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Exploring the relationship between corporate social responsibility and firm innovation

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Abstract This research investigates the link between corporate social responsibility (CSR) and firm innovation. Drawing upon the literatures on CSR and the knowledge-based view, we conceptualize that a firm's CSR programs enable it to build broader and deeper relationship networks with its stakeholders, facilitating the sharing and exchange of external knowledge of its stakeholders; in turn, stakeholders' external knowledge complements the firm's internal knowledge and promotes firm innovation. Using a large scale data set compiled from various archival sources, our empirical results show that firms with greater CSR activities exhibit higher innovativeness capability and launch more new products. Furthermore, we show that this positive relationship between CSR and firm innovation is stronger for firms with higher R&D investment and firms operating in more competitive markets. This research broadens current understanding of the business returns to CSR, suggesting that CSR can be a catalyst for innovation.

Keywords Corporate social responsibility · Innovativeness capability · New product introductions · R&D · Market competitiveness

Corporate social responsibility (CSR), defined as "the broad array of strategies and operating practices that a firm develops in its efforts to deal with and create relationships with its numerous stakeholders and the natural environment" (Waddock 2004, p. 10), has been widely adopted by firms. CSR activities reflect a firm's stakeholder orientation and often range from community outreach, cause-related marketing, and employee well-being programs, to environmentally friendly sourcing and manufacturing practices (Smith 2003).

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Can firms do well by doing good? Prior research has documented various business benefits of CSR. For example, CSR has been shown to positively affect consumer product responses (Brown and Dacin 1997; Du et al. 2011), customer satisfaction (Luo and Bhattacharya 2006), and brand evaluations during a product harm crisis (Klein and Dawar 2004). Recent research on branding suggests that warmth and competence are two key dimensions of brand/firm evaluation, and that perceptions of brand/firm warmth and competence influence consumer purchase and loyalty behaviors (Kervyn et al. 2012). Consistent with this view, prior CSR studies have implicitly theorized that a firm's CSR programs enhance customers' warmth perceptions about the firm (e.g., caring, trustworthy, have the public's best interest in heart), and consequently lead to a variety of positive outcomes such as customer loyalty (e.g., Du et al. 2011; Klein and Dawar 2004). The current study seeks to go beyond CSR's effect on warmth perceptions to explore its potential impact on firm competence, specifically, innovation, a topic that has received scant attention. Innovation is a key aspect of firm competence because it enables a firm to cater to the ever changing needs of the marketplace and is pivotal to the profitability and long-term survival of any firm (Hauser et al. 2006). Thus, investigating the CSR—innovation link will broaden our understanding of the business returns to CSR.

Anecdotal evidence suggests a positive link between CSR and innovation. According to a large-scale survey of senior executives and CSR professionals conducted by McKinsey, innovation is one of the key pathways through which CSR creates business value (Bonini et al. 2009). Examples of CSR-stimulated new product innovations can be frequently noticed in the marketplace and trade press. For instance, since its launch in 2005, General Electric's social initiative, Ecomagination, has triggered 142 new product innovations, generating more than $105 billion in sales revenue (Ecomagination Report 2011).

This research seeks to conceptualize and empirically test the relationship between CSR and firm innovation. Drawing upon prior CSR literature (e.g., Brown and Dacin 1997; Luo and Bhattacharya 2006) and the knowledge-based view (Cassiman and Veugelers 2006), we propose that firms with greater CSR activities enjoy broader access to valuable external knowledge (i.e., knowledge and expertise of various external stakeholders), which enhances innovation. Further, taking a finer-grained approach, we predict that the relationship between CSR and innovation is contingent on firm characteristics (i.e., the level of R&D investment) and external market condition (i.e., market competitiveness).

Based on a secondary data set compiled from different archival sources, the results show support for the hypothesized contingent linkages between CSR and firm innovation. This research makes several key contributions. First, by documenting the link between CSR and innovation, we uncover a new pathway through which CSR contributes to firm value. Second, we contribute to the innovation literature by identifying CSR as an antecedent to innovation. Our study suggests that stakeholder-oriented activities such as CSR programs can be a powerful catalyst for firm innovation.

