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AUTHORS	Yu-Chun Lin
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Yu-Chun Lin (Taiwan)

Does R&D investment under corporate social responsibility increase firm performance?

Abstract

Research and development (R&D) investment affects firms' growth and reflects their investment energy. However, it is recorded as an expense in financial statements, according to generally accepted accounting principles (e.g., International Financial Statements Standards). This study examines whether firms' R&D investment has a positive effect on their performance, when they engage in corporate social responsibility. The author focuses on firms that have earned corporate social responsibility awards from *Global Views Magazine*, *Common Wealth Magazine*, and the *Taiwan Institute for Sustainable Energy* in order to measure firms' levels of corporate social responsibility engagement. Tobin's Q is used as a proxy for firm performance. Because corporate social responsibility engagement is not mandatory in Taiwan, the Heckman two-stage process is used to control for an endogeneity bias. In the first stage, logit regression is employed, using a dummy variable as a proxy for a firm's social responsibility engagement. In the second stage, the impact of corporate social responsibility on firm value is estimated by regressing Tobin's Q on various governance and firm characteristics and on a dummy variable for social responsibility engagement. Based on all public traded companies in Taiwan for the period 2005 – 2014, and after controlling for an endogeneity bias, it is found that R&D investment is positively associated with Tobin's Q, but only when firms engage in corporate social responsibility. Therefore, an investment strategy that meets corporate social responsibility objectives benefits firm performance. The empirical results provide policy implications for firm R&D investment and corporate social responsibility implementation.

Keywords: R&D investment, corporate social responsibility, firm performance, Tobin's Q.
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Introduction

Due to recent food safety and financial related scandals, regulators and researchers have emphasized the importance of corporate social responsibility (hereafter CSR) to enhance production quality and restore society's confidence in Taiwan (e.g., Chen, Shiu, and Chang, 2015). CSR engagement could have a positive influence on customer satisfaction and financial performance (Choi, Kwak, and Choe, 2010). Waddock and Graves (1997) find that CSR engagement has a positive effect on the returns of assets. Choi et al. (2010) found a positive relationship between CSR and firm financial performance. However, some studies argue that the related costs accompanied by CSR engagement are high (Mishra and Suar, 2010; Surroca, Tribo, and Waddock, 2010). Gatsi, Anipa, Gadzo, and Ameyibor (2016) suggest that the level of CSR disclosed has a significant negative relationship with firm performance. CSR continues to be a highly topical subject regarding whether investments in CSR are value-enhancing.

This study examines whether CSR engagement strengthens the influence of a firm's R&D investment on a firm's performance. We argue that the long-term profitability of firms is created by investments in in-house research and development (R&D) activities. R&D investment has an impact on firm operation and performance. To address this issue properly, we conduct an endogeneity correction for the treatment effects. Firm R&D investment based on CSR engagement should meet firm strategy and market expectation. CSR engagement provides firms with better communication and relationships with their stakeholders such as customers, suppliers and investors. Firms' CSR engagement may motivate customers to buy more products and, therefore, enhance business operations and performance (Mill, 2006; Soana, 2011). While prior research finds the insignificant relation between CSR engagement and a firm performance (e.g., Choi et al., 2010; Mishra and Suar, 2010), the mixed results in the prior research are driven by the different research periods, observations, and a diversity of measures of firm performance. We attempt to examine whether the association between R&D investment and firm performance is stronger, when firms are engaged in CSR activities, which previous literature has not investigated.

Based on Jensen and Meckling's (1976) agency theory, Barnea and Rubin (2010) propose the overinvestment hypothesis, which suggests that if

Yu-Chun Lin, Ph.D. in Accounting, Assistant Professor, Department of Finance, Shih Hsin University, Taiwan.

CSR initiatives do not maximize firm value, such initiatives are a waste of valuable resources and a potentially value-destroying proposition. Miller (1986) suggests that one of the reputation building actions firms can adopt is selling high-quality products. Firm reputation resulted from CSR engagement will improve customers' confidence in the firm's innovation and increase customer satisfaction among new innovative products, leading to better performance. While CSR engagement creates better communication and confidence for stakeholders, R&D investment could get more supports, which might lead to better performance. This study attempts to examine whether CSR engagement has a moderating effect on the relation between R&D investment and the firm's performance.

