. We employed Driscoll Kraay's (DK) regression analysis following the study of (Baloch, Danish, et al., 2019; Baloch, Zhang, et al., 2019) to handle the above-mentioned problems in the data set. Additionally, in the case of missing values, the DK analysis is considered a more effective method to analyse the data. Moreover, studies have also concluded that it's effective both with balanced and unbalanced panel data, which makes it suitable for our analysis. DK analysis method is more useful and offers a wider variety of dimensions due to its non-parametric nature. The DK technique takes the average of the product of independent variables plus residual and uses the results in a weighted HAC method to build a standard error that accounts for cross-sectional dependencies in the data. Therefore, a DK algorithm is employed for fixed effect regression through a linear model. Additionally, as a robustness test, this study employed the two-stage least squares model to deal with possible endogeneity concerns.

4. Empirical results and discussion

4.1. Descriptive statistics

Table 1 shows the descriptive analysis of all the variables. CSR mean value is 39.481, and the minimum value is −11.060, indicating the firms that show the least corporate social responsibility, whereas the maximum value of 86.700 indicates the most CSR firm. This indicates that the distribution is right-sided. The mean value of corporate environmental responsibility (CER) is 2.26, with a minimum value of 0, indicating the least environmentally responsible firms, whereas the maximum value of 26 indicates the most environmentally responsible firms. The mean value of investment

Table 2. Correlation analysis.

	CSR	Inveff	CER	Growth	Size	Lev	Cash	Age	ROA	BM
CSR	1.000									
Inveff	0.096**	1.000								
CER	0.772***	0.005	1.000							
Growth	0.189***	0.227***	0.048	1.000						
Size	0.370***	−0.206***	0.075*	−0.564***	1.000					
Lev	−0.237***	−0.170***	0.016	−0.550***	0.832***	1.000				
Cash	0.031	0.426***	0.029	−0.011	−0.023	−0.004	1.000			
Age	−0.098**	0.060	−0.045	0.204***	−0.170***	−0.209***	0.025	1.000		
ROA	0.205***	0.095**	0.079**	0.264***	−0.206***	−0.317***	0.031	0.118***	1.000	
BM	0.200***	−0.203***	0.026	−0.883***	0.782***	0.708***	0.015	−0.203***	−0.257***	1.000

Note: Asterisks *** indicate a 1% significance level, ** indicates a 5% significance level, and * indicate a 10% significance level.
Source: Authors.

efficiency is 0.017, with a minimum value of −1.052, indicating the firm's under-investment, and a maximum value of 3.097, which indicates over-investment. A value closer to zero indicates high investment efficiency, and the mean value of 0.017 indicates that financial firms are highly efficient or slightly over-investing. The descriptive statistics indicate that investment efficiency is positively skewed. The descriptive analysis is provided in Table 1.

4.2. Correlation analysis

The correlation analysis matrix of the main variables is given in Table 2. The results show that there is a significant positive association between CSR and investment efficiency, with a coefficient value of 0.096. The results also show that a firm's performance is positively and significantly correlated with CSR, with a coefficient value of 0.205. The results for environmental responsibility show a positive correlation between ROA and the firm's environmental responsibility with a coefficient value of 0.095, whereas the relation between investment efficiency and the environmental responsibility of the firm is insignificant. These results obtained preliminarily prove our hypothesis.

4.3. Univariant analysis

Before proceeding with the regression analysis, we performed the univariant analysis. We divided the firms into two groups based on their CSR score, corporate socially irresponsible firms if the CSR of the firm is less than the average CSR of the industry, and corporate socially responsible firms if the value of the firm's CSR score is greater than the industry mean. The results in Table 3 show that firms that are socially responsible have an overall investment efficiency of 0.001. However, the difference is insignificant. The results also indicate that firms have better returns on assets if they exhibit corporate social responsibility. Regarding environmental responsibility, firms with high investment efficiency and returns show higher responsibility towards the environment.

Table 3. Univariant analysis.

	Corporate socially Irresponsible firms (1)		Corporate socially responsible firms (2)		
	N	Mean	N	Mean	Difference Test (1) − (2)
CSR	338	25.757	333	53.412	−27.655***
Inveff	299	0.002	308	−0.001	0.003
CER	338	0.869	333	3.688	−2.819***
Growth	338	1.273	333	1.787	−0.515***
Size	338	24.135	333	26.702	−2.567***
Lev	338	0.640	333	0.782	−0.142***
Cash	338	0.306	333	0.620	−0.314
Age	338	2.303	333	2.266	0.037
ROA	338	0.018	333	0.022	−0.005
BM	335	0.739	332	0.872	−0.132***

Note: Asterisks *** indicate a 1% significance level.
Source: Authors.