1 Theory and hypotheses

1.1 CSR and innovation

Drawing upon the literatures on CSR and the knowledge-based view, we argue that (1) a firm's CSR programs will enable it to build broader and deeper relationship networks

with its various stakeholders, facilitating the sharing and exchange of valuable external knowledge of its stakeholders, and (2) such inflow of external knowledge complements the firm's internal knowledge and triggers innovation.

CSR programs help a firm cultivate new relationships and strengthen existing ones. For example, through environmental initiatives, firms cultivate new ties with environmental organizations, research institutes, and community leaders, among others (Sharma and Vredenburg 1998). Sen et al. (2006) find that social initiatives enable a firm to develop multidimensional stakeholder relationships (i.e., with consumers, employees, and investors). Also importantly, through demonstrating good intentions and trustworthiness (Kervyn et al. 2012), CSR programs help deepen a firm's current relationship ties. Socially responsible firms are more likely to enjoy greater trust, higher levels of satisfaction and loyalty among various stakeholders, including customers, employees, investors, business partners, and communities (Du et al. 2011, 2007; Klein and Dawar 2004; Surroca et al. 2010).

In turn, firms with broader and deeper relationship networks enjoy greater access to ideas and knowledge residing within their stakeholder networks (Jansen et al. 2006; Tsai and Ghoshal 1998). Strong stakeholder-firm relationships will dispose stakeholders to voluntarily share information and resources with the firm, thus enabling the firm to plug in and utilize the pool of external knowledge residing among its stakeholder networks (Jansen et al. 2006). Stakeholders often possess fresh and non-redundant knowledge/expertise that complements a firm's internal knowledge and thus is important for firm innovation efforts. For example, customers can offer insights into evolving market preferences and latent needs (Uzzi and Lancaster 2003; von Hippel 1988); environmental organizations and NGOs possess superior knowledge about environmental and social issues (Porter and Kramer 2011). Peter Senge, in talking about sustainability practices, stressed the value of external knowledge held by NGOs, "The best businesses … keep expanding their expertise by partnering with NGOs that have deeper and broader knowledge" (Prokesch 2010, p. 72).

The knowledge-based view suggests that a firm's possession and utilization of knowledge drives its ability to innovate and that external knowledge plays a critical role in innovation (Cassiman and Veugelers 2006). By cultivating broader and deeper relationship networks with its stakeholders, a firm's CSR programs facilitate the inflow of fresh external knowledge from its stakeholders to the firm, broadening the firm's knowledge base. Such CSR-facilitated external knowledge is often heterogeneous from the firm's internal knowledge, and thus can promote "creative leaps" (i.e., connection of two or more disparate ideas or concepts) and lead to origination and implementation of innovative new product ideas (Katila and Ahuja 2002). Therefore, we hypothesize:

H1: All else equal, there is a positive relationship between CSR and firm innovation.

1.2 Moderating roles of R&D investment and market competitiveness

Prior CSR studies suggest that the business impact of CSR is not homogenous across firms, but rather is contingent on factors such as corporate ability (Brown and Dacin 1997; Luo and Bhattacharya 2006) and market competition (Du et al. 2007, 2011). In line with this contingent view, we investigate two potential moderators, one firm-specific factor,

R&D investment, and one market-specific factor, market competitiveness, in the CSR—innovation link. We focus on these two moderators not only because prior research suggests that they are key levers influencing the business outcomes of CSR, but also because they capture, to a certain degree, a firm's ability and motivation to derive innovation outcomes from CSR. In particular, R&D is a form of technological investment that results in technological capability (e.g., patents, amount of technological knowledge) and enhances firm innovativeness (Gatignon and Xuereb 1997). Such investment in firm ability has been shown to accentuate the business outcomes of CSR (Luo and Bhattacharya 2006). Given our research focus on the CSR—innovation link, we consider R&D investment a highly relevant factor. While R&D affects a firm's ability to derive innovation outcomes from CSR, market competitiveness influences a firm's motivation to do so. Firms facing high competitive pressure must be more effective in discovering market needs and creating superior new products to satisfy the market needs (Slater and Narver 1994). Thus, competitive pressure will motivate a firm to be more vigilant about and more eager to utilize CSR-triggered external knowledge and ideas to generate new product innovations.