We focus on firms earning CSR awards from specific organization. To mitigate potential selection bias in the CSR sample, we employ Heckman – two-stage in our analyses. We use apposite conditioning variables, or consider endogenous treatment effects in which better quality firms tend to choose CSR engagement to begin with, because the contribution of CSR engagement to firm value and operating performance will be overstated or attributed incorrectly (Greene, 1993). Heckman (1979) proposed a two-stage estimation procedure using the inverse Mills' ratio to take the endogeneity bias into account.

We collect Taiwan firms with CSR performance from the awards from credible organization, like *Global Views Magazine, Common Wealth Magazine* and the *Taiwan Institute for Sustainable Energy* (TAISE). On the first stage, we use logit regression using a dummy variable to proxy for CSR engagement. On the second-stage, a regression of Tobin's Q on various governance and firm characteristics and a dummy variable for CSR engagement allows estimate of whether CSR involvement impacts firm value. After correcting for endogeneity bias, our research findings show that firm R&D investment is positively associated with firm Tobin's Q, only when firms are engaged in CSR. The results suggest that CSR has a moderating effect on the association between R&D investment and firm performance.

This study contributes to the related literature in several other ways. First, while prior research focused on R&D investment, adding to long-term or short-term performance, our findings support that CSR engagement strengthens the influence of R&D investment on a firm's value. Second, prior research provided mixed results on the connection between CSR engagement and a firm's performance (e.g., Choi et al., 2010; Mishra and Suar, 2010). We show that the benefits of CSR engagement on improved firm performance are generated through R&D investment. To the best of our knowledge, no other published studies show a moderating effect of CSR engagement on the association between R&D investment and a firm's performance.

The remainder of this paper is organized as follows. The following section reviews previous literature and develops our hypotheses. The data and research methodology are presented in the subsequent section. The empirical results are discussed in the penultimate section, whereas the final section offers our concluding remarks.

1. Literature review and hypotheses development

1.1. Theory and evidence. From the traditional view of agency theory (Jensen, 1986), firms operate primarily to make profits. There are lots of issues that need to be managed beside the profit maximization objective. This dilemma continues to be very important throughout the global economic world. The purpose of a firm's operation is not only for financial profit but also to practice CSR. The CSR issue has received growing interest from business scholars. Basically, there are two theoretical approaches to develop the issue of social responsibilities.

1.1.1. Institutional theory. Institutional theory (Jennings and Zandbergen, 1995) argues that firms need to display ethical and socially desirable actions, therefore, it is suggested that firms can develop a sustainable and real presence, as well as a sustainable environment for the firm. Firms need effective internal and external monitoring, because there is no clearly known effective monitoring mechanism to prevent the potential managerial entrenchment of firms engaging in CSR activities. A form of corporate social responsibility recommends that corporate leaders arrange bottom-line results not only in economic terms (revenue minus costs), but also in terms of the company's impact on society, including the environment.

Carroll (1999) defined CSR as organizational activities that meet the ethical and discretionary responsibilities expected by society. Institutional theory also implies that corporate governance increases the firm value. Agyemang-Mintah (2016) suggests that the establishment of the remuneration committee by the board assisted in achieving a positive impact on the profitability of UK financial institutions. McWilliams and Siegel (2001) indicated that when there is an ideal level of CSR, which has a positive impact on financial performance. Previous studies have acknowledged that the support of top management has a vital

effect on CSR activities (Hart, 1995; Weaver, Trevino, and Cochran, 1999; Quazi, 2003; Swanson, 2008). Gove & Janney (2011) suggested that firms can benefit from enhanced reputation because of a CSR enhanced reputation when they undergo major crises or scandals. Therefore, CSR scholars' have argued that companies have ethical and moral obligations to society that are expected even if there is no requirement (Carroll, 2004).

