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**The Relationship between Innovation Intensity and Corporate Social Responsibility in US
firms**

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Abstract

This study examines the role of corporate social responsibility (CSR) in moderating the relationship between innovation and firm performance. This study analyzes the CSR ratings and R&D intensity based on the resource-based view theory to identify the importance of intangible resources. Both CSR and R&D provide competitive advantages given by this theory. This study expects to see that if firms are more diversified, the moderating effect of CSR will be strengthened. The sample includes 11,093 observations over nine years. This study intends to help firms make effective strategies to allocate their intangible resources in managerial practice. After conducting a series of robustness checks, this study concludes that CSR has a positive moderation effect between innovation and the firm's economic performance. Such an effect would wane in the group of less diversified firms.

JEL Classification: G30, M14, O31, O32

Keywords: Corporate social responsibility, firm performance, R&D.

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1. Introduction

Investing in innovation is a strategic approach for firms to obtain competitive advantages and keep sustainable development. However, firms cannot simply get an edge over competition given by innovative investment since such a position is limited by several diversified mechanisms in the competitive environment. In this study, I explore a critical mechanism on the relationship between research and development investment and corporate social responsibility (CSR) activities. CSR plays a significant role in affecting whether firms can or cannot stand out in the competitive market. Through participating in CSR activities, firms attempt to strengthen the dominance given by innovation and extend its benefits.

The resource-based view (RBV) theory emphasizes the importance of intangible resources that are valuable, rare, inimitable, and nonsubstitutable (VRIN) (Kraaijenbrink et al., 2010). This theory allows us to analyze the effect of CSR ratings and R&D intensity since both CSR ratings and R&D share the characteristics of intangible resources and are consistent with the RBV theory. Based on RBV theory, this study finds some necessary linkage between intangible competitiveness and firm performance. Firm performance is a direct indicator measuring benefits gained by firms. In managerial practice, firms regard corporate diversification as an effective approach to capture competitive advantages. Stakeholders keep a close eye on the problem of informational asymmetry among firms and outsiders. Such informational asymmetry directly affects firm performance. Innovation provides competitive advantages as well as this asymmetry. The process of generating, developing, and applying innovative knowledge would be potentially affected by the asymmetry. Investing in CSR is a practical approach to help firms overcome the informational problem between the firms and outsiders to get close to the economic rent potential by developing

innovative knowledge. To reduce this problem and increase the appropriability, CSR ratings can moderate the relationship between R&D intensity and firm performance.

Many comparative studies, such as those by Padgett and Galan (2010), have found that CSR is correlated to R&D; Eberhart et al. (2004), Ramasza and Karbowski (2020), and Lins et al. (2017) have found that firm performance has a positive impact on R&D and CSR. Focusing on the direct relationship of these two variables could help make a proper choice on a competitive strategy to solve their potential conflicts. Moreover, firm performance builds a gap between them to judge whether firms can efficiently allocate resources to meet market requirements. Still, little work has been undertaken to address the specific mechanism of CSR on reducing the asymmetry between innovation and firms' external stakeholders, even though the relationship between CSR ratings and R&D intensity has already been examined in the previous studies. Missing information on this issue makes it difficult for firms to carefully balance the investment strategies on either CSR or R&D. Numerous scholars have ignored the role of CSR in research and development and have not directly pointed out the relationship between CSR and innovation. Thus, I considered it necessary to study this effect in order to fill in the gaps in the literature.

This study gets persuasive results to test and prove two hypotheses given in the literature review section. This paper expects to see the moderation role of CSR ratings in the relationship between R&D intensity and firm performance and whether the extent of diversification affects this moderation effect. Data collected from the WRDS database provide detailed information annually about US firms from 2010 to 2018. Based on the multivariable regression model and Pearson correlation analysis, this paper finds that CSR ratings positively affect the relationship between innovation intensity and firm financial performance, and this positive moderation effect will be highly strengthened within those groups with highly-diversified business structures. The

regression model is operated to examine the moderating power on the primary correlation. Conducting the robustness checks, this paper re-examines the moderating effect on the relationship through adding more control variables, replacing dependent and independent variables, and conducting instrumental variable regression based on industry average CSR scores and R&D investment of other firms in the same industry. In this way, these results provide guidance for firms to adjust their business structures appropriately.

The main contribution of this study is to provide instructions in managerial practice. Even if numerous previous studies have separately examined the effect of CSR on R&D, this study examines how reducing the information asymmetry in highly diversified firms strengthens the competitive advantages given by innovation. Besides, this study is the first to explore how CSR scores enable R&D intensity to positively affect firm performance. Several scholars have already pointed out that CSR is a crucial factor to affect firm performance rather than a driven factor (Kemper et al., 2013). According to the findings, this study demonstrates this implication. Even if the point that CSR influences firm performance have already been confirmed, results and conclusions are still indeterminate. Moreover, in order to emphasize the importance of allocating intangible resources appropriately, this study works on giving instructions on how innovative firms add investments in the proportion of CSR activities to gain more benefits.