R&D investment will enhance a firm's ability to absorb and leverage CSR-facilitated external knowledge to generate innovations. Specifically, a key notion in the innovation literature is absorptive capacity, which refers to a firm's ability to utilize and exploit knowledge obtained from external sources (Cohen and Levinthal 1990). Absorptive capacity is "a function of the prior related knowledge … [which] confers an ability to recognize the value of new information, assimilate it, and apply it" (Cohen and Levinthal 1990, p. 128). R&D investment has been found to positively affect a firm's absorptive capacity, promoting organizational learning and the firm's ability to convert external knowledge into innovations. Cassiman and Veugelers (2006) find that R&D is complementary to external knowledge acquisition, boosting the marginal return of external knowledge on innovation outcomes. As such, a firm with higher R&D investment is likely to be in a strong position to judge the relative merits of external knowledge made accessible through its CSR programs. Such firm is also likely to be more competent in assimilating stakeholders' external knowledge and have the requisite technological know-how to flesh out and transform innovative ideas into tangible product offerings (Gatignon and Xuereb 1997). Therefore, we hypothesize:

> H2: All else equal, the relationship between CSR and firm innovation is stronger for firms with high R&D investment than for firms with low R&D investment.

Market competitiveness increases a firm's motivation to leverage CSR-facilitated external knowledge for innovation purposes. Intense competition will likely propel the firm to take greater advantage of CSR-facilitated external knowledge, assimilating and utilizing it to a greater extent to achieve innovation outcomes. On the other hand, firms facing low competition will be less inclined to leverage such external knowledge.

Additionally, high market competition will amplify the value of CSR-facilitated external knowledge in a firm's innovation process. Innovation in competitive markets often requires more complex problem solving, because it is harder for new products to possess distinct advantages in terms of quality, specific functionalities, or unique positioning in a crowded

and highly competitive market landscape (Gatignon and Xuereb 1997; Cooper 1984). In such a dynamic, competitive environment, the ability to access and leverage external knowledge is even more critical for successful innovations (Hauser et al. 2006; Katila and Ahuja 2002). Therefore, we expect the positive link between CSR and innovation to be stronger for firms in more competitive markets than those in less competitive markets.

> H3: All else equal, the relationship between CSR and firm innovation is stronger for firms in more competitive markets than for firms in less competitive markets.

2 Data

2.1 Key measures

For an overall measure of a firm's *CSR* activities, we use the Kinder, Lydenberg, Domini & Co. (KLD) Stats dataset. KLD is a research firm specializing in tracking firms' CSR activities. KLD uses a variety of sources to capture CSR data about each company. Corporate data sources include an annual survey on CSR practices filled out by each firm's investor relations office, annual reports, 10K forms, and quarterly reports, as well as CSR or sustainability reports, if any. External data sources include articles about a company in the general business press, trade magazines, academic journals, and external surveys and ratings, where appropriate.

KLD data provide third-party, comprehensive ratings about a firm's CSR practices for each calendar year, and have been widely used in prior literature as a measure of firm CSR activities (e.g., Sen and Bhattacharya 2001; Servaes and Tamayo 2013; Waddock and Graves 1997). KLD ratings cover all key social and environmental domains: environmental impact, community relations, corporate governance, employee relations, product safety/quality, and diversity. Within each domain, there are performance ratings along several sub-dimensions, capturing both positive and negative performance (i.e., strengths and concerns, respectively); for example, the environment domain has six indicators on positive performance (i.e., strengths) and seven indicators on negative performance (i.e., concerns). In line with prior research (Servaes and Tamayo 2013; Waddock and Graves 1997), we subtract the number of concerns from the number of strengths to get a score for each domain, and then sum the scores across all domains to get an aggregate measure for overall CSR rating. Finally, to account for industry differences, in the empirical analysis, we use the ratio of a firm's overall CSR score to the average CSR score of its industry (as defined by the 4-digit SIC codes) as the final measure of CSR.