Table 4. CSR, investment efficiency, and performance.

	(1) Inveff	(2) Inveff	(3) ROA	(4) ROA
CSR	0.0014***	0.0015***	0.0003***	0.0006***
	(0.0003)	(0.0001)	(0.0001)	(0.0001)
Size		0.0863***		0.0235***
		(0.0103)		(0.0056)
Lev		−0.0320*		−0.0746***
		(0.0180)		(0.0100)
Cash		−0.0152***		−0.0070***
		(0.0046)		(0.0027)
Age		0.0023		0.0022
		(0.0040)		(0.0023)
BM		0.0825***		0.0436***
		(0.0200)		(0.0148)
Growth		0.0483***		0.0103***
		(0.0030)		(0.0034)
_cons	0.1176***	−0.1011***	0.0180***	−0.0014
	(0.0261)	(0.0190)	(0.0062)	(0.0168)
Industry & Year FE	Yes	Yes	Yes	Yes
N	612	550	671	550
adj. R2	0.067	0.594	0.061	0.222

Note: Asterisks *, and *** give the significance level at 10, and 1 percent, respectively.
Source: Authors.

4.4. Empirical analysis

Table 4 gives the regression analysis performed to determine the influence of CSR on the investment efficiency and financial performance (ROA) of financial institutions. The results of models (1) and (2) confirm a significant positive association between CSR and investment efficiency with coefficients of 0.0014 and 0.0015, respectively. Similarly, models (3) and (4) show that CSR performance is positively linked with a firm's performance with coefficient values of 0.0003 and 0.0006, respectively. These results indicate that firms that exhibit social responsibility perform better as high CSR performance is related to better financial channels, a rise in investment, extension in a trade credit period, and low default risk. Therefore, firms that exhibit high CSR performance have more investment opportunities due to an advantage in

Table 5. Environmental responsibility, investment efficiency, and performance.

	(1) Inveff	(2) Inveff	(3) ROA	(4) ROA
CER	0.0031***	0.0011**	0.0018***	0.0037***
	(0.0006)	(0.0005)	(0.0004)	(0.0006)
Size		0.0011***		0.0277***
		(0.0102)		(0.0059)
Lev		−0.0459***		−0.0599***
		(0.0174)		(0.0103)
Cash		−0.0043*		−0.0087***
		(0.0024)		(0.0028)
Age		0.0028		0.0024
		(0.0034)		(0.0024)
BM		0.0420**		0.0477***
		(0.0179)		(0.0156)
Growth		0.0153***		0.0083**
		(0.0033)		(0.0035)
_cons	0.0654***	−0.0487***	0.0184***	0.0124
	(0.0230)	(0.0243)	(0.0017)	(0.0171)
Industry & Year FE	Yes	Yes	Yes	Yes
N	612	550	671	550
adj. R2	0.041	0.3214	0.005	0.142

Note: Asterisks ***, **, and * give the significance level at 1, 5, and 10 percent, respectively.
Source: Authors.

financing and cost (El Ghoul et al., 2019). The results obtained are also in line with earlier research (Benlemlih & Bitar, 2018; Gonenc & Scholtens, 2019; Lin et al., 2021; Liu & Tian, 2021).

These results are in line with hypotheses H1 and H2. Therefore, we conclude that corporate social responsibility helps the firm increase its investment efficiency and performance.

Table 5 shows the regression results for the firm's environmental responsibility, investment efficiency, and return on assets (ROA) taken as a proxy for the firm's performance. In Table 5, models (1) and (2), show that there is a significant positive linkage between a firm's environmental responsibility and investment efficiency with coefficients of 0.0031 and 0.0011, respectively. Similarly, models (3) and (4) show that there is a positive association between environmental responsibility and a firm's performance, with coefficients of 0.0018 and 0.0037, respectively. The results can be explained by the fact that firms with high environmental responsibility invest in green projects and adopt advanced and environmentally friendly technology. This makes their production process more efficient and, in turn, improves the firm's growth and returns. Moreover, studies have also shown that financial firms that invest in green technology and projects to help other firms invest in environmentally friendly technology, increase production, reduce carbon emissions and improve environmental quality (Safi et al., 2021). These findings are also in line with our hypotheses H3 and H4 that environmentally responsible firms show better efficiency and performance.

