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Ethical image, corporate social responsibility, and R&D valuation☆

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ABSTRACT

This study examines whether socially responsible firms carry higher research and development (R&D) valuation, and how product market competition affects this relationship. From a sample of U.S. firms over the period 1995–2010, we find firms with stronger corporate social responsibility (CSR) performance to have higher R&D valuation. This result supports the view that CSR efforts create an ethical and healthy corporate image which lends credence to its R&D projects. As expeted, the above positive relationship between CSR efforts and R&D valuation is significant only in highly competitive industries. This study contributes to the literature by demonstrating that ethical image affects the market's perception on R&D investments and the valuation of the firm.

1. Introduction

Social responsibility and R&D (research and development) are key issues of the current U.S. economy. President Obama's 2013 inaugural address, in sketching the main challenges of the next four years, makes multiple references to social responsibility issues including caring for the vulnerable people, equitable wages for honest labor, equal opportunities for those in the bleakest poverty, responding to the threat of climate change, developing sustainable energy sources, and preserving our planet. The address also acknowledges R&D's role in bringing about changes and meeting some of these social challenges. For instance, it calls for training math and science teachers, building research labs, harnessing new ideas and technology, and developing sustainable energy technologies to promote new jobs and new industries. This paper studies social responsibility and R&D at the firm level. In particular, it provides evidence on the contribution of R&D efforts to the firm's economic value, and how CSR (corporate social responsibility) affects the nature and extent of such a contribution.

Firms invest in R&D to seek new business opportunities and gain competitive advantages. This is clear from the R&D statements of the world's two most valuable companies, ExxonMobil and Apple Inc. ExxonMobil's Website describes the firm's focus on technologies for “increasing efficiency, developing new supplies and safeguarding the environment”. In its 2012 annual report, Apple Inc. recognizes “focused investments in R&D [as] critical to its future growth and competitive position in the marketplace”, and vows to “make further investments in R&D to remain competitive”. A stronger competitive position is conducive to a higher valuation of the firm. Conversely, when a firm loses its competitive edge, its market valuation suffers. For instance, Apple Inc.'s P/E ratio fell

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from 15 multiples to 10 multiples in late 2012 through early 2013 when the firm apparently lost its leadership position in some new product segments such as large screen smart phones (CNN Money Jan 25, 2013; Reuters Dec 6, 2012).[1]

The economic value of R&D efforts is informative to the market but difficult to determine. Managers with unethical motivations to maximize short-term rewards may prefer to invest in R&D projects that produce short term rather than long term economic benefits. The risky and secretive nature of R&D projects further obscures their value. Given these considerations, the market has reasons to doubt the optimality of firms' R&D investment decisions, and to question the real value of these projects. Therefore, the extent that R&D expenditures contribute to competitive position and firm value is unclear to the market.

This paper examines whether CSR performance helps reveal R&D's contribution to firm value. The inaugural address calls on the whole nation to meet the social challenges together. Responding to mounting stakeholder interest, firms are eager to show their CSR fulfillment. Because CSR and business ethics are closely tied, a strong CSR record may help improve the firm's ethical image too. ExxonMobil and Apple Inc. exemplify such enthusiasm for CSR in their Websites. ExxonMobil prominently presents its dedication to math and science education, malaria control, women's economic opportunities, human rights, community-specific investments, social projects and non-profit organizations, employee safety and health, greenhouse gas remission, and climate change risk management. Similarly, according to Apple's Website, the firm embraces environmental responsibilities, recycling, and social and ethical responsibility across the supply chain. These CSR efforts create a healthy and ethical corporate image which may lend credence to R&D projects. Therefore, we hypothesize that a firm with a strong CSR record is more likely to receive favorable market valuation of its R&D investments.

Data for testing the above hypothesis is obtained from KLD (Kinder, Lydenberg, and Domini Research & Analytics) and *Compustat*.[2] Results from these tests significantly relate socially responsible firms to high R&D valuation. Moreover, we repeat the tests on two subsamples with high versus low PMC (product market competition). These sub-sample tests investigate if the market is more willing to trust the R&D efforts of firms which are compelled to compete for survival. Significant and positive results from the high-PMC subsample and insignificant results from the low-PMC subsample suggest that, consistent with expectation, R&D investments by firms with strong CSR records are more favorably perceived amid intensive competition.

This study contributes to the literature in several ways. First, our study supports the conjecture that CSR efforts promote an ethical firm image. Second, we shed light on how CSR affects R&D investment and firm valuation. Extant research on CSR links a firm's social responsibility to its financial performance and earning management (Kim et al., 2012; McWilliams and Siegel, 2001). Our study is among the first to empirically explore the relation between CSR, R&D investment, and firm valuation. Third, our results highlight CSR's role in helping investors differentiate the more versus less value-enhancing R&D investments. CSR performance is a useful differentiator as it is associated with the quality of managers' discretionary decisions in R&D investments.

The remaining sections of this study unfold as follows. Section 2 reviews the literature on R&D, CSR, and PMC, and introduces the hypotheses. Section 3 describes the data. Section 4 introduces the variables and the model of R&D valuation (i.e. the portion of firm value attributable to R&D efforts). Section 5 reports empirical results and discusses their implications. Concluding remarks and future research opportunities are presented in Section 6.

2. Prior Literature and Hypothesis Development

2.1. R&D and Firm Value

Investments in R&D enhance knowledge creation, leading to product and process innovation (Padgett and Galan, 2010). R&D investments could endow firms with a certain degree of monopoly power by either exploiting cheaper ways of producing existing goods and thus lowering the costs, or developing new and better products to earn excess profits. Exploiting the monopoly power created by R&D investments, firms could gain market share from its non-innovative competitors to further dominate the market. Consistent with these arguments, empirical studies provide evidence supporting a positive relationship among corporate R&D investments, firm performance, and firm value (Aboody and Lev, 1998; Lev and Sougiannis, 1996; Sougiannis, 1994; Austin, 1993; Hall, 1993; Chan et al., 1990; Bublitz and Ettredge, 1989; Hirschey and Weygandt, 1985).

Although R&D investments are generally valuable to a firm, they are at the discretion of managers hence opening the door to agency problems. Managers can decide "whether to (continue to) invest", "which to invest", "when to invest", as well as "how much to invest". Given different utility functions of managers versus shareholders, R&D investment decisions might not always maximize shareholder value. R&D is a long-term investment where the gains from converting an invention into actual productivity may be realized after a long lag. Managers with myopic views might forgo valuable R&D projects for quicker benefits such as meeting near-term earnings targets (Roychowdhury, 2006; Bushee, 1998; Baber et al., 1991; Dechow and Sloan, 1991; Graham et al., 2005). Because R&D investments have uncertain outcomes and are subject to failures, managers may de-emphasize innovation and thus under-invest in R&D projects even if these projects maximize shareholder-value. The rationale is that different from

[1] Reuters. Dec 6, 2012. Apple's market cap falls below $500 billion as shares keep falling. http://www.reuters.com/article/2012/12/06/us-apple-stock-marketcap-idUSBRE8B50U320121206

CNNMoneyInvest January 25, 2013. Exxon tops Apple as most valuable company. http://money.cnn.com/2013/01/25/investing/apple-exxon/index.html?iid=HP_River

[2] KLD was acquired by RiskMetrics Group in 2009, which in 2010 merged into MCSI who now publishes the ESC (environmental, social and governance) index.

investors who can diversify risks and hedge the consequences of failures, managers have to deal with un-diversifiable human capital in the company (Hill and Snell, 1988).

Agency costs are exacerbated by the higher information asymmetry in R&D investments compared to other capital and financial decisions (Aboody and Lev, 2000). Generally accepted accounting principles (GAAPs) are at least partially responsible for this information asymmetry as they require R&D expenditures to be expensed immediately when incurred and do not oblige firms to report details of on-going R&D projects. In addition, as R&D projects are often firm-specific, assessing their values based on the performance of comparable firms in the same industry may be inappropriate. The absence of organized markets of R&D assets also precludes informative R&D valuation. Prior studies such as Hall (1993) and Jensen (1993) document a sizable fall in R&D valuation as a result of agency problems associated with R&D investments.

2.2. CSR and R&D Valuation

Despite the lack of consensus in defining CSR, the most widely accepted definition is "the social responsibility of business encompassing the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time" (Carroll, 1979, p500). The past decade has witnessed rapid growth in ethical and socially responsible investments in the United States and around the world (Dhaliwal et al., 2011). Increasing stakeholder pressure on management to address and respond to social issues is driving more and more companies to engage in CSR activities. CSR activities strengthen managers' competency in responding to external changes, thereby facilitating efficient product and process innovation (McWilliams and Siegel, 2001), and increasing the potential output from innovative R&D investments. Because CSR facilitates forward thinking (e.g., Porter and Kramer, 2006; Orlitzky et al., 2003), firms with higher CSR performance are less likely to behave myopically. Consistent with this argument, Kim et al. (2012) find that socially responsible firms are less likely to manipulate real activities, which includes cutting R&D and other discretionary expenses to boost current period accounting earnings. A strong commitment to CSR reduces concerns over management's myopic view in R&D investment decisions, and accordingly encourages investors to positively value the firm.