To assess firm innovation, we examine two metrics, *innovativeness capability* and *new product introductions*. Innovativeness capability refers to a firm's ability to accumulate and apply its knowledge stock to produce new technologies, new products/services, and other new fronts (Cho and Pucik 2005; Hauser et al. 2006). It is measured by *Fortune's* ratings on innovativeness. Specifically, in ranking the America's most admired corporations each year, *Fortune* polls more than 10,000 financial analysts, senior executives, and Wall Street investors to measure U.S. firms' performance in terms of key attributes including quality of products/services, innovativeness, long-term financial investment value and so on. In line with prior literature (Cho and Pucik 2005; Luo and Bhattacharya 2006), we use

Fortune's ratings on innovativeness as the measure for innovativeness capability. To account for industry differences, in the empirical analysis, we use the ratio of a firm's innovativeness capability to the industry average of innovativeness as the final measure of innovativeness capability.

We also examine *new product introductions* as another measure of firm innovation. New product introductions are a key metric of innovation because they are the innovation output that is of most relevance to firms. To gather new product announcements, multiple data sources are used, including Lexis-Nexis, Factiva (which includes *the Wall Street Journal*), press releases reported on the company websites, and various newswire services such as Reuters and Business Newswire. We search these data sources with the following key words to identify new product announcements: name, ticker symbol of the company, and events of the new product introduction (or similar words such as launch, announce, and beta). To identify the true new product introductions, we first sort the results of over seven thousand reports on the basis of the first press release date the product was announced; we then eliminate announcements that are redundant. We also exclude announcements that belong to firms not covered by the *Fortune* ratings, the KLD dataset, or COMPUSTAT.

Firm R&D investment is measured by the ratio of R&D spending to total assets. We obtain the measure from COMPUSTAT. *Market Competitiveness* is measured by the inverse of Herfindahl industry concentration index, derived from COMPUSTAT. The Herfindahl index is the sum of squared market shares of the firms in the industry (based on the 4-digit SIC codes) derived from sales revenue (Anderson et al. 2004).

As a result of merging KLD, *Fortune* ratings, Lexis-Nexis, Factiva, and COMPUSTAT, we have a total of 512 firm-year data points for 128 firms during the 2001–2004 period. Firms in our final sample cover all major industry sectors, such as manufacturing durables and nondurables, airlines, communications, electronics, transportation, energy, retail, utilities, healthcare, and others. Table 1 reports the descriptive statistics and the correlation matrix.

2.2 Control variables

We include a set of firm- and industry-level covariates to control for factors that might affect firm innovation. At the firm level, we control for size, leverage, advertising, and sales growth. *Firm size* is measured by the natural log of number of employees. *Leverage* is the ratio of book debt to total assets. *Advertising* is the ratio of advertising expenses to total assets. S*ales growth* is measured by the growth rate of firm sales revenue from year t-1 to year t. At the industry level, we control for the number of business segments, manufacturing industry (or not), and market instability. *Number of segments* is measured by the number of unique business segments in which a firm operates. *Manufacturing industry* variable is measured by a dummy (1=manufacturing industries and 0=otherwise). We got information about the number of segments and manufacturing industry variables from COMPUSTAT database directly. *Market instability* is measured by the standard deviation of five-year sales growth rates (prior to the given year) across firms in a given industry[1] (Gruca and Rego 2005).

[1] For example, market instability for year 2001 is measured by the standard deviation of five-year (1996-2000) sales growth rates across firms in a given industry.

Table 1 Descriptives and correlations

	CSR	Innovativeness capability	New product introductions	R&D investment	Market competitiveness
CSR					
Innovativeness capability	0.233				
New product introductions	0.152	0.305			
R&D investment	0.008	0.281	0.325		
Marketing competitiveness	−0.035	0.105	0.095	0.007	
Mean	3.278	6.031	35	0.071	0.056
SD	1.362	1.557	12	0.253	0.117

Correlations greater than 0.09 are significant at $p<0.05$

3 Hypotheses testing: analysis and results

3.1 Analysis approach

To estimate the relationship between CSR and firm innovativeness capability, we use generalized method of moments (GMM) regression model because GMM specifications accommodate the possible biases of endogeneity, heteroskedasticity, and serial correlation. To account for endogeneity, we use instrumental variables with lagged independent variables in the time period t-2 in estimation (e.g., Anderson et al. 2004). In addition, because GMM approach relies on moment conditions rather than full density, it can generate heteroskedasticity-consistent estimations and asymptotically correct standard errors for statistical inferences (Hamilton 1994).