1.1.2. Stakeholder theory. Stakeholder theory, which originally has been described by Edward Freeman, is the mirror image of corporate social responsibility. The perception by stakeholders is that firms who satisfy their stakeholders are able to create a strategic, competitive advantage (Freeman, 1984). Stakeholder theorists have argued that while there are normative, ethical elements to stakeholder theory beyond its management, these are separate and distinct (Freeman, 1984; Jones and Wicks, 1999). This theory attempts to address the "principle of who or what really counts". The research into CSR has primarily employed stakeholder theory, with CSR frequently characterized as a business philosophy influencing corporate strategy and enacted in response to stakeholder interests or demands (Carroll, 1999; McWilliams and Siegel, 2001; Salam, 2009).

Hillman and Keim (2001) found that when corporate social responsibility engagement is properly presented and is in line with their stakeholders' expectations, this will lead to value creation. The association between business and other stakeholders is deemed to return more benefits to shareholders by higher profits and maintenance of legitimacy than when firms seek to maximize profits for only shareholders (Gatsi et al., 2016). For instance, Fombrun, Gardberg and Bernett (2000) argued that by acting as corporate citizens, businesses build strong reputational capital that translates into economic returns and shareholder value. Jo and Harjoto (2012) show that CSR engagement positively influences corporate financial performance, supporting the conflict-resolution hypothesis based on stakeholder theory. Chen et al. (2015) results support the view that CSR engagement serves as the moral capital of the firm, ultimately mitigating any adverse sentiment by stakeholders in case of poor corporate actions, and, thus, supporting a case for leniency in any punishment that may be considered.

The above two theories enhance the development of CSR related research and practice. Since CSR engagement is valuable for firm development and operations, firms have recently been strongly encouraged to engage in CSR. Different CSR concepts have been elaborated in order to identify the role of business in relation to society.

1.2. Hypotheses development. Based on the institutional theory and stakeholder theory, CSR engagement is beneficial to the firm's development, which may affect performance in a variety of ways. However, from the perspective of value creation, CSR engagement potentially creates incremental profits, but some expenditure occurs during the process. Previous studies suggest the interrelations among CSR and firm performance are largely inconclusive (see, e.g., Beurden and Gössling, 2008; Baron, Harjoto, and Jo, 2011; Garcia-Castro Anno and Canela, 2010). In particular, whether it is valuable for firms to engage in CSR has not yet been found.

As the field of business ethics expands correspondingly, businesses are viewed as holding a wide range of economic and civic responsibilities. The engagement of civic responsibilities could be potentially beneficial to a firm's operation and performance. Prior research suggested that CSR leads to improved firm's profitability. Donker, Poff, and Zahir (2008) found a significantly positive relationship between CSR index and firm performance. Choi et al. (2010) focused on South Korean firms and found a positive relationship between CSR and a firm's financial performance. Ekatah, Samy, Bampton, and Halabi (2011) found that regardless of the causal connection, CSR is found to be positively related to the profitability of the firm. Almsafir (2014) also found that financial performance is better when firms are highly rated in their CSR indexes compared to other firms.

However, some studies find that CSR may have a negative impact on corporate performance, because they experience additional costs. Mishra and Suar (2010) and Surroca et al. (2010) find that CSR adversely affects corporate financial performance. Other prior research finds no evidence on the relationship between CSR and a firm's performance (Aupperle, Carroll, and Hatfield, 1985; Soana, 2011). Chang (2011) used 30 Taiwanese publicly listed firms with CSR awards from *Common Wealth* magazine in 2007 and found that CSR does not have either a short- or long-term effect on stock returns. Therefore, we do not present any prediction of the relationship.

H1: CSR engagement is not associated with firm performance.

Prior research suggested that the more executives are committed to R&D, the better a firm's performance is. While the long-term innovation capability of firms is determined by R&D investment, the costs are expense, leading to a short-term decrease in financial performance. The uncertainty and risk in the process of research and development create

asymmetric information between managers and shareholders (Milkovich, Gerhart, and Hannon, 1991; Makri et al., 2006). Whether more R&D investment increases a firm's financial performance is an interesting empirical research.