CSR creates a reputation that a firm is honest and reliable, adding financial value to the firm (Schnietz and Epstein, 2005; Lantos, 2001; McWilliams and Siegel, 2001). If a firm treasures its reputation, the desire to protect that reputation can inhibit managers from engaging in socially unacceptable activities. Thus, with CSR enhancing the firm's reputation, managers may invest in R&D projects in the most strategically sensible way to avoid potential reputation damages. Prior studies find that products of firms with a socially responsible reputation are typically perceived by consumers to be of good quality, and are difficult for other firms to imitate (McWilliams and Siegel, 2001; Schnietz and Epstein, 2005; Padgett and Galan, 2010). By the same logic, investors will also expect the R&D investments of these firms to be of better quality and difficult for others to imitate, resulting in a stronger relationship between R&D investments and firm value perceived by investors.

Socially responsible firms are found to be more ethical (Phillips et al., 2003; Donaldson and Preston, 1995; Jones, 1995; Carroll, 1979) and transparent in corporate dealing (Economist Intelligence Unit 2008),[3] have an incentive to be honest, trustworthy, and ethical in their business activities, and adhere to a high standard of behavior (Kim et al., 2012). Hence, these firms are less likely to abuse R&D investment decisions, which helps improve investors' perception about the value of R&D. These qualities of being ethical, transparent, and honest help reduce information asymmetry, alleviate the agency problems associated with R&D investments, and contribute to a stronger relationship between R&D investments and firm value.

However, the popular press is sometimes skeptical of the motive for CSR reporting and even sees CSR as a cover-up for opportunistic conduct (Skapinker, 2010; Hemingway and Maclagan, 2004). According to this line of argument, some seemingly socially responsible firms may make value-reducing R&D decisions, leading to a negative relationship between CSR and firm value. The direction of the relationship between CSR and R&D valuation therefore needs to be empirically determined. Based on the preponderance of evidence supporting a positive relation, we state our first Hypothesis as follows.

H1. CSR performance is positively associated with R&D valuation.

2.3. Impact of Product Market Competition

Product market competition is regarded as an important industry-level governance mechanism in prior literature (e.g., Giroud and Mueller, 2010). Firms operating in a concentrated industry dominated by a few firms are expected to earn higher profits for a long time before earnings revert to the normal level. These firms could benefit from monopoly power by colluding with their industry peers to protect their economic rents and imposing high entry barriers against potential competitors (Eaton and Lipsey, 1981; Mueller, 1977). On the contrary, more intense product market competition is related to lower profitability, greater performance volatility, and higher liquidation risk (Irvine and Pontiff, 2009; Hou and Robinson, 2006).

Firms in competitive industries face higher bankruptcy and liquidation risks. Given involvement in CSR activities normally leads to immediate financial burden (Elhauge, 2005), managers are considered to be much more forward-looking and ethically

[3] See http://graphics.eiu.com/files/ad_pdfs/eiuOracle_CorporateResponsibility_WP.pdf. The same survey reports that 69% of the investors view CSR as a signal of good future performance and 87% of the executives say CSR promotes profitability.

reliable should they still invest in CSR. Investors would therefore have less concern over managerial myopic/unethical R&D investment if firms competing in competitive industries show strong commitment to social responsibility.

In addition, a product market with intense competition generates additional information, which further reduces the information asymmetry that fuels R&D-associated agency problems. A number of prior studies (e.g., Prior et al., 2008; McWilliams et al., 2006; Petrovits, 2006; Carroll, 1979; Jensen and Meckling, 1976) suggest that managers might engage in CSR practices for personal benefits rather than for the interest of the firm and its stakeholders. Product market competition may moderate the motivation for personal benefits because managers are more likely to engage in CSR practice in pursuit of value-enhancing R&D investments to strengthen the firm's competitive position than to seek personal benefits. Therefore, in competitive industries, high CSR scores are believed to signal that firms are either sufficiently confident of their R&D projects and not worried by the takeover risk (Kole and Lehn, 1997; Kole and Lehn, 1999), or driven by forward-thinking to choose to invest in CSR (Flammer, 2014). Based on these arguments, when product market competition is high, the association between socially responsible behaviors and firms' R&D valuation is predicted to be more pronounced. Accordingly, we state our second hypothesis as follows.

H2. The association between CSR performance and R&D valuation is stronger if a firm confronts higher product market competition.

3. Data and Sample

This study uses corporate social performance data from KLD. KLD is an independent investment research company that specializes in assessing firms' social performance along seven dimensions including community, corporate governance, diversity, employee relations, environment, human rights, and product. It issues annual performance evaluations based on a wide variety of information, which includes surveys, financial statements, articles in the popular press and academic journals, as well as government reports. Prior studies document several weaknesses of KLD data (Graves and Waddock, 1994; Humphrey et al., 2012). For example, all dimensions of CSR are given equal importance, whereas most observers of corporate social performance consider some areas as more important than others. Each positive or negative indicator of CSR performance is given a score of 1 or 0, without considering the level of the performance, the consequent social impact, and how well the firms manage the concerns. Additionally, CSR score might be skewed by the number of measures within each KLD dimension. Even so, KLD data have a number of benefits over other ratings. First, each company is rated on multiple attributes considered important to social performance. Second, the assessment is conducted by one group that uses an objective set of screening criteria. Thus, the ratings are applied consistently across all companies and are replicable. Third, KLD is an independent research company that consists of knowledgeable individuals not affiliated with any rated companies or researchers. Finally, this database covers a wide range of companies listed on the stock market. Indeed, KLD data are "factual, reliable, broad-ranging, and maintained with consistency and transparency" (Waddock, 2003a, p1) and described as "the *de facto* research standard at the moment" for measuring CSR in scholarly research (Waddock, 2003a, p4). Hence, KLD rating is generally accepted as a valid proxy for firms' social responsibility efforts and performance observed by the public (Graves and Waddock, 1994; Szwajkowski and Figlewicz, 1999; Waddock, 2003b; Mattingly and Berman, 2006). To date, KLD data have become one of the most widespread used databases employed in prior literature to operationalize the CSR construct (Dhaliwal et al., 2011; Kim et al., 2012; Di Giuli and Kostovetsky, 2014; Servaes and Tamayo, 2013).

Our sample is initially drawn from KLD data over the period 1995–2010.[4] We then merge KLD data with financial data from *Compustat*. We further exclude observations with negative sales, assets, book values, market values as well as observations with missing variables. The final sample has 21,290 firm-year observations.

4. Variables and Empirical Model

4.1. Dependent Variable — Tobin's Q

Tobin's Q (*Tobq*) is the dependent variable representing firm value. R&D investments arguably influence firm performance over time and the ultimate effects of R&D investments may emerge in the distant future. As a forward-looking measure of firm performance, Tobin's Q captures the stock market's expectations about future growth and profitability potential of the company (Montgomery and Wernerfelt, 1988) and therefore is appropriate in assessing the role of R&D efforts in creating economic value for shareholders. Combining capital market data with accounting data, Tobin's Q captures the impact of R&D investments (Ceccagnoli, 2009). Following prior literature (Bebchuk et al., 2009; Gompers et al., 2003), this paper adopts the widely used operationalization of Tobin's Q as the book value of assets minus the book value of equity, plus the market value of equity, scaled by the book value of assets. As in Gompers et al. (2003), we also use industry-adjusted Tobin's Q (*AdjTobq*), computed as Tobin's Q net of its industry (2-digit SIC) median for that year, as an alternative measure of the dependent variable.

4.2. R&D Investments

Following prior literature, we measure the R&D investments as a firm's reported R&D expenditures divided by assets (*RDE*). In our sensitivity analysis, we use estimated capitalized R&D (net R&D assets) as an alternative measure of R&D investments.

[4] KLD data starts from 1991, but this study needs 4 years of data for lagged variables.

4.3. Corporate Social Responsibility (CSR)

KLD compiles positive indicators (strengths) and negative indicators (concerns) of corporate social performance. Following prior literature, we subtract the total CSR concern count from the total CSR strength count to construct a net score of CSR performance, labelled as *CSRscore*. A high *CSRscore* therefore represents a superior CSR performance.

