Does corporate social responsibility disclosure improve firm investment efficiency?
Evidence from China

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Abstract

Purpose – The purpose of this paper is to investigate the impact of corporate social responsibility (CSR) disclosure on firm-level investment efficiency.

Design/methodology/approach – An econometric model is used to estimate the impact of CSR reporting on investment efficiency on a sample of listed Chinese firms during the period from 2010 to 2013. Financial reporting quality is included in the model as a control variable. Investment efficiency is estimated based on existing models. Two scenarios are identified: under-investment and over-investment.

Findings – The results provide evidence of a higher level of investment efficiency for CSR reporting firms than for non-reporting firms. This relationship is, however, more pronounced in the over-investment scenario than in the under-investment scenario. In addition, the association between CSR disclosure and investment efficiency is stronger for firms with lower financial reporting quality (FRQ). These findings support the hypothesis that CSR disclosure provides effective incremental information that contributes to reduce information asymmetry and promote investment efficiency.

Originality/value – This is the first paper that directly tests the association between CSR disclosure and firm-level investment efficiency. The results suggest that firms and investors should consider the effect of CSR disclosure on information asymmetry and its impact on the availability and cost of capital. This work also contributes to the understanding of the economic impacts of CSR disclosure and provides arguments for regulatory entities to enforce CSR disclosure.

Keywords Disclosure, Corporate social responsibility, Investment efficiency

Paper type Research paper

1. Introduction

Previous literature suggests an association between the quality of a firm's financial reporting and investment efficiency (Bushman and Smith, 2001; Healy and Palepu, 2001; Biddle and Hilary, 2006; Lambert *et al*, 2007; McNichols and Stubben, 2008; Biddle *et al.*, 2009; Chen *et al.*, 2011; Chen *et al.*, 2011; Gomariz and Ballesta, 2014). Many of these studies estimate accounting quality measures using models that consider discretionary accruals as proxies for accruals quality and earnings management.

In this paper, we examine the impact of corporate social responsibility (CSR) disclosure on investment efficiency. More specifically, we investigate if Chinese firms that issue CSR reports exhibit a higher level of investment efficiency than firms that do not issue CSR reports.

The impact of financial reporting quality on investment efficiency results from the reduction in information asymmetry, and improvement of the moral hazard, adverse selection and agency problems (Healy and Palepu, 2001; Lambert *et al.*, 2007). Higher financial reporting quality allows capital constrained firms to more easily attract capital by making their investment activity more visible, and reduce adverse selection in the issuance of securities. In addition, higher financial performance quality increases investors' ability to monitor managerial investment activity and reduces managerial incentives to over-invest.

Another line of research shows that CSR disclosure is associated with more accuracy in analysts' forecasts and lower cost of capital (Vanstraelen and Zarzeski, 2003; Aerts *et al.*, 2008; Sharfman and Fernando, 2008; Dhaliwal *et al.*, 2011, 2012, 2014; Hung *et al.*, 2013). This research suggests that CSR disclosures contribute to a reduction in information asymmetry and therefore contribute to a reduction in the cost of capital.

Our study is applied to a sample of firms listed in the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE) during the period from 2010 to 2013. China is a unique setting for this study for three reasons. First, CSR disclosure has recently become mandatory for some Chinese firms. In December of 2008, the China Securities Regulatory Commission (CSRC) mandated certain firms listed in the SHSE and SZSE to issue stand-alone CSR reports along with the annual reports[1]. Second, the CSRC provided detailed guidelines on the reports content[2]. Although many companies in the USA follow the Global Reporting Initiative (GRI) guidelines, CSR disclosure in the USA is mostly voluntary, and there is some discretion left regarding what information companies include in the report, making the comparison across companies less relevant. There is evidence that mandatory adoption of financial disclosure, such as the International Financial Reporting Standards (IFRS), creates more information externalities due to comparability across companies, self-selection issues related to voluntary disclosure and higher level of knowledge and understanding of the disclosures by investors (Daske *et al.*, 2008; Li, 2010; Hung *et al.*, 2013; Wang, 2014). From 46 firms issuing CSR reports which contained little material information in 2007, this number increased to 582 in 2009, with much higher levels of materiality in the reports content, as required by the mandate. Third, environmental and social issues are a major concern in China, and likely to significantly impact firms' investment decisions and firm value. Therefore, China provides a unique setting for the study of the impact of CSR disclosure on information asymmetry and investment efficiency.

Following previous studies on investment efficiency (Chen *et al.*, 2011; Gomariz and Ballesta, 2014; Li and Liao, 2014), we calculate the normal investment level based on the model by Biddle *et al.* (2009) and use the deviation from the normal level as a proxy for investment efficiency. Subsequently, we investigate the influence of CSR disclosure on investment efficiency under the over-investment and under-investment scenarios. We find a positive association between CSR disclosure and investment efficiency. When we break the sample for the over-investment and under-investment scenarios, we find that this relationship is significant for firms that over-invest, but not for firms that under-invest. We argue that this result may be related to the use of additional resources in CSR activities required by non-stakeholders of the firms, as a result of mandatory CSR disclosures making public substantial information about the firm's CSR activities, as suggested by Hung and Wang (2014).

Additionally, we hypothesize that the relationship between CSR disclosure and investment efficiency may be influenced by the financial reporting quality of the firm. The information role of CSR disclosure is likely to be less important for firms with high financial disclosure quality, as the problem of information asymmetry is less pronounced. The results confirm our prediction by showing a significant relationship between CSR disclosure and

investment efficiency for the sample of firms with low financial disclosure quality, but not for the sample of firms with high financial disclosure quality. We conclude that the incremental information provided by CSR disclosure beyond what is provided by financial reports contributes to an increase in investment efficiency.

