



When does employee-oriented corporate social responsibility enhance Research Quotient innovation efficiency? The role of corporate governance

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ABSTRACT

This study examines how employee-oriented CSR (WCSR) affects Research Quotient innovation efficiency (RQ) using a sample of 1420 firms from 2002 to 2021. First, the results reveal a negative association between WCSR and RQ, which contradicts our expectations. Then, we conducted the analysis under various conditions and found that the impact of WCSR on RQ is not linear. While WCSR positively affects RQ in firms with stronger governance, its impact is negative when corporate governance weakens. Similarly, in firms with low WCSR, corporate governance negatively affects RQ, suggesting that firms should improve both their WCSR and their governance. The study also documents that the baseline results are mainly driven by the subsamples of high-WCSR firms, big firms, and low-R&D-intensity firms. The relationship between WCSR and RQ takes the shape of an inverted "U". The direct effect of WCSR on RQ first increases, reaches a maximum, and then decreases. Enhanced WCSR positively affects RQ in low-WCSR firms but negatively in high-WCSR firms, suggesting a threshold beyond which increasing investment in WCSR could deteriorate innovation efficiency unless effective governance mechanisms are implemented to counterbalance the adverse effects. The results are robust to various specifications, including alternative measures, dynamic system-GMM, and propensity score matching.

1. Introduction

Many academics defend that innovation is the main factor in firm success (Kogan et al., 2017). However, innovation is often fraught with uncertainty, making the success of innovative initiatives anything but guaranteed (Seo et al., 2020). Corporate innovation is

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inherently complex and demands significant investment in capital, technical knowledge, human resources, and specialized skills (Li & Wang, 2022). In particular, skilled human resources are essential because a firm's success in innovation hinges on the effort and creativity of its employees throughout the innovation process (Bauman & Skitka, 2012). Talented and motivated employees can contribute more effectively to innovation than any other resources available within the company.

Recognizing the value of human resources, researchers emphasize the need for corporate social responsibility (CSR) strategies that promote workforce productivity and creativity (Cheng & Han, 2025; Paruzel et al., 2023; Piserà et al., 2025). The core argument is that employees are likely to develop a positive attitude toward their company if they feel valued and adequately treated (Hosmer & Kiewitz, 2005). CSR can effectively enhance workers' creativity, as they are the primary stakeholders who directly contribute to the firm's success (Bauman & Skitka, 2012). When employees are well-treated, they may be more motivated to engage actively and creatively in innovation (Chen et al., 2016). In this context, Benlemlih and Bitar (2018) note that CSR initiatives focused on employees are often more effective in improving investment efficiency than those aimed at secondary stakeholders.

Recent literature indicates that companies engaged in CSR activities toward their employees achieve significant success (Suto & Takehara, 2022). Employee-oriented CSR is positively correlated with various employee-related outcomes, such as job satisfaction, commitment, and firm productivity (Bai, 2022; Cheng & Han, 2025; George et al., 2021; Paruzel et al., 2023; Piserà et al., 2025). By providing satisfactory working conditions, companies signal effective management practices (Bai, 2022), which in turn enhance employee engagement and help attract and retain talented workers with critical skills (Chen et al., 2016; Liu et al., 2020). Empirical studies show that employee-oriented CSR boosts employee motivation for innovation (Li & Wang, 2022; Liu et al., 2020) and leads to improved inventor productivity (Bai, 2022) and greater corporate innovation output (Makpotche, 2025). From this standpoint, Chen et al. (2016) argue that better treatment of employees is essential for successful innovation, even when other factors that drive the innovation process are considered.