The results shown in Tables 4 and 5 support the view that spending in CSR supplements advertising, conveying a better product quality through differentiation, reducing agency problems and conflict between the firm's managers or controlling shareholders and non-investing stakeholders, which helps in increasing performance (Falck & Heblich, 2007; Harjoto & Jo, 2011; Khediri, 2021). At the same time, the results are inconsistent with the view that CSR spending is utilised for value-

Table 6. Regression analysis for state-owned and non-state-owned enterprises.

	State-owned firm's		Non-state-owned firms	
	(1) Inveff	(2) ROA	(3) Inveff	(4) ROA
CSR	0.0011***	0.0003***	0.0017***	0.0009***
	(0.0002)	(0.0001)	(0.0003)	(0.0001)
Size	0.0587***	0.0111	0.0318**	0.0406***
	(0.0159)	(0.0082)	(0.0145)	(0.0087)
Lev	−0.0236	−0.0877***	0.0088	−0.0750***
	(0.0240)	(0.0112)	(0.0258)	(0.0164)
Cash	−0.0144***	−0.0031	0.0898***	−0.0315***
	(0.0049)	(0.0026)	(0.0137)	(0.0088)
Age	0.0089*	0.0067**	0.0015	−0.0047
	(0.0053)	(0.0028)	(0.0055)	(0.0036)
BM	−0.0264	0.0215	0.1269***	0.0318
	(0.0301)	(0.0288)	(0.0268)	(0.0219)
Growth	0.0040	−0.0094	0.0532***	0.0136***
	(0.0089)	(0.0112)	(0.0033)	(0.0043)
_cons	0.0525	0.0486	−0.1436***	−0.0085
	(0.0369)	(0.0376)	(0.0270)	(0.0234)
Industry & Year FE	Yes	Yes	Yes	Yes
N	233	233	317	317
adj. R^2	0.181	0.305	0.737	0.263

Note: Asterisks ***, **, and * give the significance level at 1, 5, and 10 percent, respectively.
Source: Authors.

destroying activities (Barnea & Rubin, 2010; Jensen & Meckling, 1976; Pagano & Volpin, 2005; Surroca & Tribó, 2008).

4.5. Further analysis

Table 6 provides the results for state-owned enterprises and non-state-owned enterprises. The findings of models (1) and (2) for state-owned enterprises show that there exists a significant positive linkage between CSR, investment efficiency (Inveff), and financial performance (ROA) with a coefficient of 0.0011 and 0.0017. Similarly, models (3) and (4) show results for non-state-owned firms. The results show a significant positive association between CSR, investment efficiency, and performance (ROA), with a coefficient value of 0.0017 and 0.009. The coefficient values for non-state-owned are higher than for state-owned enterprises, indicating that CSR's effect on non-state-owned firms is higher. The possible logical reasoning for this could be that state-owned enterprises invest in projects that benefit the community and are not concerned by the outcome as the government supports the projects. In contrast, non-state-owned firms invest in CSR activities to enhance their investment, growth, and returns.

4.6. Robustness check

To further robust test the results and control for the issue of endogeneity in this research study, we perform the two-staged least square method (2SLS). Based on the previous studies of Al Mamun et al. (2020), Chun et al. (2019), and Shahab et al. (2020), this study uses the mean values of province CSR as an instrumental variable to perform the 2SLS test for endogeneity, and no prior research study suggests that

Table 7. Robustness check 2SLS results.