Our work contributes to the literature that studies the economic consequences of CSR disclosure. Previous studies present empirical evidence on the relationship between CSR disclosure and the cost of capital cost, analyst coverage and forecast accuracy (Hung *et al.*, 2013; Dhaliwal *et al.*, 2011, 2012). We show that CSR disclosure also contributes for an increase in investment efficiency. Therefore, our results suggest that CRS disclosure leads to a decrease in information asymmetry.

This paper also contributes to the study of the impact of the 2008 CSR disclosure mandate in China. Hung and Wang (2014) find a negative market reaction at the date of the announcement of the mandate, and higher input costs and lower capital expenditures following the mandate. Hung *et al.* (2013) find that mandatory CSR reporting firms experience a decrease in information asymmetry following the mandate. Our results are in line with the conclusions reached by Hung *et al.* (2013) in that mandatory CSR disclosure in China resulted in a decrease in information asymmetry.

Finally, our study contributes to the understanding of the connection between non-financial disclosure and financial disclosure. Our results suggest a complementary role of CSR disclosure, because it further contributes to resolve information asymmetry beyond the reduction that results from the information provided by financial reporting. The higher is the level of financial reporting quality, the lower is the informational role of CSR disclosure, and vice-versa.

The rest of the paper proceeds as follows. Section 2 reviews previous literature and presents the hypotheses development. Section 3 describes the data, variables definition and empirical model. Section 4 presents the empirical results. Section 5 reports the robustness checks and Section 6 presents the main conclusions of the paper.

2. Previous literature and hypothesis development

Financial theory predicts that firms can achieve optimal investment levels in a world without frictions (Modigliani and Miller, 1958). However, both theoretical and empirical literature shows that there are frictions that lead to investment inefficiency. The most important frictions generally considered, moral hazard and adverse selection, are caused by information asymmetry between managers and outside investors. These imperfections can lead firms to under-invest (invest less than the optimal level) or over-invest (invest more than the optimal level).

Under the moral hazard model, private information held by managers, the conflict of interests between management and shareholders and the lack of monitoring of managers, may lead to managers trying to maximize their personal welfare and invest more than the optimal level by making investments that are not suitable for shareholders (Jensen, 1986; Jensen and Meckling, 1976). Under the adverse selection model, managers are better informed than outside investors and have incentives to issue capital when a firm is overvalued. Rational investors anticipate this tendency and are likely to ration and raise the cost of capital, which will lead to financial constraints and under-investment (Stiglitz and Weiss, 1981; Lambert *et al.*, 2007; Biddle *et al.*, 2009).

In this sense, any factors that contribute to reduce information asymmetry also contribute to improving investment efficiency. Control mechanisms, such as financial reporting quality, could enable better supervision of managerial activities and attenuate information asymmetries and information risk (Healy and Palepu, 2001; Hope and Thomas,

2008). In addition, a large body of literature suggests that firms with higher level of financial reporting quality (FRQ) have higher investment efficiency, and FRQ is efficient in reducing information asymmetry in the market (Biddle *et al.*, 2009; Biddle and Hilary, 2006; Cheng *et al.*, 2013; Gomariz and Ballesta, 2014). Our predictions follow this viewpoint and rely on the assumption that a firm's investment efficiency is inversely related to information asymmetry.

Previous literature provides mixed views regarding the effectiveness of the information provided by CSR disclosures. While some studies cast doubts about this effectiveness (Marquis and Qian, 2014), others provide evidence that non-financial disclosures, including CSR disclosures, can provide significant incremental information that is used by rational market participants and, therefore, contribute to reduce information asymmetry. For example, Aerts *et al.* (2008), use a sample of firms in Europe and North America to show that the accuracy of analysts' earnings forecasts is higher for firms with environmental disclosures. Vanstraelen and Zarzeski (2003) provide evidence of a similar relationship for firms with higher levels of nonfinancial disclosures. Dhaliwal *et al.* (2012) find that the issuance of stand-alone CSR reports is associated with better analysts' forecast accuracy, but this relationship is stronger in stakeholder-oriented countries and when there is more opaque financial disclosure, suggesting a complementary role between CRS disclosures and financial disclosures. Hung *et al.* (2013) compare the information asymmetry level of listed firms in China around the adoption of mandatory CSR disclosure policy and find that information asymmetry declines significantly after the mandate.

In addition, previous studies find that CSR disclosure is associated with a reduction in a firm's cost of capital (Sharfman and Fernando, 2008; Dhaliwal *et al.*, 2011, 2014), further suggesting an informative role of CSR disclosures. Building on the aforementioned evidence, our first hypothesis is:

H1. CSR reporting firms exhibit a higher level of investment efficiency than non-reporting firms.

While CSR disclosure may contribute to decrease the information asymmetry problem, some studies argue that excess CSR demand by non-shareholders may harm firms in several ways (Heinkel *et al.*, 2001; Moser and Martin, 2012). One of the arguments discussed in the literature is the competition for resources between CSR activities and other activities in the company. CSR may lead to internalizing social costs and resource reallocation inside the firm. In addition, CSR disclosure creates pressure for companies to invest in environmental and social activities. Hung and Wang (2014) find that after the 2008 mandate for CSR disclosure from the CSRC, CSR reporting firms in polluting industries have lower capital expenditures, firm value and worst financial performance. These findings suggest that firms may have to undertake additional environmental protection activities to satisfy public stakeholder demands as a result of CSR disclosure.