Furthermore, research on the role of CSR in innovation activities has focused mainly on corporations' innovation behavior and the number of patents they produce. Along those lines, empirical studies show that CSR positively affects the firm's investment (Benlemlih & Bitar, 2018) and innovation as measured by patent counts (Bai, 2022; Chen et al., 2016). Yuan et al. (2023) show that the firm's aggregate CSR score negatively affects the patent counts per R&D expense. However, this measure implies that all patents have the same technological content and economic value, whereas patents vary widely in quality and value. Additionally, while specific CSR dimensions may be more relevant to innovation than others, empirical studies have primarily focused on overall CSR scores. Benlemlih and Bitar (2018) argue that only primary stakeholders directly linked to the firm's activities enhance investment efficiency. They document that CSR components related to employees are more relevant for firm innovation than those related to secondary stakeholders such as human rights, environmental practices, and community involvement. Indeed, using the firm's overall CSR score can mask the impact of each CSR dimension (Benlemlih & Bitar, 2018; Chen et al., 2016). In addition, measuring innovation efficiency is problematic in the literature, as patent counts capture innovation output and R&D expenses measure innovation input. In that regard, empirical studies focus mainly on firms' ability to innovate rather than on innovation efficiency, using patent applications and R&D expenses to capture firms' innovation output and input, respectively. Thus, although the literature has documented the positive relationship between CSR and diverse firm outcomes, the impact on innovation efficiency remains unclear. To the best of our knowledge, no systematic analysis has been conducted on the relationship between CSR and RQ innovation efficiency. RQ is relatively new to the finance literature (Cooper et al., 2022) and less explored. The present research aims to fill this gap by examining how employee-oriented CSR (WCSR) influences RQ innovation efficiency. RQ is the percentage increase in firm revenue due to a 1% increase in R&D expenses, capturing the efficiency of the firm's investments in innovation (Cooper et al., 2022; Knott, 2008).

Building on prior literature, we argue that active CSR toward employees helps stimulate work efficiency and creativity (Bai, 2022). Improved working conditions may enhance employee engagement, which is necessary to reduce moral hazard and free-riding in innovation (Makpotche, 2025). Furthermore, researchers have documented that effective governance mechanisms are important in innovation as they reduce conflicts of interest (Bobillo et al., 2018; Islam & Rahman, 2023). Since R&D activities face information asymmetry problems (Howell, 2017), in pursuit of the analysis, we consider stronger corporate governance necessary for WCSR to affect RQ positively. We assume that in well-governed firms with better WCSR, researchers are more motivated and agency conflicts are mitigated. Thus, the effect of WCSR on RQ may depend on the quality of corporate governance. To test this hypothesis, we examine the moderating role of firm governance.

To conduct the study, we analyze a sample of 1420 U.S. firms for 2002–2021. We collected data on WCSR from the Refinitiv ESG database and financial data from Compustat. We utilize the Research Quotient (RQ), an innovation efficiency metric developed by Knott (2008), to assess innovation efficiency. RQ is based on the market value of the innovation output, taking into account both the quantity and the technological quality of the innovation product (Cooper et al., 2022). Specifically, RQ represents the percentage increase in revenue resulting from a 1% increase in R&D expenses; therefore, it is comparable across different firms (Cooper et al., 2022; Knott, 2008). Data on RQ are from Wharton Research Data Services (WRDS) RQ databases. Using panel models with firm and year-fixed effects, we find that the impact of WCSR on RQ is not linear. The WCSR positively affects RQ innovation efficiency only in firms with stronger governance. When corporate governance weakens, the direct effect of WCSR on RQ is negative, which drives our results for the full sample. Similarly, in firms with low WCSR, corporate governance negatively affects RQ, suggesting that companies should improve both their WCSR and their corporate governance. Just like WCSR, the quality of firm governance is necessary but not sufficient to enhance RQ. Stronger governance associated with better WCSR may alleviate the free-riding problem and enhance innovation efficiency. These findings are robust across various specifications, including alternative model specifications and corrections for endogeneity.