4.4. Other Control Variables

We include capital expenditure and advertising expenditure as control variables since prior studies suggest that they are both positively associated with firm value (Adams and Santos, 2006; Anderson and Reeb, 2003; Bebchuk et al., 2009). We control for financial leverage because debts change a firm's contracting environment through debt covenants (Faleye, 2007) and thereby inhibit its ability to create value. We include firm size to reduce heteroscedascity, and include the annual growth rate of sales, *Growth*, to control for the effect of future investment opportunities on firm value (Yermack, 1996). The ROAs at times *t*, *t-1* and *t-2* control for the effects of contemporaneous and past performance on firm value (Coles et al., 2008). Following prior studies (Coles et al., 2008; Bebchuk et al., 2009), we also control for *Age* of the firm.

4.5. Empirical Model

The following model (Model 1) represents the relationship between CSR and R&D valuation:

$$\text{Tobin}'\text{s } Q_{i,t} = \alpha_0 + \alpha_1 RD_{i,t} + \alpha_2\left(CSRscore_{i,t} * RD_{i,t}\right) + \alpha_3 CSRscore_{i,t} + \alpha_4 Adv_{i,t} + \alpha_5 Capx_{i,t} + \alpha_6 Lev_{i,t} + \alpha_7 Size_{i,t} + \alpha_8 Growth_{i,t} + \alpha_9 ROA_{i,t} + \alpha_{10} ROA_{i,(t-1)} + \alpha_{11} ROA_{i,(t-2)} + \alpha_{12} Age_{i,t} + \varepsilon$$

where:

Tobin's Q = the book value of assets minus the book value of equity, plus the market value of equity, scaled by the book value of assets, labelled as *Tobq*; we also use industry-adjusted Tobin's Q (*AdjTobq*), computed as *Tobq* net of its industry (2-digit SIC) median, as an alternative measure.
RD = research and development investments, measured as R&D expenditure scaled by total assets (*RDE*); we also use estimated capitalized R&D (*RDC*) as an alternative measure.
CSRscore = net score of CSR ratings, measured as total strength count minus total concern count.
Adv = advertising expenditure scaled by total assets;
Capx = capital expenditure scaled by total assets;
Lev = total debt divided by total assets;
Size = firm size measured by the natural logarithm of total assets;
Growth = annual growth rate of sales;
ROA = return on assets;
Age = the natural log of the number of years since the first trading date on CRSP.

The above model includes dummy variables to control for fixed industry and year effects. The coefficient α_1, representing R&D valuation (i.e. the portion of firm value attributable to R&D efforts), is predicted to be positive and significant. Our variable of interest is the interaction term *CSRscore*RD* which measures the impact of CSR on R&D valuation. We expect α_2 to be positive and significant.

5. Empirical Results

5.1. Descriptive Statistics and Univariate Analysis

Table 1 Panel A reports the descriptive statistics for variables used in Model 1. All variables except *CSRscore* are winsorized at the top and bottom 1% of their distributions. *CSRscore* is not winsorized because observations concentrate on just a small number of discrete values. The mean values of *Tobq* and *AdjTobq* are 1.927 and 0.306, respectively. R&D expenditure scaled by total assets (*RDE*) has a mean of 2.9% (median of 0). Consistent with Kim et al. (2012) and Padgett and Galan (2010), the average *CSRscore* is −0.290, indicating that on average the CSR concerns of sample firms slightly outweigh the strengths. Advertising and capital expenditure account for about 1.0% and 4.6%, respectively, of the total assets. Firm size has a mean (median) of 7.452 (7.366). On average annual sales grow at a rate of 13.7%. Returns on assets in the current and past two years are around 6%. In sum, the descriptive statistics of these variables are consistent with prior literature (Faleye, 2007; Villalonga and Amit, 2006; Bebchuk et al., 2009; Kim et al., 2012).

Panel B Table 1 presents the summary statistics of *CSRscore* across all industries based on 2-digit SIC code. Higher scores indicate a better overall CSR performance. The extractive industry (Coal Mining, SIC code = 12) has the lower score, while the

Table 1
Descriptive statistics.
Panel A reports the summary statistics of all variables used in estimating Model 1. The sample period is from 1995 to 2010. All variables except *CSRscore* are winsorized at the 1st and 99th percentile values. *CSRscore* is not winsorized because observations concentrate on just a small number of discrete values. *Tobq* is the ratio of market value of assets to book value of assets and is calculated as the book value of assets minus the book value of equity, plus the market value of equity, scaled by the book value of assets. *AdjTobq* is computed as *Tobq* net of its industry (2-digit SIC) median for the current year. *RDE* is research and development expenditure scaled by the total assets. *RDC* is estimated research and development assets scaled by the total assets. *CSRscore* is net score of CSR ratings, measured as total strength minus total concern in six social rating categories of KLD ratings data including community, corporate governance, diversity, employee relations, environment, human rights and product. *Adv* is advertising expenditure scaled by the total assets. *Capx* is capital expenditure scaled by the total assets. *Lev* is total debt divided by total assets. *Size* is firm size, measured as the natural logarithm of total assets. *Growth* is annual growth rate of sales. *ROA* is net income (before R&D expenditures) on total assets, after adjusting for the tax influence of R&D expenditure. *Age* is firm age measured as the natural logarithm of the number of years since the first trading date as recorded in CRSP.
Panel B reports the summary statistics of *CSRscore* for all industries based on 2-digit SIC code.

Panel A. Descriptive statistics of all variables

Variable	N	Mean	Std dev	Median	25th Pctl	75th Pctl
Tobq	21,290	1.927	1.256	1.480	1.133	2.196
AdjTobq	21,290	0.306	1.141	0.000	−0.285	0.473
RDE	21,290	0.029	0.059	0.000	0.000	0.031
RDC	21,290	0.074	0.154	0.000	0.000	0.075
CSRscore	21,290	−0.290	2.221	0.000	−1.000	1.000
Adv	21,290	0.010	0.027	0.000	0.000	0.004
Capx	21,290	0.046	0.054	0.030	0.010	0.061
Lev	21,290	0.219	0.190	0.194	0.047	0.338
Size	21,290	7.452	1.694	7.366	6.224	8.521
Growth	21,290	0.137	0.274	0.091	0.006	0.209
ROA_t	21,290	0.057	0.099	0.050	0.013	0.102
ROA_{t-1}	21,290	0.060	0.095	0.051	0.014	0.103
ROA_{t-2}	21,290	0.057	0.101	0.049	0.013	0.101
Age	21,290	2.559	0.930	2.652	2.079	3.311

Panel B. Descriptive statistics of CSR scores across industries

2-Digit SIC code	Industry name	Mean	Std dev	Median	25th Pctl	75th Pctl	PMC level[a]
01	Agricultural Production — Crops	−2.235	2.861	−2	−4	0	Low
02	Agricultural Production — Livestock	−1.500	1.000	−2	−2	−1	Low
07	Agricultural Services	−0.786	1.311	−1	−2	0	Low
10	Metal, Mining	−0.987	2.553	0	−3	1	Low
12	Coal Mining	−3.780	1.791	−4	−5	−2	Low
13	Oil & Gas Extraction	−1.434	1.954	−1	−2	0	High
14	Nonmetallic Minerals, Except Fuels	−0.500	0.971	0	−1	0	Low
15	General Building Contractors	−1.453	1.647	−1	−2	0	Low
16	Heavy Construction, Except Building	−1.036	2.582	−1	−2	0	Low
17	Special Trade Contractors	−0.744	1.499	−1	−1	0	Low
20	Food & Kindred Products	0.021	3.508	0	−2	2	High
21	Tobacco Products	−2.452	2.158	−2	−4	−1	Low
22	Textile Mill Products	0.071	2.231	0	−2	2	Low
23	Apparel & Other Textile Products	−0.795	1.983	−1	−2	0	Low
24	Lumber & Wood Products	0.000	2.172	0	−1	1	Low
25	Furniture & Fixtures	0.733	2.935	0	−1	1	Low
26	Paper & Allied Products	−0.295	2.403	0	−2	1	High
27	Printing & Publishing	0.779	1.919	1	0	2	High
28	Chemical & Allied Products	−0.301	2.356	0	−2	1	High
29	Petroleum & Coal Products	−3.136	2.874	−3	−5	−1	Low
30	Rubber & Miscellaneous Plastics Products	0.292	2.614	0	−1	2	Low
31	Leather & Leather Products	0.552	2.892	0	−2	2	Low
32	Stone, Clay, & Glass Products	−0.513	2.024	−1	−2	1	Low
33	Primary Metal Industries	−1.176	2.443	−1	−2	0	Low
34	Fabricated Metal Products	−0.966	1.778	−1	−2	0	Low
35	Industrial Machinery & Equipment	0.098	2.587	0	−1	1	Low
36	Electronic & Other Electric Equipment	−0.069	2.234	0	−1	1	High
37	Transportation Equipment	−1.057	2.088	−1	−2	0	Low
38	Instruments & Related Products	0.019	2.046	0	−1	1	High
39	Miscellaneous Manufacturing Industries	0.386	2.213	0	−1	1	Low
40	Railroad Transportation	−2.547	2.042	−2	−4	−1	Low
41	Local & Interurban Passenger Transit	−1.900	1.792	−1	−4	−1	Low
42	Trucking & Warehousing	−0.471	1.669	0	−1	0	Low
44	Water Transportation	−1.566	1.345	−1	−2	−1	Low
45	Transportation by Air	0.754	2.369	0	−1	2	Low
46	Pipelines, Except Natural Gas	0.000	1.000	0	−1	1	Low
47	Transportation Services	−1.026	1.319	−1	−2	0	Low
48	Communications	−0.429	1.807	0	−1	1	High
49	Electric, Gas, & Sanitary Services	−0.965	2.669	−1	−2	1	High
50	Wholesale Trade - Durable Goods	−0.395	1.334	0	−1	0	Low