The impact of additional demand for resources for CSR activities will, however, be different in the under and over-investment scenarios. In the case of an under-investment scenario, where information asymmetry and adverse selection result in an increase in the cost of capital and financial constraints, the allocation of additional resources to environmental and social activities is more critical. CSR disclosure provides incremental information that contributes to reduce information asymmetry and bring outside funding from capital suppliers. However, additional CSR demands caused by CSR disclosures may compete for these funds. Therefore, the effect of CSR disclosure is a "double-edged sword" in the under-investment scenario. On one hand, CSR disclosure will result in additional outside

funding, and, on the other, this funding will also be used by the incremental CSR demands of non-stakeholders.

In an over-investment scenario, the additional spending in CSR activities created by CSR disclosure may actually contribute to a decrease in investment excess, and to move toward the optimal investment level (Gomariz and Ballesta, 2014). In an under-investment scenario, while the resolution of information asymmetry associated with CSR disclosure will move the investment level toward the optimal level, this additional spending may move the investment level in the opposite direction, offsetting some of the initial improvement in investment efficiency. Therefore, we hypothesize that CSR disclosure is positively associated with a higher level of investment efficiency, but this relationship will be weaker in the under-investment scenario and stronger in the over-investment scenario. The second hypothesis is:

H2. The relationship between CSR reporting and investment efficiency is more pronounced in the over-investment scenario.

As mentioned earlier, previous literature provides support to the view that higher financial reporting quality can improve corporate investment efficiency through a reduction in information asymmetry (Biddle *et al.*, 2009; Chen *et al.*, 2011). If the firm provides enough information to capital suppliers through the traditional information channel, the problem of information asymmetry between firms and capital suppliers will be negligible. In this case, the additional information provide by CSR disclosure may not be significant in resolving the information asymmetry problem. We, therefore, expect that the informational effect of CSR disclosure is lower in higher FRQ firms. Our last hypothesis is the following:

H3. The impact of CSR disclosures on investment efficiency decreases with FRQ.

3. Research design
3.1 Data and sample selection
To select our sample, we considered all firms listed on the SHSE and the SZSE during the period from 2010 to 2013. We selected the sample starting period of 2010 because disclosures previous to the CSR disclosure mandate of 2008 suffer from the lack of materiality and self-selection problems associated with voluntary disclosure, and because we use lag independent variables in our empirical model to avoid contemporaneous endogenous problems. The information regarding CSR disclosures was obtained from RKS, a firm specializing in ranking CSR reports for listed Chinese companies[3]. The financial data were obtained from the China Securities Market and Accounting Research (CSMAR) database.

The initial sample consists of 9,088 firm-year observations. After removing observations with incomplete data, firms labeled as Particular treatment (PT) and Special treatment (ST)[4] and financial firms, the final sample includes 6,546 firm-year observations, 1,675 of which are CSR reporting observations and 4,871 are non-reporting observations. About 74 per cent of the CSR reporting sample (or 1,240 firm-year observations) are associated with the CSR reporting mandate, and the remaining result from voluntary CSR reporting. To exclude the impact of outliers, we winsorize each continuous variable at the 1 and 99 per cent levels of their distribution.

3.2 Model specification and variable measures
To estimate the effect of CSR disclosure on investment efficiency, and following previous literature (Li and Liao, 2014; Chen *et al.*, 2011), we estimate the model:

$$Inveff_{i,t} = \beta_0 + \beta_1 CSRreporting_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 Age_{i,t-1} + \beta_4 TANG_{i,t-1}$$
$$+ \beta_5 Slack_{i,t-1} + \beta_6 LEV_{i,t-1} + \beta_7 ROA_{i,t-1} + \beta_8 FRQ_{i,t-1}$$
$$+ \sum Industry\ dummies + \varepsilon_{i,t} \tag{1}$$

where *Inveff* represents investment efficiency, *CSRreporting* is a dummy variable equal to 1 if the firm issues a CSR report, *Size* is the firm size calculated as the natural logarithm of total assets, *Age* is the natural logarithm of the firm's listing time, *TANG* is assets tangibility measured as the ratio of fixed assets to total assets, *Slack* controls for financial resources or financial constraints and is measured as the ratio of cash to fixed assets, *LEV* is the ratio of total liabilities to total assets, *ROA* is the ratio of income before extraordinary and discontinued operations on total assets and *FQR* measures financial reporting quality. These control variables represent factors that may influence investment efficiency.

Following Li and Liao (2014) and Chen *et al*. (2011), *Inveff* is calculated as the absolute value of the residuals from the model of Biddle *et al*. (2009). This model estimates normal level of investment as:

$$Invest_{i,t} = \beta_0 + \beta_1 NEG_{i,t-1} + \beta_2 Growth_{i,t-1} + \beta_3 NEG_{i,t-1} \times Growth_{i,t-1} + \varepsilon_{i,t} \tag{2}$$

where *Invest* is the firm's investment expenditure in year t divided by the beginning-of-year book value of assets and multiplied by 100, *NEG* is as a dummy variable equal to 1 for negative sales growth and 0 otherwise and *Growth* is the lagged sales growth. We estimate the model in a cross-sectional manner for each year and industry. The variable *Inveff* is then calculated from the residuals of the model. Under-investment scenarios are defined by negative residuals and over-investment scenarios by positive residuals. We take the absolute value of the residuals and multiply it by -1 to change the dependent variable into a positive index, such that higher values correspond to higher levels of investment efficiency.

Following previous works (Chen *et al*., 2011; Gomariz and Ballesta, 2014), the variable *FRQ* is estimated using two different models[5]. *FRQ_DD* is calculated as the absolute value of residuals from the model of Dechow and Dichev (2002) multiplied by -1. The model introduced by Dechow and Dichev (2002) is the following:

$$WCA_{i,t} = \beta_0 + \beta_1 CFO_{i,t-1} + \beta_2 CFO_{i,t} + \beta_3 CFO_{i,t+1} + \varepsilon_{i,t} \tag{3}$$

where *WCA* is working capital accruals, calculated as the change in non-liquid current assets minus the change in current liabilities plus the change in short-term bank debt, and *CFO* is the cash flow from operations deflated by average total assets.