To estimate the relationship between CSR and new product introductions, we use the count of new products introduced in a given year as the dependent variable. This count variable is embedded with two unique properties: nonnegative values (no negative new products) and integers (no decimals), necessitating Poisson regression analysis. Because of the time-series and crosssectional nature of the panel data, we use the random parameters Poisson model with latent heterogeneity (Baltagi 2001). The Poisson probability of new product introductions is specified as:

$$P(N = n_{it}|x_{it}) = \frac{\left(e^{-\psi_{it}}\psi_{it}^{n_{it}}\right)}{n_{it}!}, \tag{1}$$

where n_{it} is the new product count for firm i in year t. To account for latent heterogeneity and possible over- or under-dispersion (zero inflation), we employ a Gamma Poisson model and specify ψ_{it} as follows:

$$\widehat{\psi}_{it} = \exp(X_{it}\varsigma + \xi_o + \xi_i), gamma, \tag{2}$$

where X_{it} is a vector of CSR, R&D investment, market competitiveness, relevant interaction terms, control variables, and lagged new product introductions, ζ is a vector of parameters to be estimated, ξ_0 is the overall intercept, and ξ_i is the latent

heterogeneity parameter. To further control for unobserved latent heterogeneity in the data and check the robustness of the results, we use robust covariance matrix in the Poisson model (Greene 2007, E24)

Finally, to rule out reverse causality, we conducted the Granger causality test and confirmed the direction of influence from CSR to innovativeness capability ($F_{\text{Granger test}}$= 35.782, $p<0.01$) and new product introductions ($F_{\text{Granger test}}$=27.033, $p<0.01$), rather than the reverse direction.

3.2 Results

Table 2 presents the analysis results. H1 hypothesizes a positive relationship between CSR and firm innovation. The GMM model results suggest that there is an overall positive relationship between CSR and firm innovativeness capability (β=0.278, $p<0.05$); similarly, the results of the Poisson model indicate a positive relationship between CSR and new product introductions (ζ=0.022, $p<0.01$). Thus, H1 is supported.

Table 2 Hypotheses testing results

	Dependent variables	
	Innovativeness capability (GMM Model)	New product introductions (Poisson Model)
Controls		
R&D investment	0.209***	0.031**
Market competitiveness	0.012*	0.018**
Firm size	0.184*	0.416***
Firm leverage	−0.042	−0.207
Firm advertising	0.238**	0.032**
Firm sales growth	1.606***	0.351***
Manufacturing industries	−0.217**	−0.005
Number of segments	−0.004	−0.002
Market instability	−0.002	−0.007
Lagged dependent variable	0.238***	0.169**
CSR (H1)	0.278**	0.022***
CSR×R&D investment (H2)	0.066**	0.016**
CSR x market competitiveness (H3)	0.009	0.014*
R&D×market competitiveness	−0.007	−0.008
CSR×R&D×market competitiveness	0.015	0.011*
Incremental changes in R^2		
Controls only	46.5 %	42.8 %
+CSR and interaction terms	8.1 %	7.9 %

R^2 in Poisson Models is McFadden Pseudo *R*-square

*$p<0.10$; **$p<0.05$, ***$p<0.01$

H2 hypothesizes that R&D investment will strengthen the relationship between CSR and firm innovation. In the GMM model, the interaction between CSR and R&D investment is positive (β=0.066, p<0.05), indicating that the relationship between CSR and innovativeness capability is more positive for firms with higher R&D investment than for firms with lower R&D investment. In the Poisson model, the interaction between CSR and R&D investment is also positive (ζ=0.016, p<0.05), indicating that, as R&D investment increases, the link between CSR and new product introductions becomes stronger. Therefore, H2 is supported.

To test H3, we look at the coefficient of the interaction between CSR and market competitiveness. In the GMM model, the expected positive interaction between CSR and market competitiveness is not significant (p>0.10), indicating that competitiveness does not moderate the CSR—innovativeness capability relationship. However, in the Poisson model, in line with our expectation, the interaction between CSR and market competitiveness is positive (ζ=0.014, p<0.05), suggesting that the relationship between CSR and new product introductions is more positive for firms in more competitive markets than for those in less competitive markets. Therefore, H_3 is supported in the case of new product introductions, but not in the case of innovativeness capability.