The remaining sections provide meaningful exposition. Section 2 collects and reviews preceding literature in the related fields as well as comes up with two significant hypotheses. Section 3 points out the source of data and explains the variables. Besides, the persuasive methodology is constructed. Section 4 expands specific discussions and gets supportive results. These results illustrate the moderating role of CSR on the relationship between innovative intensity and firm performance.

2. Literature Review and Hypotheses Development

There is increased attention to and demand for CSR and R&D through firm performance in managerial practice. The impact of CSR on firm performance and R&D is vague, and the risks and challenges involved in the competitive environment are always uncertain. The following sections review relevant theories and empirical evidence and present the hypotheses.

2.1. The Resource-Based View

According to the resource-based view (RBV), Barney et al. (2001) reveal that heterogeneous resources can partially explain firm performance differences. This theory significantly emphasizes the importance of obtaining intangible resources (Branco and Rodrigues, 2006) since these resources meeting the criteria are valuable, rare, inimitable, and nonsubstitutable (VRIN) (Kraaijenbrink et al., 2010). Barney (1991) argues that the firms with VRIN competitive advantages always expect excellent returns, and their competitors could hardly duplicate their achievements. The firms would become more competitive if they could better estimate and capture such resources (Bromiley and Rau, 2016). The good financial performance sustained based on valuable resources is difficult to replicate so that the firms can maintain their competitive advantages (Barney et al., 2001).

Nonetheless, the process of obtaining competitive advantages is not limited to internal strategies and decisions, and such advantages are also affected by external factors and the environment. Shaukat et al. (2016) argue that firms cannot evaluate resources by excluding external factors in the market environment. Firms in different fields and different periods always have different values.

From the perspective of the resource-based view (RBV), both CSR and R&D intensity plays a significant role in capturing intangible resources, such as know-how and reputation (Padgett and Galan, 2010). They are difficult to imitate and hard to substitute. Even if these resources are not productive at all, firms could make these intangible resources productive in the managerial practice by organizing and allocating them efficiently (Russo and Fouts, 1997). Firms become more competitive measured in firm performance in their industries through R&D and CSR activities.

2.2. Competitive Advantages

At first, knowledge application and innovation are fundamental means to promote and sustain the competitive advantage of firms (Wang and Noe, 2010). Based on the RBV, innovation activities can help firms fully allocate and utilize existing resources, improve potential values, and create new intangible resources or assets. Wang and Wang (2012) indicate that introducing a new product, service, or process is beneficial to promote firm performance. There is a first-move advantage that new products or services introduced into the market always face little competition and lead to high-profit margins (Botta, 2019). Based on such a competitive advantage, firms can temporarily capture monopoly profits at first. However, Padgett and Galan (2010) argue that as time goes by, high profits attract more competitors to enter the market, so high-level profits cannot be maintained. Moreover, it is also probable to keep a high-firm level of profits over time when firms continually invest in innovation (Lee et al., 2019). Azar and Drogendijk (2014) argue that firms with greater innovativeness are able to have better firm performance or keep high profitability by meeting customers' demands and developing new processes or capabilities. This

argument is confirmed by many studies (Ryu and Lee, 2016) that there is a positive relationship between R&D and firm performance.

McWilliams and Siegel (2011) claim that investing in R&D related to CSR-related products, such as recycled products, that consider the sustainability of the environment and maintain good citizenship behavior is a preferable choice for customers. Based on RBV, investing in CSR is conducive to differentiating the products or services and improving the process by allocating resources appropriately (Cegliński and Wiśniewska, 2016). Ho et al. (2016) find that R&D and CSR are positively related since both are associated with innovative processes or products.

However, the problem of information asymmetry, innovators grasp more comprehensive information than external stakeholders and internal employees, has come up during the process of innovation (Pollack and Bosse, 2014). Innovators are unwilling to expose the core technologies and knowledge to the public so as to keep their competitive advantages and reduce costs (Brown and Martinsson, 2012). For the marketplace for financing, employees, and customers, firms may increase the likelihood of opportunistic behavior and suffer from adverse selection and moral hazards (Pollack and Bosse, 2014). If firms conceal some vital information like immature technology, unwarranted quality, and exaggerating functions of products, particularly those environmentally-friendly products, it will significantly harm customers (Delerue and Lejeune, 2010). Therefore, it would be a significant challenge for employees, investors, and customers to identify and evaluate the quality of products and services delivered by firms.