The variable *FRQ_KASZ* is estimated as the absolute value of residuals from the model of Kasznik (1999) multiplied by -1. The model is shown as follows:

$$TA_{i,t} = \beta_0 + \beta_1 \Delta Sales_{i,t} + \beta_2 PPE_{i,t} + \beta_3 \Delta CFO_{i,t-1} + \varepsilon_{i,t} \tag{4}$$

where *TA* is total accruals, calculated as the change in non-liquid current assets minus the change in current liabilities plus the change in the short-term bank debt minus depreciation, $\triangle Sales$ is the change in sales revenues, *PPE* is total property, plant and equipment and $\triangle CFO$ is the change in cash flow from operations.

To avoid the synchronous endogeneity problem, we lag our interest and control variables by one period. We expect that the influence of CSR disclosure on investment efficiency depends on the different investment scenarios (over-investment or under-investment). To

address this issue, we estimate the model represented in equation (1) for the sub-samples of under-investment and over-investment. In this case, the variable *Inveff* is denoted by *Ineff_over* and *Ineff_under*, respectively, for the over-investment and under-investment sub-samples. All models are estimated with *t*-statistics clustered at the firm and year level, robust to both heteroskedasticity and within-firm serial correlation (Petersen, 2009).

To test *H3*, and investigate the influence of financial reporting quality on the association between CSR disclosure and investment efficiency, we further divide the sample into the high FRQ sub-sample and the low FRQ sub-sample, depending on the financial reporting quality level of the firm. We then estimate the model for the two sub-samples and compare the coefficients of the variable *CSRreporting*. The results will support *H3* if the coefficient of *CSRreporting* in the low FRQ sub-sample is significantly higher than the coefficient in the high FRQ sub-sample.

3.3 Propensity-score matching approach

To make our empirical analysis more stable, we follow Cheng *et al.* (2013) and employ a propensity-score matching approach to generate a control sample. This approach can provide the control sample that has more similar characteristics to CSR reporting firms, but without CSR disclosure. The first stage in the procedure is to estimate the following logit regression model by year[6]:

$$
\begin{aligned}
CSRreporting_{i,t-1} = {} & \beta_0 + \beta_1 CSRreporting_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 Age_{i,t-1} \\
& + \beta_4 TANG_{i,t-1} + \beta_5 Slack_{i,t-1} + \beta_6 LEV_{i,t-1} + \beta_7 ROA_{i,t-1} \\
& + \beta_6 FRQ_{i,t-1} + \sum Industry\ dummies + \varepsilon_{i,t-1}
\end{aligned}
\tag{5}
$$

The variables used in the model defined in equation (5) are the same as in equation (1). In the second stage, we use the caliper matching method to match firms in the control and treatment samples. Following Cheng *et al.* (2013), we set the caliper distance to 0.01 from the treatment firms' propensity. The matching procedure is with no replacement, and therefore, treatment firms and non-disclosure firms without matchers will be dropped off in this process. After matching, the control observable dimensions are similar in each CSR reporting firm and its control matching one. The results will support *H1* if investment efficiency is higher in the CSR reporting group.

4. Empirical results and discussion

4.1 Descriptive statistics

Table I presents the descriptive statistics for the continuous variables in our study. About 36 per cent of our sample (2,352 observations on a total of 6,546) represents the over-investment scenario. This number suggests that Chinese listed firms are less prone to suffer from the over-investment problem than the under-investment problem. The average level of the variable *Ineff_over* (*Ineff_under*) is −6.716 (−3.638), indicating that over-investment (under-investment) firms inefficiently invest 6.716 (3.638) per cent of the total assets on average in a fiscal year. These values are consistent with previous studies (Gomariz and Ballesta, 2014; Li and Liao, 2014; Chen *et al.*, 2011). The *CSRreporting* dummy variable has a mean of 0.256, implying that in about 25.6 per cent of the observations firms report CSR. Descriptive statistics for the other variables are in line with previous literature (Zhang *et al.*, 2015).

Variable	Observation	Mean	SD	P25	P50	P75
Ineff	6,546	−4.712	4.886	−5.948	−3.637	−1.626
Ineff_over	2,352	−6.716	7.404	−8.886	−4.341	−1.762
Ineff_under	4,194	−3.638	2.410	−5.267	−3.390	−1.570
CSRreporting	6,546	0.256	0.436	0	0	1
Size	6,546	22.090	1.301	21.160	21.930	22.840
Age	6,546	2.117	0.754	1.609	2.398	2.708
TANG	6,546	0.345	0.247	0.159	0.293	0.490
Slack	6,546	2.730	8.598	0.259	0.657	1.702
LEV	6,546	0.587	0.331	0.366	0.562	0.753
ROA	6,546	0.086	0.117	0.029	0.080	0.146
FRQ_DD	6,546	−0.107	0.114	−0.137	−0.072	−0.033
FRQ_KASZ	6,546	−0.103	0.106	−0.134	−0.070	−0.031

Notes: *Ineff* is the absolute value of the residual from the model of Biddle *et al.* (2009) multiplied by −1. *Ineff_over* is overinvestment, the positive residual or positive value of *Ineff*, multiplied by −1. *Ineff_under* is underinvestment, the negative residual or negative value of *Ineff*. *CSRreporting* is a dummy variable equal to 1 if the firm issues a CSR report in the previous year. *Size* is the natural logarithm of total assets. *Age* is the natural logarithm of the firm's listing time. *TANG* is measured as the ratio of fixed assets to total assets. Slack is measured as the ratio of cash to fixed assets. *LEV* is the ratio of total liabilities to total assets. *ROA* is the ratio of income before extraordinary and discontinued operations on total assets. *FRQ_DD* is the absolute value of the residuals from the model of Dechow and Dichev (2002) multiplied by −1. *FRQ_KASZ* is the absolute value of the residuals from the model of Kasznik (1999) multiplied by −1