	(1) CSR	(2) Inveff	(3) ROA	(4) Inveff	(5) ROA
Province_CSR	0.1779***				
	(0.0318)				
CSR		−0.0014***	0.0006***		
		(0.0005)	(0.0001)		
CER	4.2175***			0.0010**	0.0004***
	(0.1428)			(0.0005)	(0.0002)
Size	3.3557***	0.1466***	0.0268***	0.1409***	0.0320***
	(0.3426)	(0.0107)	(0.0068)	(0.0108)	(0.0071)
Lev	−9.3026**	−0.0543***	−0.0817***	−0.0615***	−0.0712***
	(3.8546)	(0.0183)	(0.0116)	(0.0182)	(0.0120)
Cash	0.0614	−0.0249***	−0.0082***	−0.0228***	−0.0106***
	(0.0754)	(0.0047)	(0.0030)	(0.0047)	(0.0031)
Age	−0.8609	0.0030	0.0016	0.0024	0.0020
	(0.6198)	(0.0040)	(0.0026)	(0.0041)	(0.0027)
BM	1.0915	0.1375***	0.0637***	0.1257***	0.0787***
	(1.0840)	(0.0301)	(0.0191)	(0.0300)	(0.0197)
Growth	2.8866***	0.0610***	0.0174***	0.0612***	0.0175***
	(1.0840)	(0.0066)	(0.0042)	(0.0066)	(0.0043)
_cons	−1.1241***	−0.1406***	−0.0274	−0.1342***	−0.0332
	(0.2963)	(0.0312)	(0.0198)	(0.0314)	(0.0207)
Year & Industry FE	Yes	Yes		Yes	Yes

Note: Asterisks **, and *** give the significance level at 5 and 1 percent, respectively.
Source: Authors.

CSR of firms in the same province will affect the investment efficiency and performance of firms there we can say that the instrument variable is exogenous. Table 7 shows the results for 2SLS, model (1) shows the first stage results for CSR and the instrumental variable, and Models (2) and (3) show the second stage results for CSR, investment efficiency (Inveff), and financial performance (ROA). Similarly, Models (4) and (5) show the second-stage results for CER, investment efficiency (Inveff), and financial performance (ROA). The results obtained using the 2SLS technique are similar to previous results presented in Tables 4–6. This further verifies that the results are consistent with hypotheses H1-H4.

4.7. Discussion

There is much debate surrounding corporate social responsibility (CSR) and whether or not it is a worthwhile endeavour for businesses. The results of our study show that CSR and Corporate Environmental Responsibility (CER) positively influence the investment efficiency and performance of the firm. The results confirm and are in line with the first school of thought that CSR is a win-win situation for the company because it can help the company build a good reputation, attract and retain talent, and improve its bottom line. In contrast, the second school of thought is that CSR is value-destroying because it can lead to a loss of focus on the company's core business, decreased shareholder value, and increased regulation. A company that is seen as being socially responsible can build a good reputation with consumers, employees, and other stakeholders. This can help to attract and retain talent, as employees are increasingly looking for companies that align with their values. In addition, CSR can help to improve a company's bottom line by increasing sales, reducing costs, and

improving employee productivity. This supports the view that spending in this area can supplement advertising and convey better product quality to consumers through differentiation. Additionally, they suggest that CSR can help to reduce agency problems and conflicts between managers, controlling shareholders, and non-investing stakeholders, ultimately leading to increased performance (Falck & Heblich, 2007; Harjoto & Jo, 2011; Khediri, 2021; Liu & Tian, 2021; McGuinness et al., 2017; Siegel & Vitaliano, 2007). The main reason why investing in corporate social responsibility (CSR) is often seen as being better than not doing it is because of the potential reputational benefits that can be gained. In today's business world, customers and stakeholders are more interested in understanding if the firms they do business with are functioning in a socially responsible way. For example, people may want to know if the firm is involved in environmentally-friendly operations, whether it supports charity organisations, or whether it treats its workers fairly. Suppose a firm can show that it is functioning in a socially responsible way. In that case, this may provide it with a competitive edge in terms of recruiting and maintaining customers and other stakeholders and attracting more investment. Additionally, it can help build the company's brand and reputation, leading to further financial benefits. Overall, this study's results show that CSR and CER positively influence both performance and investment efficiency, and the potential benefits of investing in CSR tend to outweigh the risks. For companies serious about building a positive reputation and doing business sustainably, CSR should be seen as an essential part of their strategy.

5. Conclusions and recommendations

In this study, we investigated the effect of CSR on a firm's investment efficiency and performance (ROA) for China's financial firms listed on the Shanghai and Shenzhen stock markets from 2010 to 2019. We also investigated the effect of environmental responsibility on the firm's investment efficiency and performance. The findings show CSR enhances a firm's investment efficiency and financial performance (ROA). Additionally, firms that exhibit environmental responsibility have better investment efficiency and ROA. This shows that firms that invest in environmentally friendly technology and projects have better outcomes in terms of their investment and returns. The findings demonstrate a significant positive relationship between a firm's environmental responsibility, investment efficiency, and ROA. Furthermore, the findings reveal that the association between CSR, environmental responsibility, investment efficiency, and performance is greater for non-state-owned than for state-owned enterprises. This shows that state-owned enterprises invest in projects that benefit the community and are not concerned by the outcome as the government supports these projects. The two-stage least square method (2SLS) further verifies the results obtained using regression analysis. Our findings support the theory that spending in CSR supplement advertising, conveying better product quality through differentiation, and reducing agency problems and conflict between managers, controlling shareholders, and non-investing stakeholders, which help in increasing performance while being inconsistent with the theory that CSR spending is utilized for value-destroying