Meanwhile, CSR is an approach for firms to obtain a competitive advantage in the market. Jain et al. (2017) define CSR that firms are required to hold accountable for their business behaviors and any plans of being involved in socially responsible actions. Numerous studies (Yu

et al., 2017) indicate that many firms regard CSR as a core strategy to distinguish themselves from the competitors and improve a corporate image in order to obtain certain competitive advantages. Moreover, the process of CSR leads firms to face both opportunities and uncertainties in the competitive market (Padgett and Galan, 2010). McWilliams and Siegel (2001) indicate that attributing the characteristic of CSR to the design or production and development with CSR-related resources helps maintain the level of CSR. Like Padgett and Galan (2010), many scholars consider that taking social concerns into the strategic management of firms rather than merely giving attention to social responsibility provides long-term business interests. Griffin et al. (2020) conclude that there is a positive correlation between CSR and firm performance.

Hypothesis 1: CSR ratings have a positive moderation effect on the relationship between R&D intensity and firm performance.

Specifically, various research focuses on the impact of the consequences of diversification on firm performance (Hashai, 2015). Diversified stakeholders are closely related to the scope of businesses. Additionally, diversification lowers managerial risks for insiders but decreases the availability of favorable information conveyed to external stakeholders (Ataullah et al., 2014). Kacperczyk (2009) argues that CSR ratings can be regarded as a complementary measure to predict long-term firm performance and viability. CSR visibility is unequally distributed between internal and external stakeholders, which affects firm performance as well (Gao and Yang, 2016).

Hypothesis 2: The moderation effect of CSR ratings on the relationship between R&D intensity and firm performance is weaker in firms with a lower level of diversification.

3. Data and Methodology

3.1. Data

The study employs three data sources: Thomson Reuters database, Kinder, Lydenberg, Domini Research & Analytics company (KLD) and the Standard & Poor's Compustat Fundamentals database. All these databases are available at Wharton Research Data Service (WRDS).

From Thomson, the primary data are acquired. Thomson reports each firm's company name, net income, total assets, total debts, operating income before depreciation, earnings before interest and tax expense (EBIT), market capitalization, research and development expenses, and provisions for risks and charges. Regarding the sample selections, I get observation during the period of 2010-2018 since I find that the KLD database lacks data of social ratings during the period of 2019-2020. Then, observations with missing variables are deleted.¹ This study gets essential financial information of 3,764 firms and 11,093 observations over nine years.

This study measures firm performance using return on assets (ROA). According to Hambrick and Quigley (2014), it is a ratio that indicates how well firms generate benefits to total assets. This study first gets ROA through the ratio of operating income before depreciation to firms' total assets. Alternatively, another measurement is the ratio of EBIT to total assets. Besides, I exploit the ratio of research and development expenses to total assets as R&D investments. This indicator is used to describe the inputs of a firm on their innovative knowledge and exclude the vagueness of intangible resources. In addition, Tobin's q is a ratio of market value plus debt over total assets,

¹ In my sample period from 2010 to 2018, 524,703 observations are obtained at first. I exclude those observations missing data of research and development expense. Next, data reduction is operated by combining data from Compustat and KLD database together.

which is a proxy for investment opportunities. Moreover, there are several control variables, such as risks, being considered in robustness check. When some firms take active actions on CSR activities, they always expect to anticipate risks involved in advance and reduce or avoid potential risks.

From KLD, I download 36,651 observations of social ratings. KLD classifies CSR into 13 categories: alcohol, community, corporate governance, diversity, employee relations, environment, firearms, gambling, human rights, military, nuclear, product, and tobacco. This study only exploits five categories, that are community, diversity, employee relations, environment, and human rights. Both the subject categories and subcategories of strengths and concerns are marked specific scores.

Besides, KLD also classifies diversity into the following subcategories: CEO, promotion, board of director, work-life benefits, women and minority contracting, employment of the disabled, gay and lesbian policy, non-representation, controversies, board diversity, board of directors—minority, and other factors.

This study also needs a control variable, firm age, from Compustat. This variable is measured as the time between the initial appearance on Compustat and the present time.

Table 1 reports the descriptive statistics for the fundamental financial situation and CSR score of US firms. 9.5% ROA shows the approximate earning capacity of sample firms. The mean of CSR scores is negative, which indicates that CSR concerns are on average higher than CSR strengths. The descriptive report also includes R&D and patents. For instance, both the upper and lower quartile of patents are 0. The minimum and the maximum is 0 and 22.615, respectively. Table 1 also sees variable control variables, including size, leverage, and firm age.

Additionally, the results of the Pearson correlation analysis for the main variables are shown in Table 2. The positive and significant correlation coefficient of CSR shows that the higher the level of CSR scores is, the stronger the earning capabilities are. The most significant correlation coefficient among main variables is 0.357, the correlation between firm size and CSR scores.

3.2. Methodology

First, CSR ratings are required to be given in advance. This study calculates the CSR ratings based on the approach given by Lins et al. (2017):

$$CSR = \sum \left(\frac{\Sigma Strength_{ij}}{SN_i} - \frac{\Sigma Concern_{ij}}{CN_i} \right), \quad (1)$$

where $Strength_{ij}$ or $Concern_{ij}$ indicates the strength or concern rating of subcategory j in the category i . SN_i or CN_i indicates the total number of strengths or concerns in the category m .