Radical innovations have the potential to transform a technology field and fundamentally improve a firm's competitive position (Crawford, 1994; Urban and Hauser, 1993). A firm's R&D investmentis beneficial to creating long-term performance improvement. R&D budgets can be spent on radical innovations or on incremental innovations (Dewar and Dutton, 1986). By prioritizing R&D investment, managers not only have to make commitments on R&D investment, but they also need to have confidence in generating further profits. This reasoning supports the notion that in firms with high R&D expenditures, customer satisfaction can be improved through better quality products, which, in turn, increases customer's constancy and commitment to their firm. As a result, this will add value and performance to firms. Building on the existing literature, we argued that CSR and major R&D investment plays a crucial role in a firm's performance. Despite its potential impact, little is known about which factor affects the effectiveness of R&D investment. In this paper, we revisit the relationship between R&D investment and a firm's performance, taking into consideration a possible moderating effect of CSR engagement.

H2: R&D investment is positively associated with firm performance, when firms engage in CSR.

2. Sample and research methodology

2.1. Sample and data. CSR firms are identified as companies that have received at least one of the following CSR awards: (i) the "Corporate Social Responsibility Award" from *Global Views Magazine*; (ii) the "Corporate Citizen Award" from *Common Wealth Magazine*; and (iii) the "Taiwan Corporate Sustainability Award" from the *Taiwan Institute for Sustainable Energy* (TAISE). Based on this definition, we identified firms that received CSR awards for the period 2005-2014 as CSR firms. If a firm received multiple CSR awards in our sample period, we only include the firm's data once in our sample. After removing records with missing values and those without financial data, the final sample contains 511 CSR firms. The distributions by year and by award are shown in Panel A of Table 1. On average, *Common Wealth Magazine* announces 35 firms as exhibiting CSR engagement best practice. The TAISE began offering the "Taiwan Corporate Sustainability Award" from 2008, and increased the number of firms that receive the award in 2013.

We obtain the financial information of sample firms from the *Taiwan Economic Journal* (TEJ). Then, we exclude financial institution firms and firms without financial data. The final sample contains 13,960 firm-year observations. Table 1 (see Appendix) summarizes the sample selection procedure.

2.2. Heckman two-stage estimation and regression model. *2.2.1. First-stage model: CSR-awarded firms.* Focusing on firms that have received a CSR award could result in an endogenous bias of the research findings. Therefore, we employ the two-stage estimation procedure of Heckman et al. (1997) to control for such a bias. On the first stage, we estimate the following probit model for CSR firms:

$$PRO(CSR)_{i,t} = \alpha_0 + \alpha_1 SIZE_{i,t} + \alpha_2 MTB_{i,t} + \\ + \alpha_3 PROFIT_{i,t} + \alpha_4 AGE_{i,t} + \alpha_5 OWNERSHIP_{i,t} + \\ + Industry_i + Year_i + \varepsilon_{i,t} \quad (1)$$

See Appendix Table 2 for the definitions of the variables.

The variable CSR is a dummy variable, set equal to one if a firm has earned a CSR award, and zero otherwise. We use CSR awards to measure the quality of CSR engagement, because it was not mandatory for firms to engage in CSR during the sample period in Taiwan. Firms that have earned CSR awards have a higher market-to-book value of assets ratio than firms without CSR awards do (Godfrey, Merrill, and Hansen, 2009). Following prior literature, we control for firm size (SIZE), the market-to-book value of assets (MTB) ratio, firm profit (PROFIT), and firm age (AGE). Here, we extend the findings of Jo and Harjoto (2012) to control for the corporate governance variables in the model. Barnea and Rubin (2010) empirically examine the relationship between CSR ratings and firms' ownership and capital structures. Thus, we control for firm ownership (OWNERSHIP) in equation (1). We also use *Industry* and *Year* to control for the fixed effects of industry and years, respectively.

2.2.2. Second-stage model: Tobin's Q. We use the following regression model to examine whether firms invest R&D activities have better performance than their counterparts when firms are engaged in various CSR.

$$Tobin'sQ_{i,t} = \alpha_0 + \alpha_1 CSR_{i,t} + \alpha_2 RD_{i,t} + \\ + \alpha_3 CSR \times RD_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 LEVERAGE_{i,t} + \\ + \alpha_6 LIQUIDITY_{i,t} + \alpha_7 ROA_{i,t} + \alpha_8 GROWTH_{i,t} + \\ + \alpha_9 LOSS_{i,t} + \alpha_{10} BOARD_{i,t} + \alpha_{11} INDE\%_{i,t} + \\ + \alpha_{12} Lambda_{i,t} + \varepsilon_{i,t} \quad (2)$$

The definitions of the variables are provided in Table 2 (see Appendix).