Table 1 *(continued)*

Panel B. Descriptive statistics of CSR scores across industries							
2-Digit SIC code	Industry name	Mean	Std dev	Median	25th Pctl	75th Pctl	PMC level[a]
51	Wholesale Trade - Nondurable Goods	−0.995	1.578	−1	−2	0	Low
52	Building Materials & Gardening Supplies	0.250	2.151	1	0	1	Low
53	General Merchandise Stores	−1.224	2.614	−1	−3	0	Low
54	Food Stores	0.170	2.875	0	−2	2	Low
55	Automative Dealers & Service Stations	−1.800	1.656	−2	−3	−1	Low
56	Apparel & Accessory Stores	0.044	2.173	0	−1	1	Low
57	Furniture & Homefurnishings Stores	−0.682	1.427	−1	−2	0	Low
58	Eating & Drinking Places	−0.315	2.620	−1	−2	1	Low
59	Miscellaneous Retail	−0.069	1.785	0	−1	1	Low
60	Depository Institutions	0.647	1.602	0	0	1	High
61	Nondepository Institutions	0.937	2.809	0	−1	2	Low
62	Security & Commodity Brokers	−0.618	2.023	−1	−2	0	Low
63	Insurance Carriers	−0.219	1.860	0	−1	1	High
64	Insurance Agents, Brokers, & Service	−0.434	1.646	0	−1	0	Low
65	Real Estate	−0.543	1.520	−1	−2	1	Low
67	Holding & Other Investment Offices	−0.389	1.236	0	−1	0	Low
70	Hotels & Other Lodging Places	0.254	2.293	0	−1	1	Low
72	Personal Services	−0.955	1.523	−1	−2	0	Low
73	Business Services	−0.033	1.934	0	−1	1	Low
75	Auto Repair, Services, & Parking	−0.907	1.815	0	−2	0	Low
76	Miscellaneous Repair Services	0.000	0.000	0	0	0	Low
78	Motion Pictures	−0.149	1.956	0	−1	1	Low
79	Amusement & Recreation Services	−1.253	1.506	−1	−2	0	Low
80	Health Services	−1.123	1.568	−1	−2	0	Low
81	Legal Services	0.200	0.447	0	0	0	Low
82	Educational Services	−0.012	1.876	0	−1	1	Low
83	Social Services	0.077	2.382	0	−2	1	Low
87	Engineering & Management Services	−0.614	1.679	−1	−1	0	Low
99	Non-Classifiable Establishments	−1.750	3.263	−1	−4	0	Low

[a] In our main analysis we calculate HHI based one 3-digit SIC code to be consistent with prior literature (e.g., Hou and Robinson, 2006; Giroud and Mueller, 2010; Haw et al., 2015). In Panel B Table 1 here, however, we report HHI based on 2-digit SIC code for the sake of space.

financial services sector (Nondepository Institutions, SIC code = 61) has the highest. The results are consistent with prior literature (e.g., Tsoutsoura, 2004; Chih et al., 2010).[5]

Table 2 presents the correlation coefficients of the variables. R&D investments are positively associated with Tobin's Q, suggesting that R&D efforts enhance firm value. *CSRscore* is positively related to both *Tobq* and *AdjTobq*, suggesting a positive impact of CSR performance on firm value. Advertising expenditures and capital expenditures are both positively associated with Tobin's Q, indicating the value-enhancing nature of such expenditures. The correlation coefficients of *Lev*, *Size* and *Age* (with Tobin's Q) are negative and significant, implying a higher firm value for less geared, smaller and younger firms. The correlation coefficients of *Growth* and *ROA* (with Tobin's Q) are positive and significant, suggesting that the market attaches a higher value to firms with stronger growth opportunity and higher profitability.

5.2. Effect of CSR on R&D Valuation

Multivariate tests are conducted using ordinary least squares (OLS). The results are presented in Table 3. The dependent variables are *Tobq* for columns (1) and (2) and *AdjTobq* for columns (3) and (4).

Consistent with prior literature (Hall, 1993; Hirschey and Weygandt, 1985; Sougiannis, 1994; Chambers et al., 2002; Chan et al., 2001; Bublitz and Ettredge, 1989), the coefficients on *RD* are positive and significant (*P*-value <0.01) in all columns, suggesting that firms with higher level of R&D expenditures are valued more favorably by the market. The coefficients on *CSRscore* are significantly positive, reflecting that better CSR performance is associated with higher firm value. This result is consistent with prior literature (Luo and Bhattacharya, 2006; Fombrun and Shanley, 1990). More importantly, we find positive and significant coefficients on *CSRscore***RD*, indicating that the market more highly values the R&D expenditures of firms with better CSR performance. These results support our first hypothesis.

The parameter estimates of control variables are generally consistent with prior literature (Faleye, 2007; Villalonga and Amit, 2006; Bebchuk et al., 2009). A positive and significant relationship exists between advertising/capital expenditures and firm value in all specifications, indicating that advertising/capital expenditures are valued by the market. The coefficients on *Lev* are negative and significant, implying that the market disfavors risks and therefore discounts the firm value for high leverage. The significantly negative coefficients of *Size* imply that larger firms have lower firm values (Adams and Santos, 2006; Agrawal and Knoeber, 1996).

[5] Further tests show that the mean values of *CSRscore* for high-PMC and low-PMC groups are −0.151 and −0.429, respectively and the difference is significant (*p*-value < 0.00). The results are consistent with high-PMC firms showing better CSR performance.

Table 2
Correlation matrix.
This table presents the Pearson and Spearman correlation of the variables. The Pearson (Spearman) correlation coefficients are presented above (below) the diagonal. Correlation coefficients in bold denote statistical significance at the 5% level or better. The sample period is from 1995 to 2010. All variables follow the definitions in Table 1.

Variable	*Tobq*	*AdjTobq*	*RDE*	*RDC*	*CSRscore*	*Adv*	*Capx*	*Lev*	*Size*	*Growth*	ROA_t	ROA_{t-1}	ROA_{t-2}	*Age*
Tobq	–	0.952	0.390	0.334	0.095	0.149	0.111	−0.280	−0.291	0.220	0.411	0.349	0.240	−0.125
AdjTobq	0.765	–	0.270	0.216	0.100	0.106	0.082	−0.229	−0.190	0.216	0.369	0.300	0.196	−0.115
RDE	0.411	0.102	–	0.924	0.063	−0.047	−0.071	−0.242	−0.334	0.091	0.155	0.159	0.112	−0.131
RDC	0.379	0.079	0.947	–	0.064	−0.046	−0.081	−0.224	−0.310	0.028	0.147	0.138	0.101	−0.058
CSRscore	0.055	0.103	0.042	0.044	–	0.082	−0.047	−0.076	0.030	−0.003	0.071	0.078	0.082	0.032
Adv	0.103	0.050	0.021	0.013	0.074	–	0.082	−0.070	−0.083	−0.040	0.066	0.093	0.081	0.010
Capx	0.293	0.088	0.076	0.069	−0.072	0.066	–	0.025	−0.088	0.099	0.055	0.100	0.080	0.019
Lev	−0.303	−0.224	−0.283	−0.258	−0.088	−0.087	0.019	–	0.317	−0.002	−0.252	−0.226	−0.173	0.066
Size	−0.313	−0.100	−0.288	−0.250	0.012	−0.047	−0.114	0.384	–	−0.097	−0.078	−0.079	−0.030	0.320
Growth	0.257	0.250	0.053	0.022	−0.007	−0.031	0.082	−0.058	−0.085	–	0.111	−0.021	−0.073	−0.194
ROA_t	0.624	0.423	0.351	0.342	0.029	0.092	0.257	−0.321	−0.192	0.219	–	0.578	0.412	0.047
ROA_{t-1}	0.517	0.315	0.335	0.327	0.035	0.106	0.281	−0.289	−0.174	0.077	0.701	–	0.579	0.048
ROA_{t-2}	0.422	0.229	0.300	0.299	0.046	0.099	0.255	−0.238	−0.137	0.023	0.558	0.701	–	0.080
Age	−0.075	−0.064	−0.038	0.019	0.014	−0.029	0.133	0.138	0.358	−0.170	0.052	0.062	0.086	–

The coefficient estimates of *Growth* are significantly positive, suggesting that growth opportunity captures the development potential of firms and thus enhances the firm value. The coefficients of $ROA_{i,t}$, $ROA_{i,(t-1)}$ and $ROA_{i,(t-2)}$ are positive and significant, suggesting that the market values profitable firms favorably. The coefficients of *Age* are significantly negative, indicating a negative relationship between firm age and firm value.