The study also investigates whether the effect of WCSR on RQ differs among the subsamples. The relationship between WCSR and RQ takes the shape of an inverted "U". We find that WCSR negatively affects RQ in the high-WCSR subgroup, consistent with the

baseline results. In contrast, enhanced WCSR positively affects RQ in the low-WCSR subsample, suggesting a non-linear effect of WCSR on RQ. In addition, in the low-WCSR subsample, the impact of WCSR on RQ is more pronounced for firms with stronger governance. Thus, the effect of WCSR on RQ may be more beneficial for firms with low WCSR than for firms with high WCSR. Taken together, the results indicate that there is a threshold beyond which increasing investment in WCSR could reduce the firm's innovation performance if no effective governance mechanism is in place to counterbalance the adverse effects. Furthermore, the impact of WCSR on RQ in the subgroups of big firms and low-R&D-intensity firms is similar to the baseline results. The results for the subgroups of small and high R&D intensity are not significant. Finally, the results do not depend on the firm's investment opportunities (Tobin's Q). Therefore, the results are mainly driven by the high-WCSR subsample, the big firms, and the low-R&D-intensity firms, respectively.

The findings reveal the importance of considering WCSR alongside corporate governance in the innovation process. Considering one without the other may result in inefficiency. The study also explores the relationship between the four dimensions of WCSR. It reveals that the baseline findings are mainly driven by workforce diversity, and training and career development. Furthermore, the study documents a positive effect of WCSR on R&D intensity. Although we find no direct effect of corporate governance, the interaction between WCSR and firm governance positively impacts R&D intensity, suggesting that WCSR promotes R&D investments in well-governed firms. These findings are not surprising, as the impact of corporate governance on innovation remains controversial in the literature (O'Connor & Rafferty, 2012; Atanassov, 2013). Unsurprisingly, WCSR and corporate governance positively impact firm value, supporting previous studies documenting the positive relationship between corporate governance and firm value (Ammann et al., 2011; Jo & Harjoto, 2011). In concordance with Cooper et al. (2022), RQ is positively associated with firm value even after controlling for corporate governance and WCSR. The results complement Cooper et al. (2022) and indicate that the RQ can be used to predict firm value and that, in its absence, the WCSR and corporate governance may predict firm value.

The paper makes several contributions to the literature. To the best of our knowledge, this is the first study examining the relationship between WCSR and RQ innovation efficiency. The study helps understand how and when good ethical practices regarding CSR toward employees and firm governance affect innovation performance. It advances literature in several areas, including innovation, finance, accounting, CSR, economics, and human capital. The study extends the existing literature by providing novel evidence that stronger governance must be associated with active employee-oriented CSR to improve RQ innovation efficiency. More interestingly, it warns that increased CSR investment in a worse-governed environment may lead to inefficiency in innovation. Just as employee-oriented CSR, corporate governance quality is a necessary but not sufficient condition for enhancing innovation efficiency. Furthermore, by examining RQ innovation efficiency, the study expands the financial and accounting literature on innovation and firm performance. Since innovation is a key determinant of long-term economic growth (Kogan et al., 2017), the study expands the economic literature on human capital and economic development. The study builds on previous work (Benlemlih & Bitar, 2018; Chen et al., 2016) by revealing that considering primary stakeholders, especially employees, is vital for firms' innovation.

Second, our paper is related to empirical studies on CSR and innovation. In a previous study, Chen et al. (2016) and Liu et al. (2020) used patent counts and citations to capture innovation output quantity and quality, respectively. They found a positive impact of employee-related CSR on both innovation quality and quantity. However, their results imply, for example, that a firm that produces 10 patents worth 1 million each (10 million in total) will be considered more innovative than another firm that produces a single patent worth 20 million. In a recent study, Makpotche (2025) corrected this weakness using the dollar value of innovation output. This author found that employee-oriented CSR positively affects innovation output quality, measured by the estimated dollar value of patents. However, its measures do not account for the investments firms make to achieve these innovations. For example, some companies can produce very valuable patents at low cost, while others can obtain the same patents at high cost. Our study differs significantly from these previous studies in that we examined RQ innovation efficiency, which captures both the quantity and the quality of firm innovation. While previous studies focus mainly on innovation output without considering the resources firms invest in R&D to produce it, by definition, RQ accounts for both innovation output and input. Using RQ addresses the shortcomings of previous studies on CSR and innovation. In addition, we control for other dimensions of corporate social performance and analyze each WCSR dimension to identify the most important for innovation.