Dependent variable: Tobin's Q. We use Tobin's Q as the dependent variable to measure firm performance (Makri, Lane, and Gomez-Mejia, 2006). Tobin's Q is a widely used as a proxy for operating performance in the literature (e.g., Anderson and Reeb, 2003; Yermack, 1996; Gompers, Ishii, and Metrick, 2003). To obtain a value for Tobin's Q, we sum the market value of the firm's equity shares and the book value of total liabilities, and, then, divide this by the book value of total assets.

CSR engagement. In order to test hypothesis 1, we include the variable CSR to capture the effect of CSR awards on firm performance. Here, CSR is a dummy variable, set equal to one if a firm has earned a CSR award, and zero otherwise. Chang (2011) used 30 Taiwanese public listed firms that earned CSR awards from *Common Wealth Magazine* in 2007 to examine the information content of CSR award announcements. Chen et al. (2015) focus on CSR firms from 2005 through 2010, and find that CSR appears to affect stock prices. We follow prior literature, and use CSR-related awards from three sources (i.e., *Global Views Magazine*, *Common Wealth Magazine*, and TAISE) as a proxy for firm CSR quality.

R&D investment. Following Hirschey and Weygandt (1985), we use the ratio of R&D expenses to net sales (denoted by RD) as an independent variable to control for the effects of a firm's R&D investment. A firm's R&D expenses show the investments made by the firm in in-house R&D. The more committed the firm is to its innovation strategy, the higher the R&D expenses will be. Furthermore, we use interactions to test for the moderating effects of CSR on the association between R&D investment and firm performance.

Control variables. Lin, Horng, and Chou (2016) suggest that working capital management impacts the profitability and operating performance of firms. Following prior research (Crutchley et al., 1999), we control for firm leverage (LEVERAGE) and firm liquidity (LIQUIDITY) in the model. Liquidity is measured as the sum of cash on hand and short-term investments, divided by total assets. The uncertainty in the R&D process is sensitive to financial performance (Sher and Yang, 2005). Therefore, we include the return on assets (ROA) ratio, financial distress (LOSS), and sales growth (GROWTH) in the regression model. Prior studies on corporate governance (Kallunki and Silvola, 2008; Jackling and Johl, 2009) have shown that the quality of corporate governance is an important factor affecting firm performance. Here, we use the number of board members (BOARD) and the ratio of independent board members to board size (INDE%) as control variables. Finally, we include year and industry dummy variables to control for year and industry fixed effects, respectively.

3. Empirical results

3.1. Description statistics. Table 3 (see Appendix) presents the descriptive statistics for the variables. Approximately 2.7% of Taiwanese public listed companies have received CSR-related awards. The average market-to-book value ratio of these firms is 1.43, and the average ROA is 8%. These distributions are similar to those reported in Chen et al. (2015). The sales growth rate is 30% for the sample firms. About 41% of the observations show a profit in terms of financial performance. On average, firms have nine board members, of which 25% are independent directors.

Table 4 (see Appendix) shows the Pearson correlation coefficients between the variables. We find that, consistent with our expectations, CSR is positively correlated with SIZE at the 0.01 level. CSR seems to be highly negatively associated with firm performance. A possible reason for this is that the requirements and determinants of CSR awards are based on performance (Jackling and Johl, 2009).

3.2. Regression results. Table 5 (see Appendix) shows the empirical results for our analysis. The first column provides the results of the Heckman first-stage model. Consistent with previous findings in related research (e.g., Godfrey et al., 2009), firms that are larger (SIZE) and that show an operating profit (PROFIT) are more likely to receive a CSR award. The remaining columns of Table 5 report the results of the Heckman second-stage model. The coefficients for CSR and RD are positive, but are not statistically significant. These results imply that CSR engagement does not affect firm performance directly. Thus, hypothesis 1 is supported.