Table 3
CSR's influence on R&D valuation.
$$\text{Tobin's Q}_{i,t} = \alpha_0 + \alpha_1 RD_{i,t} + \alpha_2 (CSRscore_{i,t} * RD_{i,t}) + \alpha_3 CSRscore_{i,t} + \alpha_4 Adv_{i,t} + \alpha_5 Capx_{i,t} + \alpha_6 Lev_{i,t} + \alpha_7 Size_{i,t} + \alpha_8 Growth_{i,t} + \alpha_9 ROA_{i,t} + \alpha_{10} ROA_{i,(t-1)} + \alpha_{11} ROA_{i,(t-2)} + \alpha_{12} Age_{i,t} + \varepsilon.$$
This table presents the multivariate regression results of the above model. All variables except *CSRscore* are winsorized at the 1st and 99th percentile values. *CSRscore* is not winsorized because observations concentrate on just a small number of discrete values. The industry and year fixed effect controls are included, but not reported. The dependent variable Tobin's Q is measured as *Tobq* in columns (1) and (2) and as *AdjTobq* in columns (3) and (4). All the variables follow the definitions in Table 1. The sample period is from 1995 to 2010. *P*-values are presented in the brackets below the coefficient estimates. *, **, *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	*Tobq* as dependent variable		*AdjTobq* as dependent variable	
	(1)	(2)	(3)	(4)
RD	4.960***	4.936***	4.972***	4.949***
	[0.000]	[0.000]	[0.000]	[0.000]
CSRscore		0.015***		0.015***
		[0.000]		[0.000]
***CSRscore*RD**		***0.187***		***0.189***
		[0.002]		**[0.002]**
Adv	4.107***	3.985***	4.084***	3.962***
	[0.000]	[0.000]	[0.000]	[0.000]
Capx	1.938***	1.882***	1.933***	1.876***
	[0.000]	[0.000]	[0.000]	[0.000]
Lev	−0.788***	−0.780***	−0.783***	−0.775***
	[0.000]	[0.000]	[0.000]	[0.000]
Size	−0.065***	−0.067***	−0.065***	−0.067***
	[0.000]	[0.000]	[0.000]	[0.000]
Growth	0.647***	0.643***	0.647***	0.643***
	[0.000]	[0.000]	[0.000]	[0.000]
ROA	2.526***	2.513***	2.524***	2.511***
	[0.000]	[0.000]	[0.000]	[0.000]
ROA_{t-1}	1.406***	1.389***	1.398***	1.381***
	[0.000]	[0.000]	[0.000]	[0.000]
ROA_{t-2}	0.322***	0.293***	0.324***	0.295***
	[0.000]	[0.000]	[0.000]	[0.000]
Age	−0.060***	−0.061***	−0.059***	−0.061***
	[0.000]	[0.000]	[0.000]	[0.000]
Constant	2.072***	2.090***	0.450***	0.468***
	[0.000]	[0.000]	[0.000]	[0.000]
Observations	21,290	21,290	21,290	21,290
Adj. *R*-squared	0.427	0.428	0.305	0.306

5.3. CSR's Impact on R&D Valuation Across Competition Levels

To test H2, we conduct sub-sample regressions and compare the effects of CSR on R&D valuation under strong versus weak PMC. Following previous literature, we use *HHI* (i.e. Herfindahl-Hirschman Index) to proxy for the level of PMC. *HHI* is computed as the sum of the squared market shares of the firms competing in each industry. High (Low) HHI values denote low (high) levels of PMC. Industry membership is classified by the three-digit SIC code.[6] We first partition our sample into high-PMC and low-PMC subgroups. The high-PMC (low-PMC) subgroup consists of firm-years in industries where the *HHI* is lower (higher) than the median of the year, thus capturing observations facing higher (lower) product market competition. We then separately estimate Model 1 for the high-PMC and low-PMC subgroups. According to our second hypothesis, we expect the impact of CSR on R&D valuation to be stronger in the high-PMC subgroup.

The results are reported in Table 4. Panel A presents the descriptive statistics of all the variables in high- and low-PMC subgroups. The results show that on average high-PMC firms are characterized by significantly higher firm values (*Tobq* and *AdjTobq*), more R&D investments (*RDE*), better CSR performance (*CSRscore*), more capital expenditures (*Capx*), larger firm size (Size), and younger age (*Age*).

The regression results across different subgroups are presented in Panel B of Table 4. The dependent variables are *Tobq* for Columns (1) and (2) and *AdjTobq* for Columns (3) and (4). We find that the coefficients on *CSRscore*RD* are positive and significant in all specifications for the high-PMC sub-sample. On the contrary, none of the coefficients on the *CSRscore*RD* interaction term is significant for the low-PMC sub-sample. These results suggest that the impact of CSR performance on the market valuation of R&D only exists in competitive markets.

5.4. Endogeneity Checks

It can be argued that managers' choice of CSR efforts depends on the market valuation of a firm's R&D investment. It is also possible that the factors that determine CSR are also determining R&D valuation. If so, there will be correlation between the explanatory variables and the error term leading to biased estimates. To address these potential endogeneity problems, we first use lagged independent variables in the regression and repeat the analysis (Goss and Roberts, 2011; Hermalin and Weisbach, 1991). The results (untabulated) are unchanged. Second, we follow prior studies and adopt the instrumental variables estimation (2SLS) method (El Ghoul et al., 2011; Bartov and Li, 2015; Deng et al., 2013). The instrumental variable we use is *redstate*, a dummy variable that equals one if a firm is headquartered in a red/Republican state and zero otherwise. Rubin (2008)[7] finds that firms with high CSR rankings tend to be located in states that vote Democratic in presidential elections and low CSR firms tend to be in Republican states. We therefore expect *redstate* to be highly correlated with our sample firms' CSR performance. However, there is no reason to believe that the choice of locating in a Republican or Democratic state would have a direct significant effect on R&D valuation. Data on whether a state is red (Republican) or blue (Democratic) is available at the U.S. Electoral College. Table 5 shows the 2SLS estimation results. The coefficients on *CSRscore*RD* are positive and only significant in High-PMC subsample. Overall, the results are unchanged, suggesting that our findings are not driven by endogeneity.

5.5. Using Alternative Measures to Proxy for Firm Value: Stock Return and Intrinsic Value

In our main analysis, we use Tobin's Q as the dependent variable to proxy for firm value. To address potential measurement errors contained in Tobin's Q, we follow prior literature (e.g., Lev and Sougiannis, 1996; Healy et al., 2002) and use stock return to examine the relationship between CSR and R&D valuation. Specifically, the contemporaneous association between stock returns and R&D/CSR indicates the extent that CSR's impact on R&D is currently recognized by investors. The regression model (Model 2) is as follows.

$$\mathrm{RETURN}_{i,t} = \beta_0 + \beta_1 \mathrm{RD}_{i,t} + \beta_2 \left(\mathrm{CSRscore}_{i,t} * \mathrm{RD}_{i,t}\right) + \beta_3 \mathrm{CSRscore}_{i,t} + \beta_4 \mathrm{BETA}_{i,t} + \beta_5 EPS_{i,t} + \beta_6 \mathrm{Lev}_{i,t} + \beta_7 \mathrm{Size}_{i,t} + \beta_8 MB_{i,t} + \beta_9 \mathrm{Age}_{i,t} + \varepsilon$$

where *RETURN* is the annual common stock return from nine months before to three months after the fiscal year end. *BETA* is market model *Beta*, representing the sensitivity of a firm's return to market returns. *EPS* is earnings per share. *MB* is market to book ratio, calculated as market value of equity divided by book value of equity. Other variables are defined as in Table 1.

[6] We classify industry membership based on the three-digit SIC code following prior literature (e.g., Giroud and Mueller, 2010; Hou and Robinson, 2006; Haw et al., 2015). This classification considers the balance between a large number of observations within an industry and homogeneity among industry members. The results do not change qualitatively when we classify industry membership based on the two-digit SIC code.