Second, the same logic in equation (1) is applied to develop the diversification index by calculating a strength and concern score. Based on the diversification scores, we divide the sample firms into a lower- and a higher-diversified group. In this way, we can exclude the difficulty of dealing with interactions among three variables.

Third, SA growth refers to SA financial constraint index, following Hadlock and Pierce (2010).²

² SA growth is measured by SA financial constraint index, which is calculated as “ $-0.737 \times \text{Size} + 0.043\text{Size}^2 - 0.04\text{FirmAge}$ ”.

To prove hypotheses, the regression model sets an equation. Through control variables, if the coefficient β_3 is positive and significant, hypotheses are demonstrated. The regression is based on the following equation:

$$\begin{aligned} \text{ROA} = & \alpha + \beta_1 \text{RD}_{i,t} + \beta_2 \text{CSR}_{i,t} + \beta_3 \text{CSR}_{i,t} \times \text{RD}_{i,t} + \gamma_1 \text{Size}_{i,t} + \gamma_2 \text{Leverage}_{i,t} + \gamma_3 \text{Firmage}_{i,t} \\ & + \text{Year Dummies} + \text{Industry Fixed Effects} \end{aligned} \quad (2)$$

4. Results and Discussions

4.1. Main Results

In table 3, adjusted R^2 higher than 0.2 in models 2 to 4 demonstrates that the regression model has strong explanatory power. The positive and significant correlation coefficient of CSR in models 1 to 2 shows that investing in CSR activities helps elevate firm performance. The positive and significant correlation coefficient of innovation in models 2 to 4 indicates that a more robust innovation capacity is associated with higher earning capacity. In this way, this result supports hypothesis 1 that CSR strengthens the relationship between R&D activities and economic performance.

Specifically, the interaction between CSR and R&D has an insignificant coefficient in the firms with low diversity. That is, the engagement in CSR activities has no substantial moderating power on the relationship between innovation and firm performance in these groups. In contrast, model 4 sees a positive and significant coefficient of CSR and R&D, which demonstrates the positive moderating effect in the highly diversified groups and provides support for hypothesis 2. Therefore, both hypothesis 1 and hypothesis 2 get empirical evidence to show their accuracy.

Additionally, considering the lagged effect, this study re-runs the models and finds that the results of models 5 to 7 are consistent with that of the main models.

This study also sees that control variables, including size, and firm age, have a negatively coefficient, whereas firm age has a positively significant coefficient. This finding indicates that smaller size and longer firm age elevate a firm's earning capacity. However, leverage shows a negative and significant coefficient in all models. That means high leverage could harm a firm's economic performance.

4.2. Robustness checks

This section discusses several robustness checks. First of all, we include more control variables to reduce the impact of missing variables. Second, alternative measurements for innovation and firm performance are considered to carry out robustness checks. Last, this study utilizes instrumental variable regression to address the endogenous problem.

4.2.1. Regression with more control variables

We suggest that the process of conducting regression models may lack some key variables since this study's data and variables are derived from different databases. Several control variables are not included in the original regression model, whereas we consider more control variables in the robustness check. Model 1 and 3 in Table 4 see positive and significant coefficients of both CSR and R&D investment, which indicates that CSR and innovation activities positively affect firm performance. These results are consistent with hypotheses and provide empirical support for them.

4.2.2. Alternative measurements for firm performance

Table 5 recalculates ROA by using earnings before interest and tax (EBIT). The coefficients of both CSR and R&D are positively significant in models 1 and 3. CSR can positively moderate the relationship between R&D and firm performance in groups of high diversity.

4.2.3. Alternative measurements for innovation

When collecting data, we notice that the accuracy of measurements in innovative knowledge and activities may be influenced. In Table 6, we replace R&D with patent number. The coefficient of the interaction between CSR and R&D is negative in the low diversity group. This finding shows the consistency with the previous results and substantiates the robustness.

4.2.4. Instrumental regression model

This study considers the endogenous problem since firms with better performance are more likely to engage in CSR and R&D activities. To alleviate this problem, we use the instrumental variable, industry average CSR and R&D investment, to conduct the regression model. Cao et al. (2019) argue that industry average CSR and innovation investment would be influenced by other firms' CSR and innovation engagement in the same industry. In contrast, industry average CSR and innovation investment are less likely to affect firm performance. Both models 1 and 3 of Table 7 suggest a positively significant coefficient of the interaction between CSR and R&D. The moderation effect of CSR between innovative knowledge and firm performance only plays a role in highly diversified companies. That is, the previous findings are still effective after addressing the endogenous problem.

5. Conclusions

This paper provides theoretical and practical implications in managerial practice. More firms pay attention to the significance of innovation and social responsibility and enlarge the proportion of innovative knowledge and CSR activities in their businesses. As more studies explore the relationship between R&D and firm performance, this study provides empirical results given by US firms during the period of 2010-2018 to examine the role of CSR engagement in enhancing the proportion of innovative assets. The results indicate that CSR has a positive moderation effect on the relationship between R&D intensity and firm performance. Such an effect strengthened in the group of highly diversified firms compared to that of less diversified firms.