Table I.
Descriptive statistics

Table II shows the correlation matrix for the variables in the main analysis (pertaining to the model represented in equation 1 and the entire sample). As expected, the correlation coefficient between investment efficiency (*Ineff*) and the CSR reporting dummy variable (*CSRreporting*) is positive (0.044, significant at 1 per cent level significance), indicating a positive relationship between CSR disclosure and investment efficiency. Not surprisingly, both financial reporting quality measures (*FRQ_DD* and FRQ_KASZ) are positively correlated with investment efficiency. This result is consistent with the results from existing literature that show higher levels of investment efficiency for firms with high *FRQ* (Biddle *et al.*, 2009; Chen *et al.*, 2011). Most of the correlation coefficients for the other control variables are also in line with what was found in previous research. For instance, the positive correlations between *Size* and *Slack* with investment efficiency (*Ineff*) are also found in the study by Li and Liao (2014). Finally, the correlations between the independent variables show that there is no serious multicollinearity problem.

4.2 Results for the main analysis
Table III reports the results for the estimation of the model represented by equation (1), for the full sample and sub-samples of over and under-investment, and for the two different measures of *FQR*. The coefficients on *CSRreporting* for the full sample are 0.429 for the model with *FQR_DD* (Column 1) and 0.433 for the model with *FQR_KASZ* (Column 4), both significant at the 1 per cent level. Columns 2 and 5 show the results for the over-investment sub-sample, where the dependent variable is *Ineff_over*. The coefficients on *CSRreporting* are 0.863 and 0.865, respectively for the models with *FQR_DD* and *FQR_KASZ*, and are both significantly at the 1 per cent level. These results support *H1* and provide evidence of a higher level of investment efficiency for firm with

Variable	Ineff	CSRreporting	Size	Age	TANG	Slack	Lev	ROA	FRQ_DD	FRQ_KASZ
Ineff	1									
CSRreporting	0.044***	1								
Size	0.030***	0.360***	1							
Age	0.044***	0.090***	0.170***	1						
TANG	−0.012	−0.003	0.006	0.008	1					
Slack	0.036***	−0.005	0.001	0.008	−0.001	1				
LEV	0.005	−0.007	−0.002	0.018*	0.480***	0.000	1			
ROA	−0.003	0.007	0.022**	−0.006	0.000	−0.173***	0.000	1		
FRQ_DD	0.090***	0.025**	0.068***	−0.064***	−0.161***	−0.009	−0.100***	0.000	1	
FRQ_KASZ	0.101***	0.039***	−0.043***	−0.070***	−0.035***	−0.052***	−0.048***	−0.001	0.957***	1

Note: *, ** and *** denote statistical significance at the 10, 5 and 1% levels, respectively

Table II.
Pearson's correlation
coefficients

	All (1)	Over-investment (2)	Under-investment (3)	All (4)	Over-investment (5)	Under-investment (6)
CSRreporting	0.429*** (2.83)	0.863*** (3.01)	0.061 (0.64)	0.433*** (2.80)	0.865*** (2.93)	0.065 (0.68)
Size	0.143 (1.63)	0.123 (0.59)	0.301*** (8.60)	0.145* (1.74)	0.113 (0.56)	0.307*** (8.27)
Age	0.208** (2.13)	0.689*** (2.97)	−0.554*** (−4.18)	0.202** (2.06)	0.673*** (2.95)	−0.536*** (−4.13)
TANG	−3.076*** (−6.65)	−4.612*** (−4.50)	1.797*** (9.37)	−3.071*** (−6.49)	−4.523*** (−4.37)	1.778*** (9.12)
Slack	−0.007** (−2.11)	−0.069 (−0.98)	−0.009*** (−2.84)	−0.006* (−1.95)	−0.062 (−0.88)	−0.009*** (−2.73)
LEV	−0.354 (−0.73)	−1.305 (−1.60)	−0.660*** (−3.01)	−0.358 (−0.86)	−1.263* (−1.66)	−0.708*** (−3.60)
ROA	−0.734 (−0.65)	−0.308 (−0.14)	1.216*** (3.99)	−0.811 (−0.74)	−0.341 (−0.15)	1.143*** (3.90)
FRQ_DD	3.658*** (3.52)	5.040** (2.43)	1.918*** (5.13)			
FRQ_KASZ				4.308*** (5.29)	6.337*** (3.54)	1.909*** (5.15)
Intercept	−4.617*** (−2.76)	−5.395 (−1.33)	−6.171*** (−7.92)	−4.533*** (−2.84)	−5.006 (−1.27)	−6.246*** (−7.65)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm/Year Cluster	Yes	Yes	Yes	Yes	Yes	Yes
Observation	6546	2352	4194	6546	2352	4194
Adjusted R^2	0.071	0.064	0.208	0.072	0.066	0.207

Notes: Following Petersen (2009), t-statistics are corrected using a two-way cluster at the firm and year levels. * , ** and *** indicates significance at the 10, 5 and 1% levels, respectively

Table III.
Analysis of the relationship between CSR disclosure and investment efficiency

CSR disclosure. The coefficients on *CSRreporting* for the under-investment sub-sample are positive (0.061 and 0.065, respectively, for the models with *FQR_DD* and *FQR_KASZ*) but not statistically significant. These results are, however, consistent with our prediction in *H2* that the marginal effect of CSR disclosure may disappear due to the resource demand and competition that results from CSR disclosure leading to pressure from non-shareholders for more investment in CSR in the company. We conclude that the improvement on investment efficiency associated with CSR disclosure is more significant in the over-investment scenario. The coefficients for most of the other control variables are consistent with previous literature. For example, both *FRQ* measures are positive and significant, indicating that firms with higher level of financial reporting quality also have better investment efficiency (Biddle *et al.*, 2009; Chen *et al.*, 2011).