[7] Rubin (2008) documents that CSR policy is an inherently political phenomenon affected by the political beliefs of a firms' stakeholders. In particular, Democratic Party policies include many precepts embraced by the CSR movement. For example, Democratic Party's platform contains a commitment to support workers and consumers. On the contrary, the values of most Republicans are not in alignment with the principles of CSR. For example, Republicans believe that good government is based on a system of limited taxes and limited spending, a view that is analogous to the corporate view that profits should be distributed to shareholders and not spent on social causes.

Table 4
CSR's influence on R&D valuation in high and low product market competition.
Panel A presents the descriptive statistics of the variables used in sub-samples. The high-PMC subsample contains observations in industries with *HHI* below the median at year *t*, and the low-PMC subsample contains observations in industries with *HHI* above the median at year *t*. *HHI*, the proxy for product market competition, is computed as the sum of the squared market shares of the firms competing in each industry. Industry membership is classified based on the three-digit SIC code. The sample period is from 1995 to 2010.

Panel A. Descriptive statistics for high and low product market competition

Variable	High-PMC (n = 10,644)			Low-PMC (n = 10,646)			High-PMC minus low-PMC		
	Mean	Std dev	Median	Mean	Std dev	Median	Difference	*t*-sta	*P*-value
Tobq	2.015	1.405	1.453	1.840	1.081	1.499	0.174	10.150	0.000
AdjTobq	0.384	1.235	0.015	0.228	1.033	−0.027	0.157	10.040	0.000
RDE	0.043	0.073	0.000	0.015	0.036	0.000	0.028	35.390	0.000
CSRscore	−0.151	2.118	0.000	−0.429	2.312	0.000	0.278	9.150	0.000
Adv	0.006	0.019	0.000	0.015	0.033	0.000	−0.008	−22.740	0.000
Capx	0.047	0.062	0.026	0.045	0.045	0.033	0.002	2.800	0.005
Lev	0.220	0.198	0.184	0.218	0.180	0.201	0.001	0.510	0.607
Size	7.498	1.792	7.478	7.406	1.589	7.275	0.092	3.950	0.000
Growth	0.165	0.307	0.104	0.110	0.234	0.080	0.055	14.700	0.000
ROA_t	0.058	0.108	0.044	0.055	0.090	0.055	0.003	1.840	0.066
ROA_{t-1}	0.061	0.103	0.044	0.059	0.087	0.056	0.001	1.020	0.310
ROA_{t-2}	0.056	0.111	0.041	0.058	0.090	0.055	−0.002	−1.510	0.131
Age	2.514	0.921	2.639	2.603	0.936	2.708	−0.089	−6.990	0.000

Panel B. Regression results

Panel B presents the regression results of the following model in the high-PMC sample versus the low-PMC sample:

$$\text{Tobin's } Q_{i,t} = \alpha_0 + \alpha_1 RD_{i,t} + \alpha_2 (CSRscore_{i,t} * RD_{i,t}) + \alpha_3 CSRscore_{i,t} + \alpha_4 Adv_{i,t} + \alpha_5 Capx_{i,t} + \alpha_6 Lev_{i,t} + \alpha_7 Size_{i,t} + \alpha_8 Growth_{i,t} + \alpha_9 ROA_{i,t} + \alpha_{10} ROA_{i,(t-1)} + \alpha_{11} ROA_{i,(t-2)} + \alpha_{12} Age_{i,t} + \varepsilon$$

The dependent variables are *Tobq* for columns (1) and (2) and *AjdTobq* for columns (3) and (4). The industry and year fixed effect controls are included, but not reported. Refer to Table 1 for variable definitions. The sample period is from 1995 to 2010. *P*-values are presented in the brackets below the coefficient estimates. *, **, *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	*Tobq* as dependent variable		*AdjTobq* as dependent variable	
	(1)	(2)	(3)	(4)
	High-PMC	Low-PMC	High-PMC	Low-PMC
RD	4.452***	3.723***	4.465***	3.701***
	[0.000]	[0.000]	[0.000]	[0.000]
CSRscore	0.009	0.021***	0.008	0.021***
	[0.171]	[0.000]	[0.188]	[0.000]
***CSRscore*RD**	***0.233*** **	***0.102***	***0.240*** **	***0.090***
	[*0.003*]	**[*0.361*]**	**[*0.003*]**	**[*0.417*]**
Adv	6.411***	3.544***	6.433***	3.498***
	[0.000]	[0.000]	[0.000]	[0.000]
Capx	2.183***	1.846***	2.203***	1.818***
	[0.000]	[0.000]	[0.000]	[0.000]
Lev	−1.051***	−0.534***	−1.049***	−0.525***
	[0.000]	[0.000]	[0.000]	[0.000]
Size	−0.060***	−0.066***	−0.060***	−0.066***
	[0.000]	[0.000]	[0.000]	[0.000]
Growth	0.601***	0.654***	0.603***	0.649***
	[0.000]	[0.000]	[0.000]	[0.000]
ROA	2.029***	3.157***	2.024***	3.160***
	[0.000]	[0.000]	[0.000]	[0.000]
ROA_{t-1}	1.166***	1.642***	1.159***	1.634***
	[0.000]	[0.000]	[0.000]	[0.000]
ROA_{t-2}	−0.051	0.759***	−0.045	0.756***
	[0.660]	[0.000]	[0.700]	[0.000]
Age	−0.037***	−0.066***	−0.037***	−0.065***
	[0.004]	[0.000]	[0.004]	[0.000]
Constant	2.156***	1.967***	0.521***	0.358***
	[0.000]	[0.000]	[0.000]	[0.000]
P-value of the differences of coefficients on *CSRscore*RD*	0.082*		0.073*	
Observations	10,644	10,646	10,644	10,646
Adj. *R*-squared	0.460	0.413	0.297	0.364

Table 5
CSR, R&D valuation and product market competition: 2SLS.
This table presents the 2SLS regression results of Model 1. The instrument variable is *redstate*, a dummy variable that equals one if a firm is headquartered in a red/Republican state and zero otherwise. All variables except *CSRscore* are winsorized at the 1st and 99th percentile values. The industry and year fixed effect controls are included, but not reported. All variables follow the definitions in Table 1. The sample period is from 1995 to 2010. *P*-values are presented in the brackets below the coefficient estimates. *, **, *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	*Tobq* as dependent variable			*AdjTobq* as dependent variable		
	(1)	(2)	(3)	(4)	(5)	(6)
	Total sample	High-PMC	Low-PMC	Total sample	High-PMC	Low-PMC
RD	0.575	−1.201*	1.145**	0.575	−1.201*	1.145**
	[0.145]	[0.055]	[0.027]	[0.145]	[0.055]	[0.027]
CSRscore	−0.004	−0.084	0.076*	−0.004	−0.084	0.076*
	[0.907]	[0.196]	[0.084]	[0.907]	[0.196]	[0.084]
CSRscore*RD	***1.035****	***1.786****	***−0.392***	***1.035****	***1.786****	***−0.392***
	[0.000]	***[0.000]***	***[0.396]***	***[0.000]***	***[0.000]***	***[0.396]***
Adv	3.981***	4.269***	3.856***	3.981***	4.269***	3.856***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Capx	2.096***	1.965***	2.180***	2.096***	1.965***	2.180***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Lev	−0.796***	−1.324***	−0.446***	−0.796***	−1.324***	−0.446***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Size	−0.012*	0.019	−0.029***	−0.012*	0.019	−0.029***
	[0.083]	[0.130]	[0.001]	[0.083]	[0.130]	[0.001]
Growth	0.805***	0.930***	0.630***	0.805***	0.930***	0.630***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ROA	3.367***	3.296***	3.403***	3.367***	3.296***	3.403***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ROA	2.276***	2.241***	2.185***	2.276***	2.241***	2.185***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ROA	1.655***	1.417***	1.777***	1.655***	1.417***	1.777***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Age	−0.072***	−0.096***	−0.041***	−0.072***	−0.096***	−0.041***
	[0.000]	[0.000]	[0.004]	[0.000]	[0.000]	[0.004]
Constant	1.539***	1.617***	1.448***	1.539***	1.617***	1.448***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
P-value of the differences of coefficients on *CSRscore*RD*	0.043**			0.051**		
Observations	19,640	9820	9820	19,640	9820	9820
Adj. *R*-squared	0.480	0.527	0.470	0.480	0.527	0.470

The results are presented in Table 6. Column (1) reports the results based on the full sample. Column (2) and (3) report the results for high-PMC and low-PMC subsample, respectively. Consistent with the findings above, the coefficients on *CSRscore*RD* are significantly positive only for the full sample and the high-PMC subsample. These results further support our hypothesis.