For the theoretical implications, previous studies devoted to examining the role of innovation in the several mechanisms to better operate the business. Even if some studies discuss the relationship between CSR and firm performance, the role of CSR is not further investigated. This paper fills in this gap and points out that CSR plays a role in ameliorating the issue of information asymmetry between firms and outsiders. Second, this study considers that strategical allocation of intangible resources into different fields of activities and investments should be noticed. CSR is regarded as a crucial factor to affect firm performance rather than a driven factor.

Apart from the theoretical implications, practical significance is also included in this paper. First of all, innovative firms are expected to promote the engagement of CSR activities to mitigate information asymmetry. This specific mechanism is regarded as a practical strategy to allocate resources effectively so as to strengthen competitive advantages and meet the market's expectations. Second, regarding the informational mechanism, outsiders are also concerned about

the diversity of business structure given by CSR behaviors to expand the access to more valuable and various information.

There are some limitations to this research. First, future studies are expected to examine how CSR helps mitigate the issue of information asymmetry. The appropriability of innovative knowledge assets should be further investigated in the future. Second, we hope to see targeted studies to provide more completed measurements supported by comprehensive robustness checks. For example, CSR scores conducted merely by the KLD database may have potential limitations. The long-term indicators rather than ROA could reflect the long-term firm financial performance. Last, restricted by the availability of CSR scores in the access to CSR scores, this study is conducted during the period of 2010-2018. The recent change during the period of 2019-2021 may be ignored so that the timeliness of this study could be suspected.

To sum up, this work argues that CSR could be treated as an effective mechanism to moderate information asymmetry and improve the engagement of innovative knowledge. Collective evidence and data from US firms provide empirical support to this study.

References

- Audretsch, D. B., Bönte, W., Mahagaonkar, P., 2012. Financial signaling by innovative nascent ventures: The relevance of patents and prototypes. *Research Policy* 41, 1407–1421.
- Ataullah, A., Davidson, I., Le, H., Wood, G., 2014. Corporate diversification, information asymmetry and insider trading. *British Journal of Management* 25, 228–251.
- Azar, G., Drogendijk, R., 2014. Psychic distance, innovation, and firm performance. *Management International Review* 54, 581–613.
- Barney, J., 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17, 99–120.
- Barney, J. B., 2001. Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management* 27, 643–650.
- Botta, M., 2019. First-move advantage in seasoned equity offerings: Evidence from European banks. *Global Finance Journal* 41, 1–12.
- Branco, M. C., Lúcia, L. Rodrigues., 2006. Corporate social responsibility and resource-based perspectives. *Journal of Business Ethics* 69, 111–132.
- Bromiley, P., Rau, D., 2016. Operations management and the resource-based view: Another view. *Journal of Operations Management* 41, 95–106.
- Brown, J. R., Martinsson, G., Petersen, B. C., 2012. Do financing constraints matter for R&D?. *European Economic Review* 56, 1512–1529.
- Cao, J., Liang, H., Zhan, X., 2019. Peer effects of corporate social responsibility. *Management Science* 65, 5487–5503.
- Cegliński, P., Wiśniewska, A., 2016. CSR as a source of competitive advantage: The case study of Polpharma group. *Journal of Corporate Responsibility and Leadership* 3, 9–25.
- Chen, C., Chen, Y., Hsu, P. H., Podolski, E. J., 2016. Be nice to your innovators: Employee treatment and corporate innovation performance. *Journal of Corporate Finance* 39, 78–98.
- Delerue, H., Lejeune, A., 2010. Job mobility restriction mechanisms and appropriability in organizations: The mediating role of secrecy and lead time. *Technovation* 30, 359–366.
- Eberhart, A. C., Maxwell, W. F., Siddique, A. R., 2004. An examination of long-term abnormal stock returns and operating performance following R&D increases. *The Journal of Finance* 59, 623–650.
- Gao, Y., Yang, H., 2016. Do employees support corporate philanthropy? Evidence from Chinese listed companies. *Management and Organization Review* 12, 747–768.