activities (Barnea & Rubin, 2010; Jensen & Meckling, 1976; Pagano & Volpin, 2005; Surroca & Tribó, 2008).

The findings of this research study are useful to policymakers, managers, and regulators. Based on the findings of this research study, the policy implications are reported below:

1. The positive correlation between CSR performance and investment efficiency indicates that engaging in CSR activities increases investment efficiency and is a viable option for gaining a competitive advantage for a business. Firms should focus on adapting to high corporate social responsibility standards, which will improve their investment efficiency and performance. Managers can take the findings of this study and adapt CSR for better performance. Managers should strategically consider CSR performance because it helps reduce agency problems and conflicts with stakeholders and build a reputation as socially and environmentally responsible firms that can help improve financial performance and long-term sustainability.
2. The positive linkage between CSR/CER and investment efficiency reveals to managers that adopting CSR/CER strategies is an efficient strategy to promote firms' development and safeguard the interests of various stakeholders. Therefore, businesses should include social and environmental considerations, such as employment quality, natural resource reduction, safety and health, human rights, and carbon emission reduction, into their operations, which may be a source of competitive advantage.
3. Considering the corporate environmental responsibility average score of 2.268 for Chinese listed financial firms, which is on the lower side, the environmental responsibility of Chinese businesses is still inadequate. The findings of this study indicate that the cost of enterprises acting in an environmentally responsible manner is less than the competitive advantages it provides to the firm. This indicates that corporate environmental responsibility is crucial to the sustainable growth of businesses. Firms should engage in environmental protection activities not just for moral or legal grounds but also to increase the efficiency of their investments.
4. Based on this study's findings, firms should follow environmental regulations and adapt to advanced eco-friendly technology, which will enhance the firm's growth, investment efficiency, and returns. Moreover, enhancing resources and production efficiency are only required and not a sufficient precondition for reducing pollution. This is especially important for rapidly developing nations like China, where efficiency improvements are often offset by production increases, leading to an increase rather than a decrease in overall emissions (Cadez & Guilding, 2017).
5. Policymakers and regulators can make strict policies for firms to adapt to strict environmental and CSR standards. This will improve the environment and also improve the performance of the firms.
6. Increasing environmental awareness among consumers is also beneficial to the role of corporate social and environmental responsibility. The national

government should promote environmental protection publicity in order to connect environmental knowledge with culture in China and foster environmental awareness among the public.

The following are the study's limitations, which sets directions for future research studies. First of all, the present study is only focussed on financial firms operating in China, and future research studies can extend the scope by taking into account other countries' financial firms and comparing developed and developing countries. Second, this analysis focuses only on the influence of CSR and CER on investment efficiency and financial performance; it would be useful to add other corporate characteristics, such as corporate governance, that influence investment efficiency. This study may be expanded by incorporating corporate governance procedures like the board of directors, institutional investors, and auditor monitoring in future research. Lastly, future studies can also empirically analyse the mechanism or channels through which CER/CSR influences investment efficiency and performance.

Author's contributions

Conceptualization, AS and YC; methodology, AS, MA and AQ; software, AQ and MA; validation, AQ, YC and SW; formal analysis, AS and AQ; investigation, AS and AQ; resources, YC; data curation, AQ and AS; writing—original draft preparation, AQ and SW; writing—review and editing, AQ, AS and YC.; visualisation, AS; supervision, YC; project administration, AS, AQ and YC.

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Data availability statement

The datasets used for this study's analysis can be obtained from the Wind Financial database [https://www.wind.com.cn/en/wft.html], and China Stock Market Accounting Research (CSMAR) can be accessed at www.gtadata.com. The CSMAR and WIND data in this study are used under a licence and are subject to restrictions. The data are available from the authors with the permission of CSMAR and WIND.

Disclosure statement

No potential conflict of interest was reported by the authors.

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