Apart from stock return, we also use a measure of firm's intrinsic value (*IV*) to repeat the analysis because *IV* is less likely to suffer from R&D mispricing (Subramanyam and Venkatachalam, 2007; Chan et al., 2001). Our calculation of *IV* is based on Subramanyam and Venkatachalam (2007). We then replace Tobin's Q with *IV* and *re*-estimate Model 1. The untabulated results of the intrinsic value regression are similar to those reported in Tables 3 and 4.[8]

5.6. Other Robustness Tests

We conduct other sensitivity tests to address robustness issues. First, because the reported annual R&D expense arguably may not reflect the stock of the R&D investments captured in the firm value, we also compute and test a stock measure of R&D investments. Following previous literature (Chan et al., 2001; Chambers et al., 2002), we capitalize and amortize R&D expenditure on a pro forma basis by applying straight-line depreciation on R&D investments over five years. The estimated net R&D assets (*RDC*), as calculated with the following formula, do not lead to qualitatively different regression results (not tabulated):

$$RDC_t = RDE_t + 0.8(RDE_{t-1}) + 0.6(RDE_{t-2}) + 0.4(RDE_{t-3}) + 0.2(RDE_{t-4}).$$

where

RDC = Estimated capitalized R&D (net R&D assets);
RDE = R&D expenditures;

[8] Tabulated results can be supplied upon request to the authors.

Table 6
CSR, R&D valuation and product market competition: return model.
$RETURN_{i,t} = \beta_0 + \beta_1 RD_{i,t} + \beta_2 (CSRscore_{i,t} * RD_{i,t}) + \beta_3 CSRscore_{i,t} + \beta_4 BETA_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \beta_7 Size_{i,t} + \beta_8 MB_{i,t} + \beta_9 Age_{i,t} + \varepsilon.$
This table presents the multivariate regression results of the above model. The dependent variable RETURN is the annual common stock return from nine months before to three months after the fiscal year end. *BETA* is market model *Beta*, representing the sensitivity of a firm's return to market returns. *EPS* is the earnings per share. *MB* is market to book ratio, calculated as market value of equity to book value of equity. Other variables follow the definitions in Table 1. All variables except *CSRscore* are winsorized at the 1st and 99th percentile values. The industry and year fixed effect controls are included, but not reported. The sample period is from 1995 to 2010. *P*-values are presented in the brackets below the coefficient estimates. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)
	Total sample	High-PMC subsample	Low-PMC subsample
RD	1.699***	2.030***	1.617***
	[0.000]	[0.000]	[0.000]
***CSRscore*RD**	***0.144*****	***0.219*****	***0.035***
	[*0.000*]	**[*0.000*]**	**[*0.585*]**
CSRscore	0.001	−0.003	0.005**
	[0.672]	[0.322]	[0.039]
BETA	0.035***	−0.008	0.091***
	[0.000]	[0.322]	[0.000]
EPS	0.034***	0.033***	0.033***
	[0.000]	[0.000]	[0.000]
Lev	−0.082***	−0.110***	−0.084***
	[0.000]	[0.000]	[0.005]
Size	−0.005*	−0.003	−0.007*
	[0.057]	[0.404]	[0.070]
MB	0.027***	0.035***	0.021***
	[0.000]	[0.000]	[0.000]
Age	−0.009**	−0.003	−0.018***
	[0.015]	[0.633]	[0.002]
Constant	0.114***	0.171***	0.073*
	[0.000]	[0.000]	[0.078]
P-value of the differences of coefficients on *CSRscore*RD*		0.036**	
Observations	21,142	10,563	10,579
R-squared	0.319	0.355	0.306

Second, our results are robust to these additional sensitivity tests: (1) additional control for the interaction term between size and R&D expenditure in response to the observation in prior literature (e.g., Morck and Yeung, 1999) that firm size enhances the effect of R&D expenditure on firm value, and (2) using sales revenue as an alternative deflator of R&D, advertising, and capital expenditures.

6. Conclusion and Future Research

This study investigates the relationship between CSR and R&D valuation. We find CSR performance to be positively associated with R&D valuation, and such association to be significant only in highly competitive industries. These results are robust to different measures of R&D and firm value, endogeneity test, and additional sensitivity analyses. Our results are consistent with the views that CSR efforts help a firm create a healthy and ethical corporate image which lends credence to its R&D projects, and that the market is more willing to trust the R&D efforts of firms who are compelled to compete for survival amid intensive competition.

Demonstrating the positive association between CSR performance and R&D valuation is a unique contribution of this study, but high PMC is just one of the conditions that strengthen this association. Researchers may want to find out whether CSR performance conveys more positive R&D information when the firms is gaining instead of losing market share, or when the firm has volatile or steady CSR performance. Future research may also examine further evidence on the ethical image of CSR efforts. To collect new evidence on the association between CSR performance and R&D valuation, future research may consider other measures of R&D success such as the number of successful patent applications and the rate of new product releases.

On the other hand, astute managers may be tempted to disguise the firm as a CSR enthusiast to improve corporate image and share price. Researchers may want to examine if firms really attempt such a disguise, and if the market can see through it. Whether the market considers other information beyond CSR performance in assessing a firm's ethical standing is another question interesting to researchers.

This study focuses on the role of CSR performance in conveying R&D valuation. A similar argument can apply to other discretionary expenditures such as those spent on advertising and employee education and training. The ethical firm image created by CSR efforts arguably also lends credence to advertising and employee training activities. We leave this hypothesis to future researchers.