- Griffin, D. W., Guedhami, O., Li, K., Lu, G., 2020. National Culture and the Value Implications of Corporate Social Responsibility: A Channel Analysis. Unpublished working paper. Available at SSRN 3250222.
- Hadlock, C. J., Pierce, J. R., 2010. New evidence on measuring financial constraints: Moving beyond the KZ. index. *The Review of Financial Studies* 23, 1909-1940.
- Hambrick, D. C., Quigley, T. J., 2014. Toward more accurate contextualization of the CEO effect on firm performance. *Strategic Management Journal* 35, 473-491.
- Hashai, N., 2015. Within-industry diversification and firm performance—an S-shaped hypothesis. *Strategic Management Journal* 36, 1378-1400.
- Ho, S. S., Li, A. Y., Tam, K., Tong, J. Y., 2016. Ethical image, corporate social responsibility, and R&D valuation. *Pacific-Basin Finance Journal* 40, 335-348.
- Jain, P., Vyas, V., Roy, A., 2017. Exploring the mediating role of intellectual capital and competitive advantage on the relation between CSR and financial performance in SMEs. *Social Responsibility Journal* 13, 1-23.
- Kacperczyk, A., 2009. With greater power comes greater responsibility? Takeover protection and corporate attention to stakeholders. *Strategic Management Journal* 30, 261-285.
- Kemper, J., Schilke, O., Reimann, M., Wang, X., Brettel, M., 2013. Competition-motivated corporate social responsibility. *Journal of Business Research* 66, 1954-1963.
- Kraaijenbrink, J., Spender, J. C., Groen, A. J., 2010. The resource-based view: A review and assessment of its critiques. *Journal of Management* 36, 349-372.
- Lee, R., Lee, J. H., Garrett, T. C., 2019. Synergy effects of innovation on firm performance. *Journal of Business Research* 99, 507-515.
- Lins, K. V., Servaes, H., Tamayo, A., 2017. Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *the Journal of Finance* 72, 1785-1824.
- McWilliams, A., Siegel, D., 2001. Corporate social responsibility: A theory of the firm perspective. *Academy of Management Review* 26, 117-127.
- McWilliams, A., Siegel, D. S., 2011. Creating and capturing value: Strategic corporate social responsibility, resource-based theory, and sustainable competitive advantage. *Journal of Management* 37, 1480-1495.
- Moratis, L., 2016. Out of the ordinary? Appraising ISO 26000's CSR definition. *International Journal of Law and Management*.
- Padgett, R. C., Galan, J. I., 2010. The effect of R&D intensity on corporate social responsibility. *Journal of Business Ethics* 93, 407-418.
- Pollack, J. M., Bosse, D. A., 2014. When do investors forgive entrepreneurs for lying? *Journal*

- of Business Venturing 29, 741–754.
- Ramsza, M., Karbowski, A., 2020. Product R&D cooperation and firm performance. *The BE Journal of Theoretical Economics* 20.
- Russo, M. V., Fouts, P. A., 1997. A resource-based perspective on corporate environmental performance and profitability. *Academy of Management Journal* 40, 534–559.
- Ryu, H. S., Lee, J. N., 2016. Innovation patterns and their effects on firm performance. *The Service Industries Journal* 36, 81–101.
- Shaukat, A., Qiu, Y., Trojanowski, G., 2016. Board attributes, corporate social responsibility strategy, and corporate environmental and social performance. *Journal of Business Ethics* 135, 569–585.
- Wang, S., Noe, R. A., 2010. Knowledge sharing: A review and directions for future research. *Human Resource Management Review* 20, 115–131.
- Wang, Z., Wang, N., 2012. Knowledge sharing, innovation and firm performance. *Expert Systems with Applications* 39, 8899–8908.
- Yu, H. C., Kuo, L., Kao, M. F., 2017. The relationship between CSR disclosure and competitive advantage. *Sustainability Accounting, Management and Policy Journal* 8, 547–570.

Table 1: Descriptive Statistics

The table reports descriptive data for the fundamental financial situation and CSR score of US firms. ROA refers to the ratio of operating income before depreciation to firms' total assets. ROA2 is the ratio of EBIT to total assets. The measure of CSR score is based on the approach given by previous studies. CSR score indicates the sum of the difference between the ratio of the sum of subcategories' strengths over the total number of strengths and the ratio of the sum of subcategories' concerns over the total number of concerns. RD measure is calculated as the ratio of research and development expenses to total assets. The term of patent indicates the natural logarithm of one plus the number of patents applied every year. Size is the natural logarithm of total assets. Leverage is the ratio of the sum of short-term debt and long-term debt over total assets. Firm age is the number of years since the firms appear the first time in Compustat. SA is SA financial constraint index. Ownership concentration (Own con) is the Herfindahl index of major institutional shareholders' ownership from Thomson. Governance follows the same calculating logic of equation (1). Tobin's q is a ratio of market value plus debt over total assets, a proxy for investment opportunities.