4.3 Results for the sub-samples of high and low financial reporting quality
To test *H3*, we divide the sample in sub-samples of firms with high and low FRQ. Table IV presents the results for the analysis of the impact of FRQ on the association between CSR disclosure and investment efficiency. We classify a firm into the high FRQ group if its *FRQ* measure is higher than the sample median level. This procedure results in 3,273 firm-year observations in each group. Columns 1 and 2 of Table IV report the results for the full sample. The coefficient on *CSRreporting* in the high FRQ group is 0.194, but not statistically significant. The coefficient on *CSRreporting* in the low FRQ group is 0.697 and significant at the 1 per cent level. Moreover, the difference between the two groups is −0.503 and significant at the 10 per cent level. We follow a similar procedure for the sub-sample of over-investment firms[7]. The results are shown in Columns 3 and 4, and are similar to the ones obtained for the full sample. The coefficients on *CSRreporting* are 0.352 (not significant) and 1.408 (significant at the 1 per cent level) respectively for the high and low FRQ groups, and the difference between groups is −1.408, significant at the 10 per cent level. These results

| | All | | Overinvestment | |
	High FRQ (1)	Low FRQ (2)	High FRQ (3)	Low FRQ (4)
CSRreporting	0.194 (0.86)	0.697*** (3.58)	0.352 (0.86)	1.408*** (3.24)
Size	0.247*** (3.67)	0.054 (0.39)	0.402*** (6.18)	−0.122 (−0.35)
Age	0.094 (0.67)	0.289 (1.54)	0.678 (1.35)	0.579 (1.60)
TANG	−2.489*** (−5.32)	−3.588*** (−4.93)	−5.329*** (−3.44)	−4.484*** (−3.20)
Slack	−0.020*** (−3.66)	−0.004 (−0.72)	−0.128 (−1.41)	−0.033 (−0.38)
LEV	−0.591* (−1.73)	−0.340 (−0.41)	−1.539 (−1.18)	−1.194 (−0.64)
ROA	−0.812 (−1.61)	−0.587 (−0.30)	0.671 (0.67)	−0.844 (−0.18)
FRQ_DD	1.044 (0.34)	2.369 (1.52)	7.706 (0.66)	2.988 (0.85)
Intercept	−6.686*** (−4.29)	−3.037 (−1.04)	−11.279*** (−6.54)	−0.172 (−0.02)
Industry FE	Yes	Yes	Yes	Yes
Firm/Year Cluster	Yes	Yes	Yes	Yes
Observation	3273	3273	1160	1192
Adjusted R^2	0.044	0.086	0.044	0.062
Difference High-low	−0.503* (3.29)		−1.056* (2.53)	

Table IV.
Impact of financial reporting quality on the relationship between CSR disclosure and investment efficiency

Notes: Following Petersen (2009), *t*-statistics are corrected using a two-way cluster at the firm and year levels. We use the Chow test to examine the significance of the difference in coefficients between the two sub-samples. The Wald statistic is shown in parenthesis. *, ** and *** indicates significance at the 10, 5 and 1% levels, respectively

suggest that the impact of CSR disclosure on investment efficiency is higher for firms with lower financial quality, and support the predictions of *H3*.[8]

4.4 Results for propensity-score matching approach

Table V provides results obtained using the propensity-score matched sample. We present information on the logit model used in the first stage of the matching approach in Panel A, both for the full sample and the over-investment sub-sample. The results show that CSR reporting firms differ from non-reporting firms in size (*Size*), listing time (*Age*), capital structure (*LEV*) and returns on assets (*ROA*). In the second stage of the propensity-score matching approach, we match each treatment firm (CSR reporting firm) with a control firm. Panel B of Table V summarizes the results of the estimation of the model represented by equation (1) for the propensity-score matched samples. The coefficient on the variable *CSRreporting* is 0.437 for the full sample, significant at the 1 per cent level and 0.877 for the sub-sample with only over-investment firms, significant at the 5 per cent level (the coefficients are 0.495 and 0.950, respectively, when the models are estimated without control variables). These results provide further evidence that CSR reporting firms have higher levels of investment efficiency, which lends strong support to *H1*.

	All (1)		Overinvestment (2)	
Panel A: Logit model regression results				
Size	0.901*** (27.95)		0.922*** (16.45)	
Age	0.090** (2.04)		0.046 (0.63)	
TANG	−0.098 (−0.66)		0.232 (0.83)	
Slack	0.005 (1.32)		0.005 (0.17)	
LEV	−0.980*** (−7.20)		−0.897*** (−3.97)	
ROA	0.930*** (3.11)		0.808 (1.48)	
FRQ_DD	0.514 (1.55)		0.433 (0.81)	
Intercept	−21.421*** (−30.11)		−22.246*** (−18.04)	
Industry FE	Yes		Yes	
Year FE	Yes		Yes	
Observation	6546		2317	
Pseudo R^2	0.171		0.197	
Panel B: Regression result based on the PSM samples				
	All (1)	All (2)	Overinvestment (3)	Overinvestment (4)
CSRreporting	0.437*** (3.85)	0.495*** (3.84)	0.877** (2.05)	0.950** (2.24)
Control variables	Yes	No	Yes	No
Industry FE	Yes	Yes	Yes	Yes
Firm/year cluster	Yes	Yes	Yes	Yes
Observation	2660	2660	852	852
Adjusted R^2	0.081	0.043	0.062	0.007