References

Aboody, D., Lev, B., 1998. The value relevance of intangibles: the case of software capitalization. J. Account. Res. 36, 161–191.
Aboody, D., Lev, B., 2000. Information asymmetry, R&D, and insider gains. J. Financ. 55 (6), 2747–2766.
Adams, R.B., Santos, J.A.C., 2006. Identifying the effect of managerial control on firm performance. J. Account. Econ. 41 (1–2), 55–85.
Agrawal, A., Knoeber, C.R., 1996. Firm performance and mechanisms to control agency problems between managers and shareholders. J. Financ. Quant. Anal. 31 (3), 377–397.
Anderson, R.C., Reeb, D.M., 2003. Founding-family ownership and firm performance: evidence from the S&P 500. J. Financ. 58 (3), 1301–1328.
Austin, D.H., 1993. An event-study approach to measuring innovative output: the case of biotechnology. *Am. Econ. Rev.* 83 (2), 253–258.
Baber, W.R., Fairfield, P.M., Haggard, J.A., 1991. The effect of concern about reported income on discretionary spending decisions: the case of research and development. Account. Rev. 66 (4), 818–829.
Bartov, E., Li, Y., 2015. Corporate social responsibility and the market pricing of corporate earnings. Working Paper.
Bebchuk, L., Cohen, A., Ferrell, A., 2009. What matters in corporate governance? Rev. Financ. Stud. 22 (2), 783–827.
Bublitz, B., Ettredge, M., 1989. The information in discretionary outlays: advertising, research and development. Account. Rev. 64 (1), 108–124.
Bushee, B.J., 1998. The influence of institutional investors on myopic R&D investment behavior. Account. Rev. 73 (3), 305–333.
Carroll, A.B., 1979. A three-dimentional conceptual model of corporate performance. Acad. Manag. Rev. 4 (4), 497–505.
Ceccagnoli, M., 2009. Appropriability, preemption, and firm performance. Strateg. Manag. J. 30 (1), 81–98.
Chambers, D., Jennings, R., Thompson, R.B., 2002. Excess returns to R&D-intensive firms. Rev. Acc. Stud. 7 (2), 133–158.
Chan, S.H., Martin, J., Kensinger, J., 1990. Corporate research and development expenditures and share value. J. Financ. Econ. 26, 255–276.
Chan, L.K.C., Lakonishok, J., Sougiannis, T., 2001. The stock market valuation of research and development expenditures. J. Financ. 56 (6), 2431–2456.
Chih, H.-L., Chih, H.-H., Chen, T.-Y., 2010. On the determinants of corporate social responsibility: international evidence on the financial industry. J. Bus. Ethics 93 (1), 115–135.
Coles, J.L., Daniel, N.D., Naveen, L., 2008. Boards: does one size fit all? J. Financ. Econ. 87 (2), 329–356.
Dechow, P., Sloan, R., 1991. Executive incentives and the horizon problem: an empirical investigation. J. Account. Econ. 14 (1), 51–89.
Deng, X., Kang, J.-k., Low, B.S., 2013. Corporate social responsibility and stakeholder value maximization: evidence from mergers. J. Financ. Econ. 110 (1), 87–109.
Dhaliwal, D.S., Li, O.Z., Tsang, A., Yang, Y.G., 2011. Voluntary nonfinancial disclosure and the cost of equity capital: the initiation of corporate social responsibility reporting. Account. Rev. 86 (1), 59–100.
Di Giuli, A., Kostovetsky, L., 2014. Are red or blue companies more likely to go green? Politics and corporate social responsibility. J. Financ. Econ. 111 (1), 158–180.
Donaldson, T., Preston, L.E., 1995. The stakeholder theory of the corporation: concepts, evidence, and implications. Acad. Manag. Rev. 65–91.
Eaton, B.C., Lipsey, R.G., 1981. Capital, commitment, and entry equilibrium. Bell J. Econ. 593–604.
El Ghoul, S., Guedhami, O., Kwok, C.C., Mishra, D.R., 2011. Does corporate social responsibility affect the cost of capital? J. Bank. Financ. 35 (9), 2388–2406.
Elhauge, E., 2005. Sacrificing corporate profits in the public interest. New York Univ. Law Rev. 80, 733.
Faleye, O., 2007. Classified boards, firm value, and managerial entrenchment. J. Financ. Econ. 83 (2), 501–529.
Flammer, C., 2014. Does product market competition foster corporate social responsibility? Evidence from trade liberalization. Strateg. Manag. J. 36 (10), 1469–1485.
Fombrun, C., Shanley, M., 1990. What's in a name? Reputation building and corporate strategy. Acad. Manag. J. 33 (2), 233–258.
Giroud, X., Mueller, H.M., 2010. Does corporate governance matter in competitive industries? J. Financ. Econ. 95 (3), 312–331.
Gompers, P., Ishii, J., Metrick, A., 2003. Corporate governance and equity prices. Q. J. Econ. 118 (1), 107–156.
Goss, A., Roberts, G.S., 2011. The impact of corporate social responsibility on the cost of bank loans. J. Bank. Financ. 35 (7), 1794–1810.
Graham, J.R., Harvey, C.R., Rajgopal, S., 2005. The economic implications of corporate financial reporting. J. Account. Econ. 40 (1), 3–73.
Graves, S.B., Waddock, S.A., 1994. Institutional owners and corporate social performance. Acad. Manag. J. 37 (4), 1034–1046.
Hall, B.H., 1993. The stock market's valuation of R&D investment during the 1980's. Am. Econ. Rev. 83 (2), 259–264.
Haw, I.-M., Ho, S.S., Li, A.Y., Zhang, F., 2015. Product market competition, legal institutions and accounting conservatism. J. Int. Account. Res. 14 (2).
Healy, P.M., Myers, S.C., Howe, C.D., 2002. R&D accounting and the tradeoff between relevance and objectivity. J. Account. Res. 677–710.
Hemingway, C.A., Maclagan, P.W., 2004. Managers' personal values as drivers of corporate social responsibility. J. Bus. Ethics 50 (1), 33–44.
Hermalin, B., Weisbach, M., 1991. The effects of board composition and direct incentives on firm performance. Financ. Manag. 20 (4), 101–112.
Hill, C.W.L., Snell, S.A., 1988. External control, corporate strategy, and firm performance in research-intensive industries. Strateg. Manag. J. 9 (6), 577–590.
Hirschey, M., Weygandt, J.J., 1985. Amortization policy for advertising and research and development expenditures. J. Account. Res. 23 (1), 326–335.
Hou, K., Robinson, D.T., 2006. Industry concentration and average stock returns. J. Financ. 61 (4), 1927–1956.
Humphrey, J.E., Lee, D.D., Shen, Y., 2012. Does it cost to be sustainable? J. Corp. Financ. 18 (3), 626–639.
Irvine, P.J., Pontiff, J., 2009. Idiosyncratic return volatility, cash flows, and product market competition. Rev. Financ. Stud. 22 (3), 1149–1177.
Jensen, M., 1993. The modern industrial revolution: exit and the failure of internal control systems. J. Financ. 48 (3), 831–880.
Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. J. Financ. Econ. 3 (4), 305–360.
Jones, T.M., 1995. Instrumental stakeholder theory: a synthesis of ethics and economics. Acad. Manag. Rev. 20 (2), 404–437.
Kim, Y., Park, M.S., Wier, B., 2012. Is earnings quality associated with corporate social responsibility? Account. Rev. 87 (3), 761–796.
Kole, S., Lehn, K., 1997. Deregulation, the evolution of corporate governance structure, and survival. Am. Econ. Rev. 87 (2), 421–425.
Kole, S.R., Lehn, K.M., 1999. Deregulation and the adaptation of governance structure: the case of the US airline industry. J. Financ. Econ. 52 (1), 79–117.
Lantos, G.P., 2001. The boundaries of strategic corporate social responsibility. J. Consum. Mark. 18 (7), 595–632.
Lev, B., Sougiannis, T., 1996. The capitalization, amortization, and value-relevance of R&D. J. Account. Econ. 21, 107–138.
Luo, X., Bhattacharya, C.B., 2006. Corporate social responsibility, customer satisfaction, and market value. J. Mark. 70 (4), 1–18.
Mattingly, J.E., Berman, S.L., 2006. Measurement of corporate social action discovering taxonomy in the Kinder Lydenburg Domini ratings data. Bus. Soc. 45 (1), 20–46.
McWilliams, A., Siegel, D., 2001. Corporate social responsibility: a theory of the firm perspective. Acad. Manag. Rev. 26 (1), 117–127.
McWilliams, A., Siegel, D.S., Wright, P.M., 2006. Corporate social responsibility: strategic implications. J. Manag. Stud. 43 (1), 1–18.
Montgomery, C.A., Wernerfelt, B., 1988. Diversification, Ricardian rents, and Tobin's q. RAND J. Econ. 19 (4), 623–632.
Morck, R., Yeung, B., 1999. The economic determinants of innovation. Working Paper.
Mueller, D.C., 1977. The persistence of profits above the norm. Economica 369–380.
Orlitzky, M., Schmidt, F.L., Rynes, S.L., 2003. Corporate social and financial performance: a meta-analysis. Organ. Stud. 24 (3), 403–441.
Padgett, R.C., Galan, J.I., 2010. The effect of R&D intensity on corporate social responsibility. J. Bus. Ethics 93 (3), 407–418.
Petrovits, C.M., 2006. Corporate-sponsored foundations and earnings management. J. Account. Econ. 41 (3), 335–362.
Phillips, R., Freeman, R.E., Wicks, A.C., 2003. What stakeholder theory is not. Bus. Ethics Q. 479–502.
Porter, M.E., Kramer, M.R., 2006. The link between competitive advantage and corporate social responsibility. Harv. Bus. Rev. 84 (12), 78–92.
Prior, D., Surroca, J., Tribó, J.A., 2008. Are socially responsible managers really ethical? Exploring the relationship between earnings management and corporate social responsibility. Corp. Gov. Int. Rev. 16 (3), 160–177.
Roychowdhury, S., 2006. Earnings management through real activities manipulation. J. Account. Econ. 42 (3), 335–370.
Rubin, A., 2008. Political views and corporate decision making: the case of corporate social responsibility. Financ. Rev. 43 (3), 337–360.
Schnietz, K.E., Epstein, M.J., 2005. Exploring the financial value of a reputation for corporate social responsibility during a crisis. Corp. Reput. Rev. 7 (4), 327–345.

Servaes, H., Tamayo, A., 2013. The impact of corporate social responsibility on firm value: the role of customer awareness. Manag. Sci. 59 (5), 1045–1061.
Skapinker, M., 2010. Do corporate citizenship reports matter? Financ. Times (August 10 (http://www.ft.com/cms/s/0/d4fb10e8-c395-11e0-8d51-00144feabdc0.html#axzz2BG9Ew12W)).
Sougiannis, T., 1994. The accounting based valuation of corporate R&D. Account. Rev. 69 (1), 44–68.
Subramanyam, K.R., Venkatachalam, M., 2007. Earnings, cash flows, and ex post intrinsic value of equity. Account. Rev. 82 (2), 457–481.
Szwajkowski, E., Figlewicz, R.E., 1999. Evaluating corporate performance: a comparison of the fortune reputation survey and the Socrates social rating database. J. Manag. Issues 137–154.
Tsoutsoura, M., 2004. Corporate social responsibility and financial performance. Working Paper, Haas School of Business. University of California, Berkeley.
Villalonga, B., Amit, R., 2006. How do family ownership, control and management affect firm value? J. Financ. Econ. 80 (2), 385–417.
Waddock, S., 2003a. Myths and realities of social investing. Organ. Environ. 16 (3), 369–380.
Waddock, S., 2003b. Stakeholder performance implications of corporate responsibility. Int. J. Bus. Perform. Manag. 5 (2), 114–124.
Yermack, D., 1996. Higher market valuation of companies with a small board of directors. J. Financ. Econ. 40 (2), 185–211.