Variables	N	Mean	StdDev	Min	P25	P50	P75	Max
ROA	11,093	0.095	3.293	-91.636	0.000	0.096	0.151	182.522
ROA2	11,093	0.063	3.293	-91.682	0.000	0.059	0.111	182.522
CSR	11,093	-0.012	0.277	-1.051	-0.200	0.000	0.111	1.844
RD	11,093	0.047	0.367	0.000	0.000	0.000	0.020	33.670
Patent	11,093	0.731	3.457	0.000	0.000	0.000	0.000	22.615
Size	11,093	7.453	2.063	-5.521	6.157	7.478	8.716	14.633
Leverage	11,093	0.166	0.303	0.000	0.000	0.070	0.258	20.252
FirmAge	11,093	64.904	50.360	0.000	20.000	30.000	121.000	121.000
SA	11,093	-5.518	2.105	-7.998	-7.891	-4.277	-3.736	1.455
OwnCon	11,093	0.134	0.229	0.013	0.038	0.055	0.098	1.000
Governance	11,093	-0.013	0.063	-0.400	0.000	0.000	0.000	0.250
TobinQ	11,093	2.079	44.654	0.000	0.351	0.935	1.581	2705.251

Table 2: Pearson Correlation Matrix

The table reports the correlations among main variables, including ROA, CSR, RD, size, leverage, firm age and sale growth. This study conducts the Pearson correlation coefficient to process analysis. ROA refers to the ratio of operating income before depreciation to firms' total assets. The measure of CSR score is based on the approach given by previous studies. CSR score indicates the sum of the difference between the ratio of the sum of subcategories' strengths over the total number of strengths and the ratio of the sum of subcategories' concerns over the total number of concerns. RD measure is calculated as the ratio of research and development expenses to total assets. Size is the natural logarithm of total assets. Leverage is the ratio of the sum of short-term debt and long-term debt over total assets. Firm age is the number of years since the firms appear the first time in Compustat. When p-value is less than 0.01, we mark it with ***; when p-value is less than 0.05, we mark it with **; when p-value is less than 0.1, we mark it with *, and so on. The sample period is from 2010 to 2018.

	ROA	CSR	RD	Patent	Size	Leverage	TobinQ	Firmage	SA	OwnCon
ROA	1.000									
CSR	0.024**	1.000								
RD	0.165***	0.001***	1.000							
Patent	0.002*	0.025***	0.010***	1.000						
Size	0.001***	0.357***	-0.211***	0.007*	1.000					
Leverage	-0.104***	0.026***	-0.590***	0.006	-0.034***	1.000				
TobinQ	0.876***	0.012**	0.0039***	-0.004	-0.077***	0.020***	1.000			
FirmAge	0.018*	0.127***	-0.063***	0.027	0.307***	-0.044***	0.018	1.000		
SA	-0.021***	-0.126***	0.119***	-0.033***	-0.400***	0.050	0.011***	-0.983***	1.000	
OwnCon	-0.009	0.067***	0.005	-0.013	-0.007	0.010	-0.007	-0.008	0.014	1.000
Governance	0.001	0.135***	0.014	0.007	0.007*	-0.062	-0.011***	0.003***	0.016	0.027

Table 4: Robustness check: with more control variables

The table reports one of the results of the robustness check. More control variables, like SA growth, Ownership Concentration, Governance, and Tobin' Q, are included. All models apply the year fixed effect and industry fixed effect. ROA refers to the ratio of operating income before depreciation to firms' total assets. The measure of CSR score is based on the approach given by previous studies. CSR score indicates the sum of the difference between the ratio of the sum of subcategories' strengths over the total number of strengths and the ratio of the sum of subcategories' concerns over the total number of concerns. RD measure is calculated as the ratio of research and development expenses to total assets. Size is the natural logarithm of total assets. Leverage is the ratio of the sum of short-term debt and long-term debt over total assets. Firm age is the number of years since the firms appear the first time in Compustat. When p-value is less than 0.01, we mark it with ***; when p-value is less than 0.05, we mark it with **; when p-value is less than 0.1, we mark it with *, and so on. The sample period is from 2010 to 2018.

Variables	Full sample	Low Diversification	High Diversification
	Model 1 ROA	Model 2 ROA	Model 3 ROA
CSR	0.370*** (5.970)	0.218*** (3.640)	0.071*** (4.380)
RD	1.078*** (18.630)	-0.107 (-0.930)	1.731*** (111.870)
CSR × RD	3.101*** (8.770)	0.813** (2.190)	0.545*** (4.900)
Size	-0.064 (-6.340)	-0.176*** (-16.490)	0.000 (-0.020)
Leverage	-0.319*** (-5.110)	-0.095** (2.110)	-0.155*** (-10.400)
FirmAge	-0.051*** (-26.630)	-0.027*** (-12.710)	-0.001*** (-3.400)
SA	-1.257*** (-26.200)	-0.676*** (-12.720)	-0.025** (-2.34)
OwnCon	-0.046 (-0.750)	-0.034 (-0.750)	-0.010 (-0.730)
Governance	-0.097 (-0.430)	-0.728*** (-4.290)	0.036 (0.680)
TobinQ	0.066*** (219.280)	-0.357*** (-165.060)	0.067*** (1213.240)
Constant	-3.236*** (-17.880)	1.001*** (6.690)	-0.103** (-2.390)
Obs.	11,092	5,360	5,733
Adj- R^2	0.820	0.881	0.997
Year F.E.	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes

Table 5: Robustness check: using earnings before interest and depreciation (EBIT) to recalculate ROA

The table reports one of the results of the robustness check. Earnings before interest and tax are utilized to calculate ROA. Control variables, including Size, Leverage, and Firm age, are considered. All models apply the year fixed effect and industry fixed effect. ROA refers to the ratio of operating income before depreciation to firms' total assets. The measure of CSR score is based on the approach given by previous studies. CSR score indicates the sum of the difference between the ratio of the sum of subcategories' strengths over the total number of strengths and the ratio of the sum of subcategories' concerns over the total number of concerns. RD is calculated as the ratio of research and development expenses to total assets. When p-value is less than 0.01, we mark it with ***; when p-value is less than 0.05, we mark it with **; when p-value is less than 0.1, we mark it with *, and so on. The sample period is from 2010 to 2018.