Notes: Panel A presents information on the logit model used in the first stage of the matching approach, both for the full sample and the over-investment sub-sample. Panel B presents the estimation of the model represented in equation (1) for the propensity-matched sample, for the full and sub-sample of overinvestment. The models represented in Columns (1) and (3) include all the control variables in equations (1), while the models in Columns (2) and (4) do not include the control variables. Following Petersen (2009), *t*-statistics are corrected using a two-way cluster at the firm and year levels. *, ** and *** indicates significance at the 10, 5 and 1% levels, respectively

Table V.
Propensity-score
matching approach

5. Robustness checks

5.1 Alternative measure of investment efficiency

Following McNichols and Stubben (2008) and Li and Liao (2014), we recalculate the independent variable (*Ineff*) by replacing revenue growth with asset growth in the model of Biddle *et al.* (2009), represented in equation (2). We then re-estimate the model represented by equation (1). The results are presented in Table VI. For brevity, we only report the results for the basic analysis and omit the results for the sub-samples of under and over-investment. The coefficients on the variable *CSRreporting* are all positive at the 1 per cent level of significance. For example, these coefficients are 0.457 ($t = 3.19$) for the full sample and 0.963 ($t = 2.66$) for the over-investment subsample when the proxy of financial reporting quality is FRQ_DD. We conclude that our results are stable and robust to different measures of investment efficiency.

5.2 Alternative sample selection

As mentioned in Section 3.1, even though most of the observations related to CSR disclosures in our sample are associated with the mandate by the CSRC, about 26 per cent of the CSR reporting observations are associated with voluntary CSR disclosure. As voluntary disclosure may introduce problems related with sample self-selection, we drop all observations related to voluntary disclosure from our sample. In this manner, our sample is closer to the sample of mandatory disclosures used by Hung and Wang (2014). The results of the regressions based on the sub-sample of mandatory disclosure are reported in Table VII. The number of observation declines to 6,111 for the full sample and to 2,176 in the over-investment sub-sample. The coefficients on the variable *CSRreporting* in the regression with *FRQ_DD* are 0.454 in the full sample and 0.919 in the over-investment sub-sample, both significant at the 1 per cent level. The coefficients of the regressions with *FRQ_KASZ* are similar. These results suggest that our conclusion holds for the sample of mandatory disclosure.

	All (1)	Over-investment (2)	All (3)	Over-investment (4)
CSRreporting	0.457*** (3.19)	0.963*** (2.66)	0.460*** (3.15)	0.959*** (2.61)
Size	0.121 (1.55)	0.145 (0.64)	0.122 (1.63)	0.132 (0.58)
Age	0.270*** (3.00)	0.574*** (2.65)	0.264*** (2.93)	0.556*** (2.58)
TANG	−2.889*** (−6.23)	−4.838*** (−3.77)	−2.878*** (−6.12)	−4.751*** (−3.69)
Slack	−0.004 (−0.97)	−0.054 (−0.86)	−0.004 (−0.90)	−0.051 (−0.83)
LEV	−0.345 (−0.62)	−0.863 (−0.82)	−0.335 (−0.66)	−0.793 (−0.77)
ROA	−0.525 (−0.40)	−0.343 (−0.12)	−0.588 (−0.46)	−0.367 (−0.13)
FRQ_DD	3.155*** (3.54)	3.845* (1.71)		
FRQ_KASZ			3.816*** (4.99)	5.136** (2.24)
Intercept	−4.542*** (−3.24)	−6.292 (−1.43)	−4.440*** (−3.30)	−5.847 (−1.32)
Industry FE	Yes	Yes	Yes	Yes
Firm/Year Cluster	Yes	Yes	Yes	Yes
Observation	6546	2317	6546	2317
Adjusted R^2	0.060	0.049	0.061	0.051

Table VI.
Robustness check: alternative investment efficiency estimation

Notes: *Ineff* is recalculated by replacing revenue growth with asset growth in the model of Biddle *et al.* (2009), represented in equation 2. The model is estimated for the full sample and the sub-sample of overinvestment. Following Petersen (2009), *t*-statistics are corrected using a two-way cluster at the firm and year levels. *, ** and *** indicates significance at the 10, 5 and 1% levels, respectively

	All (1)	Over-investment (2)	All (3)	Over-investment (4)
CSRreporting	0.502*** (3.25)	1.269*** (2.98)	0.502*** (3.25)	1.269*** (2.98)
Size	0.126 (1.46)	0.122 (0.53)	0.126 (1.46)	0.122 (0.53)
Age	0.283*** (2.68)	0.568** (2.47)	0.283*** (2.68)	0.568** (2.47)
TANG	−2.838*** (−5.55)	−4.792*** (−3.58)	−2.838*** (−5.55)	−4.792*** (−3.58)
Slack	−0.004 (−1.01)	−0.045 (−0.70)	−0.004 (−1.01)	−0.045 (−0.70)
LEV	−0.411 (−0.71)	−1.042 (−1.00)	−0.411 (−0.71)	−1.042 (−1.00)
ROA	−0.386 (−0.28)	−0.070 (−0.02)	−0.386 (−0.28)	−0.070 (−0.02)
FRQ_DD	3.085*** (3.24)	3.561 (1.48)	3.085*** (3.24)	3.561 (1.48)
FRQ_KASZ	−4.678*** (−2.98)	−5.771 (−1.27)	−4.678*** (−2.98)	−5.771 (−1.27)
Intercept	−3.647** (−1.96)	−1.114 (−0.20)	−3.497* (−1.90)	−0.908 (−0.16)
Industry FE	Yes	Yes	Yes	Yes
Firm/Year Cluster	Yes	Yes	Yes	Yes
Observation	6111	2176	6111	2176
Adjusted R^2	0.057	0.048	0.057	0.048

Table VII.
Robustness check:
sample of firms with
mandatory
disclosure

Notes: Following Petersen (2009), t-statistics are corrected using a two-way cluster at the firm and year levels. *, ** and *** indicates significance at the 10, 5 and 1% levels, respectively

5.3 Alternative estimation method

According to Li and Liao (2014), the investment efficiency variable proposed by Biddle *et al.* (2009) is truncated at 0, and therefore, the ordinary least squares (OLS) coefficients may be biased. To avoid this problem, we also re-estimate the model represented by equation (1) using a truncated regression (Maddala, 1983). The results are reported in Table VIII and further provide support to *H1* and *H2*.