When we include the interaction between CSR and RD in the regression model, the coefficients of CSR and RD are significant and positive, as is the coefficient of the interaction between the two. This implies that when firms engage in CSR, R&D investment is positively associated with firm performance. The evidence from the Heckman two-stage treatment effect models reported in Models (1) and (2) suggests that a firm's R&D investment has a positive effect on the industry-adjusted Tobin's Q for firms engaging in CSR activities. These results support hypothesis 2 that CSR engagement serves as a trigger for positive effects

of R&D investment on firm performance. These results extend the findings of Xu and Yan (2014). Furthermore, our empirical results suggest that CSR has a moderating effect on the association between R&D investment and firm performance.

3.3. Additional tests. To solve the selection-bias problem, we re-run the regression model based on the instrumental variables approach. The result of a positive coefficient for the interaction between R&D and CSR remains robust under various specifications using the Heckman two-stage, OLS (unreported), and instrumental variables approaches, supporting our hypotheses.

Orlitzky et al. (2003) suggest that it is better to measure firm performance using accounting metrics, particularly the return on equity (ROE). In addition, Gatsi et al. (2016) examine how corporate social performance relates to actual returns. Our results remain robust after conducting tests using ROE as the dependent variable.

Conclusion

This study investigates whether firms' R&D investments under CSR benefit their performance. We focus on Taiwanese firms that have earned CSR awards from *Global Views Magazine*, *Common Wealth Magazine*, and the *Taiwan Institute for Sustainable Energy* during the period 2005–2014. Using the Heckman two-stage process to control for an endogeneity bias, we do not find evidence that CSR firms perform better than non-CSR firms. However, we do find evidence that when a firm is involved in CSR, its R&D investment is positively associated with its Tobin's Q. Our empirical results suggest that CSR has a moderating effect on the relation between R&D investment and performance.

Our findings suggest that a firm's social responsibility performance supports the value of its R&D investment. When CSR is considered in an investment strategy, R&D investment increases the growth and value of firms. Therefore, CSR engagement is a beneficial strategy. This study contributes to the literature on firm value creation. By documenting the effect of CSR engagement on the association between R&D investment and firm performance, we identify ways in which CSR can reduce firms' risk exposure at the expense of R&D investment. An awareness of such positive effects can help firms to manage their long-term investments.

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Appendix

Table 1. Distribution of CSR-awarded firms and sample selection procedure

Panel A: The distribution of CSR-awarded firms				
Year	Corporate Social Responsibility Award of *Global Views Magazine*	Corporate Citizen Award of *Common Wealth Magazine*	Taiwan corporate sustainability Award of the Taiwan Institute for Sustainable Energy (TAISE)	Total
2005	7	-	-	7
2006	12	-	-	12
2007	12	32	-	44
2008	12	37	6	55
2009	13	38	11	62
2010	13	36	10	59
2011	8	36	11	55
2012	10	33	15	58
2013	7	35	30	72
2014	11	32	44	87
Total	105	279	127	511
Panel B: sample selection procedure				
All firms during fiscal year 2005 to 2014 collected in the *TEJ* database				15,187
Less: financial institutions				(368)
Less: observations with missing data				(859)
Final sample for the analysis				13,960

Notes: [a]All sample firms have complete data on TEJ. The F-shares which do not have audited financial statement are excluded in our sample.

Table 2. Variable definitions

Variables	Pred. sign	Definitions
Dependent variables		
CSR		A dummy variable, set equal to 1 if firms earned CSR awards
Tobin's Q		The sum of the market value of equity shares and the book value of total liabilities, divided by the book value of total assets

Table 2 (cont.). Variable definitions

Variables	Pred. sign	Definitions
First-stage variables		
SIZE	+	The natural logarithm of total assets
MTB	+	The market-to-book value of an asset
PROFIT	+	Net income divided by market value of equity
AGE	+	The number of years from when the firm started to year t
Second-stage variables		
RD	?	The ratio of R&D expenses to net sales
LEVERAGE	-	The ratio of total liabilities to total assets
LIQUIDITY	+	The sum of cash on hand and short-term investments, divided by total assets
ROA	+	Return on assets, defined as net income before extraordinary items divided by total assets
GROWTH	+	Sales growth
LOSS	-	An indicator variable equal to 1 if earnings before extraordinary items in year t- 1 are negative, and 0 otherwise
BOARD	+	The number of directors on the board
INDE%	+	The percentage of independent board members on the board