Variables	Full sample	Low Diversification	High Diversification
	Model 1 ROA2	Model 2 ROA2	Model 3 ROA2
CSR	0.562*** (4.070)	-0.357** (-2.080)	0.865*** (3.390)
RD	1.440*** (11.170)	0.408 (1.240)	1.697*** (7.020)
CSR × RD	0.870*** (1.080)	-1.146 (1.080)	0.614** (0.340)
Size	-0.096*** (-4.880)	0.214*** (11.420)	-0.255*** (-8.040)
Leverage	-0.025 (-0.170)	-0.156 (-1.210)	-0.062 (-0.260)
FirmAge	0.002** (2.470)	-0.001*** (-2.690)	0.006*** (4.830)
Obs.	4,138	1,968	2,170
Adjusted R-squared	0.266	0.214	0.524
Year F.E.	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes

Table 6: Robustness check on alternative measures for innovation

The table reports one of the results of the robustness check. Panel A excludes all firms with zero R&D investment. Panel B uses patent number to replace R&D investment. Control variables, including Size, Leverage, and Firm age, are considered. All models apply the year fixed effect and industry fixed effect. ROA refers to the ratio of operating income before depreciation to firms' total assets. The measure of CSR score is based on the approach given by previous studies. CSR score indicates the sum of the difference between the ratio of the sum of subcategories' strengths over the total number of strengths and the ratio of the sum of subcategories' concerns over the total number of concerns. RD is calculated as the ratio of research and development expenses to total assets. Patent number is calculated through the natural logarithm of one plus the number of patents a firm applying each year. When p-value is less than 0.01, we mark it with ***; when p-value is less than 0.05, we mark it with **; when p-value is less than 0.1, we mark it with *, and so on. The sample period is from 2010 to 2018.

Variables	Full sample	Low Diversification	High Diversification
	Model 1 ROE	Model 2 ROE	Model 3 ROE
CSR	0.391 (1.640)	0.443 (0.670)	1.236*** (3.400)
Patent	0.008 (0.690)	-0.013 (-0.290)	0.004 (0.140)
CSR × Patent	0.028 (0.630)	-0.063 (-0.440)	0.056 (0.800)
Size	-0.078** (-2.080)	0.202*** (2.890)	-0.209*** (-4.730)
Leverage	-0.110 (-0.510)	-1.132** (-2.260)	-0.001*** (0.000)
FirmAge	0.007*** (5.190)	0.006*** (2.960)	0.008*** (4.480)
Obs.	11,085	5,352	5,733
Adjusted R-squared	0.301	0.168	0.047
Year F.E.	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes

Table 7: Robustness check: instrumental variable regression

The table reports one of the results of the robustness check. This table uses an instrumental variable, industry average CSR scores and R&D investment of other firms in the same industry, to address the endogenous problem. All models apply the year fixed effect and industry fixed effect. ROA refers to the ratio of operating income before depreciation to firms' total assets. The measure of CSR score is based on the approach given by previous studies. CSR score indicates the sum of the difference between the ratio of the sum of subcategories' strengths over the total number of strengths and the ratio of the sum of subcategories' concerns over the total number of concerns. RD is calculated as the ratio of research and development expenses to total assets. When p-value is less than 0.01, we mark it with ***; when p-value is less than 0.05, we mark it with **; when p-value is less than 0.1, we mark it with *, and so on. The sample period is from 2010 to 2018.

Variables	Full sample	Low diversity	High diversity
	Model 1 ROA	Model 2 ROA	Model 3 ROA
CSR	14.765 (0.690)	2.001 (0.910)	24.016* (1.840)
RD	1.781*** (2.610)	0.384 (0.290)	1.219 (0.720)
CSR × RD	16.701*** (0.700)	-1.699 (-0.670)	41.380* (1.760)
Size	0.726 (0.600)	0.150 (0.910)	-1.160* (-1.870)
Leverage	-1.283 (-0.690)	-0.070 (-0.770)	1.714* (1.700)
FirmAge	0.005 (1.270)	-0.002 (-1.800)	0.002 (0.880)
Obs.	11,085	5,360	5,733
Year F.E	Yes	Yes	Yes
Industry F.E	Yes	Yes	Yes