3.3 Additional analysis: CSR and innovativeness of new product introductions

To shed further insight into the relationship between CSR and innovation, we look into the level of innovativeness of new product introductions. New product innovations can be radical/pioneering or incremental (Srinivasan et al. 2009). Pioneering new products are radical, first-of-a-kind introductions to the market, and often embody significantly new technologies and distinctive value propositions; on the other hand, incremental new products may only offer minor improvements to existing features/offerings. Two graduate research assistants independently coded all new product introductions into two categories: pioneering and incremental. Inter-coder reliability is high at the level of 0.91. Disagreements in classification were solved via discussion. In our dataset, pioneering new products account for 18 % of all new product introductions.

We then separately analyzed the relationship between CSR and pioneering/incremental new product introductions. The results show an overall positive relationship between CSR and both pioneering and incremental new products (ζ=0.035 and 0.042, both p<0.05). Interestingly, the interaction between CSR and R&D intensity is significant only for pioneering new products (ζ=0.021, p<0.05), but not for incremental ones (p>0.10). This finding reveals the synergistic effect of CSR and R&D investment on pioneering, but not incremental, new product innovations.

On the other hand, we find that the interaction between CSR and market competitiveness is not significant for pioneering new products (p>0.10), but marginally significant for incremental ones (ζ=0.019, p<0.10). This indicates that, all else equal, in highly competitive markets, firms are more likely to leverage CSR-facilitated external knowledge for incremental (but not pioneering) innovations. This finding is consistent with prior research suggesting that, in a more competitive environment, firms often pursue incremental innovations as they are less risky and have shorter turnaround (Jansen et al. 2006).

4 Discussion

4.1 Theoretical and practical implications

To the best of our knowledge, this research is the first to investigate the relationship between CSR and firm innovation. By documenting the hitherto neglected link between CSR and innovation, this study broadens the substantive domain of CSR's business legitimacy. We extend prior literature by showing that CSR could not only enhance customers' warmth perceptions of a firm, but also feed into a firm's core competence, namely, innovation.

Also importantly, our research extends the innovation literature by identifying CSR as a novel antecedent to firm innovativeness and new product introductions. It supplements prior findings that market orientation (i.e., customer-, competitor-, and technological-orientation) is a key determinant of firm innovation (Atuahene-Gima 2005; Gatignon and Xuereb 1997). CSR activities, serving to address the interests of various stakeholders, reflect a firm's stakeholder orientation, which is broader and perhaps more strategic than market orientation (Ferrell et al. 2010). Just as market orientation stimulates organizational learning, our results suggest that a firm's stakeholder-oriented activities such as CSR stimulate organizational learning by enabling it to access the external knowledge residing within its networks of stakeholders. Such external knowledge is increasingly indispensible to innovation as the general new product development (NPD) activities shift from an internally focused process to a balanced internal and external process (Hauser et al. 2006; von Hippel 1988). Our study helps advance our understanding on the impact of stakeholder-related activities like CSR on innovation.

By showing that CSR activities boost innovation, this study provides new empirical evidence with which managers and CSR professionals can buttress the argument that expenditures on CSR may be better viewed as capital investments rather than operational costs. Managers should purposefully use CSR as a driver of innovation, and find ways to channel stakeholders' external knowledge and ideas into the firm.

4.2 Limitations and future research

Several caveats should be taken into consideration when interpreting the results of this study. First, although KLD data have been widely used in the prior CSR literature, they are not without limitations. For example, Chatterji et al (2009) find that KLD environmental ratings do not accurately measure firm environmental performance. Future research should use alternative measures of CSR to corroborate our findings.

Second, our measure for new product introductions is based on firms' public announcements of the introduction of new products. This measure is not entirely satisfactory because firms may not announce all their new products, particularly if their new products are only incrementally new and therefore not newsworthy. Additionally, although new product introductions have been widely used in prior literature as an outcome variable of firm innovation (e.g., Katila and Ahuja 2002), number of new products introductions per se do not speak to the performance of these products in the marketplace. Future research can supplement our findings by exploring the relationship between CSR and new product performance, such as profitability,

market share, or growth rate of new products. Future research can also explore the potential impact of CSR on the efficiency and effectiveness of firm innovation, such as speed to market and process innovation.

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