Table 3. Description statistics for all variables

Variables	Mean	Std. Dev.	Min	Max
CSR	0.027	0.157	0.000	1.000
RD	0.076	0.085	0.000	0.812
SIZE	14.157	1.486	8.154	20.624
MTB	1.430	0.796	0.351	13.026
PROFIT	0.481	0.958	-0.103	0.206
AGE	23.154	11.810	1.000	61.000
LEVERAGE	41.773	17.692	0.584	96.082
LIQUIDITY	0.381	0.159	0.012	0.650
ROA	0.081	0.214	-0.878	0.812
GROWTH	0.301	1.078	-0.692	17.262
LOSS	0.596	0.958	0.000	1.000
BOARD	9.256	1.958	3.000	19.000
INDE%	0.259	1.260	0.000	1.000

Table 4. Correlation coefficient

	CSR	RD	SIZE	MTB	PROFIT	AGE	LEVERAGE	LIQUIDITY	ROA	GROWTH	LOSS	BOARD	INDE%
CSR	1												
RD	0.308*	1											
SIZE	0.304***	0.908**	1										
MTB	0.033**	0.015*	0.065**	1									
PROFIT	0.305*	0.024*	0.126*	0.085*	1								
AGE	0.250**	0.106	0.015*	0.015	0.067	1							
LEVERAGE	-0.050**	-0.084**	0.029*	0.026*	-0.056	0.018	1						
LIQUIDITY	0.001	0.102*	0.065**	0.091*	0.026**	0.029**	-0.064	1					
ROA	0.292*	0.881**	0.767**	0.048**	0.031**	0.068**	-0.095***	0.061***	1				
GROWTH	0.055**	0.149	0.024*	0.210	0.126*	0.051	0.045*	0.048	0.089	1			
LOSS	-0.185**	-0.141**	0.045	-0.162**	-0.057*	0.169	0.203**	-0.015	-0.148***	0.127*	1		
BOARD	0.028**	0.264**	0.121**	0.025	0.068*	0.091*	0.081	0.145	0.026	0.056	-0.246	1	
INDE%	0.066**	0.342*	0.379**	0.325*	0.284*	0.268*	0.304	0.314	0.201	0.058*	0.038	0.095	1

Notes: [a]The definitions of the variables are summarized in Table 2

Table 5. The association between CSR engagement and firm performance – Heckman two stages

Variables[a]	Predicted direction	First-stage		Second-stage			
		CSR		*Tobin's Q*			
		Coef.	*t* statistics	Coef.	*t* statistics	Coef.	*t* statistics
INTERCEPT		-2.181	-10.62***	2.048	2.92***	1.673	1.70*
SIZE	+	0.287	4.40***	1.093	1.90*	1.097	1.20
MTB	+	0.046	1.26				

Table 5 (cont.). The association between CSR engagement and firm performance—Heckman two stages

Variables[a]	Predicted direction	First-stage		Second-stage			
		CSR		*Tobin's Q*			
		Coef.	*t* statistics	Coef.	*t* statistics	Coef.	*t* statistics
PROFIT	+	0.132	1.92*				
AGE	+	0.121	1.41				
CSR	+			1.025	1.42	1.956	1.69*
RD	?			0.986	0.96	0.041	1.78*
CSRxRD	+					1.007	2.20**
LEVERAGE	-			-3.667	-1.03	-2.323	-1.94*
LIQUIDITY	+			2.032	3.43***	1.269	2.84***
ROA	+			0.178	1.69*	0.143	0.63
GROWTH	+			0.163	3.23***	0.135	2.21**
LOSS	-			-1.086	-2.10**	-1.237	-0.64
BOARD	+			0.487	1.91*	0.143	0.97
INDE%	+			0.583	2.10**	1.094	1.46
Lambda				0.117	1.72*	0.123	1.93*
Fixed Effect				Included		Included	
N		13,920		13,920		13,920	
Pseudo R2/R		0.2485		0.1462		0.1545	
LR chi2/F		1838.74		6.34***		6.16***	

Notes: [a] The definitions of the variablesare summarized in Table 2. [b] Asterisks *, **, and *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.