	All (1)	Over-investment (2)	All (3)	Over-investment (4)
CSRreporting	0.454*** (3.29)	0.919*** (2.77)	0.457*** (3.32)	0.922*** (2.78)
Size	0.099* (1.73)	0.073 (0.51)	0.101* (1.79)	0.061 (0.43)
Age	0.256*** (3.05)	0.751*** (4.10)	0.249*** (2.98)	0.735*** (4.01)
TANG	−2.925*** (−8.38)	−4.337*** (−5.08)	−2.922*** (−8.40)	−4.234*** (−4.98)
Slack	−0.007* (−1.74)	−0.080 (−1.08)	−0.007 (−1.62)	−0.073 (−0.98)
LEV	−0.203 (−0.67)	−1.162 (−1.37)	−0.211 (−0.73)	−1.108 (−1.33)
ROA	−0.277 (−0.48)	0.352 (0.21)	−0.360 (−0.63)	0.329 (0.20)
FRQ_DD	3.735*** (5.20)	5.062*** (2.98)		
FRQ_KASZ			4.373*** (5.88)	6.453*** (3.64)
Intercept	−3.401*** (−2.78)	−3.899 (−1.27)	−3.330*** (−2.75)	−3.470 (−1.14)
Industry FE	Yes	Yes	Yes	Yes
Firm/Year Cluster	Yes	Yes	Yes	Yes
Observation	6546	2352	6546	2352
Pseudo R^2	0.014	0.012	0.014	0.012

Table VIII.
Robustness checks:
alternative
estimation using a
truncated regression
(Maddala, 1983)

Notes: Following Petersen (2009), t-statistics are corrected using a two-way cluster at the firm and year levels. *, ** and *** indicates significance at the 10, 5 and 1% levels, respectively

6. Conclusion

Previous literature suggests that CSR disclosure provides incremental information that reduces information asymmetry between firms and stakeholders (Dhaliwal *et al.*, 2014; Dhaliwal *et al.*, 2012; Hung *et al.*, 2013). This study extends this stream of research by presenting evidence regarding the impact of CSR disclosure on firm-level investment efficiency. We consider different levels of financial reporting quality in our analysis. For a sample of listed firms in China, and during the post-mandatory disclosure period in China, our empirical analysis shows a significant positive association between CSR disclosure and investment efficiency. This relationship is more pronounced for the sub-sample of firms that over-invest. Additionally, we find that this association is stronger for firms with lower financial reporting quality, indicating that CSR disclosures can play an important complementary role in reducing information asymmetry and promoting investment efficiency. Our results are robust to different sample selections and measures of investment efficiency and financial reporting quality.

Our work contributes to the understanding of the economic impacts of CSR disclosure and has important implications for regulators, companies and investors. Our results provide arguments for regulatory entities to enforce CSR disclosure. Firms and investors should consider the effect of CSR disclosure on information asymmetry and its impact on the availability and cost of capital. Future research could investigate the relationship between CSR disclosure and investment efficient in the context of other countries or in an international context. It may be of interest to investigate if the results hold in mature markets or for different financial disclosure frameworks.

The short sample period, from 2010 to 2013, is a limitation of our study. Another limitation, found in other studies on disclosure quality and investment efficiency, is that the proxies used are subject to measurement error. In addition, while our indicator variable for CSR reporting leads to significant results, a better measure of the information provided by CSR reporting would be a variable for disclosure quality. Future research could address these limitations and apply the current study in the context of other economies, where, perhaps, different disclosure environments lead to different implications for the relationship between CSR disclosure and investment efficiency.

Notes

1. Mandated firms included firms in the "Shenzhen 100 Index", firms in the "Corporate Governance Index" of SHSE, overseas listed firms and financial firms.

2. The mandate provides guidelines of disclosures covering the following five areas: protection of the interest of shareholders and creditors, protection of workers' rights, protection of suppliers, customers and consumers, environmental protection and sustainable development and public relations and social welfare services.

3. Link: www.rksratings.com/

4. According to China's Security Law, a listed firm will receive special treatment (ST) if its recent financial profit is negative for two consecutive fiscal years or its net asset value per share is lower than the book value at the end of the last fiscal year. Its statue will turn to particular treatment (PT) if it is unable to revitalize itself within two years after being labeled ST. We delete ST and PT firms because their investment behaviors are different from healthy firms. This procedure follows other literature related to China, for example Tsai *et al.* (2014).

5. Initially, we estimated *FRQ* using three different models: Dechow and Dichev (2002), Kasznik (1999) and McNichols and Stubben (2008). For the sake of brevity, we exclude the results estimated using the model by McNichols and Stubben (2008). These results are available upon request.

6. We repeated the same procedure for the sub-samples of over-investment and under-investment.

7. For the sub-sample of under-investment, the coefficients of *CSRreporting* are not significant in both the high and low FRQ groups. In the interest of parsimony, we do not report these results in the table.

8. The results obtained using the alternative measure of FQR (*FRQ_KASZ*) are similar. For brevity, we do not report them in the table.

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