Previously, Yuan et al. (2023) showed that the firm's aggregate CSR score negatively affects the "patent counts per R&D expense". Our study is fundamentally different for several reasons. First, using patent counts per R&D expense (or the ratio of the logarithm of 1 plus the number of patents in a given year to the logarithm of 1 plus the firm's R&D investment in the previous year) as a measure of innovation performance, implies that all patents are identical in terms of technological quality and economic value, which is not true. For example, a company that invests ten million dollars to produce five patents worth a total of 20 million dollars will be considered more efficient than a company that invests ten million dollars to produce two patents worth a total of 30 million dollars. Therefore, the measure used by Yuan et al. (2023) is not comparable between firms. Our study overcomes this weakness. Using RQ to measure innovation efficiency presents many advantages. Since RQ is elasticity, it is unitless and directly comparable across firms, while patents may vary widely in value (Knott, 2008). In contrast with patents or other innovation measures, RQ captures product and process innovation by accounting for revenue maximization and cost reduction (Cooper et al., 2022). It also accounts for both the quality and quantity of innovation for a given level of R&D investment. Second, Yuan et al. (2023) examine the firm's aggregate CSR score, while specific CSR dimensions may be more relevant to innovation than others (Benlemlih & Bitar, 2018). Our study differs in that we examined employee-related CSR rather than an aggregate CSR score. Employee-oriented CSR focuses solely on companies' CSR policies toward employees, internal stakeholders, who contribute directly to achieving the firm's objectives, and without whom the firm cannot succeed. The aggregate CSR score encompasses CSR toward all internal and external stakeholders and includes the three dimensions of CSR: social (which includes employee-related CSR), governmental, and environmental. However, not all of these dimensions are necessarily relevant to innovation. For example, one might ask how philanthropy toward external stakeholders can enhance a company's innovation performance, as highlighted by Benlemlih and Bitar (2018).

Finally, our findings reveal the importance of associating CSR toward employees with corporate governance in the innovation process: failing to do so may result in inefficiency. Managers and policymakers can refer to the results to make effective decisions.

The rest of this paper is structured as follows: Section 2 outlines the theoretical framework. Section 3 provides the conceptual framework and formulates the hypothesis. Section 4 presents the research design and discusses the methodology. Section 5 reports the findings. Section 6 offers additional analysis. Section 7 discusses the results, and Section 8 concludes.

2. Theoretical framework

Various theories have been proposed to elucidate the association between CSR and employee outcomes. The most recognized include stakeholder theory, agency theory, resource-based theory, and social exchange theory.

2.1. CSR, information asymmetry, and agency costs

Agency theory indicates that information asymmetry worsens agency conflicts and moral hazards at work, thereby reducing both the quantity and quality of the firm's innovations (Islam & Rahman, 2023). In particular, agency conflicts are serious in innovation due to the uncertainty surrounding the innovation output and the difficulty of evaluating technicians' efforts (Howell, 2017). Indeed, when firm governance weakens, employees act as free riders (Yu et al., 2024), and opportunistic managers avoid innovation and overinvest in short-term projects (Islam & Rahman, 2023). As CSR activities are among firms' investment decisions, CSR is sometimes viewed as a waste of resources and the manifestation of agency conflicts (Masulis & Reza, 2015). From that perspective, CSR does not yield benefits (Krüger, 2015) and should potentially be negatively associated with corporate innovation. An alternative view of CSR in agency theory is that it is a long-term strategy embedded in effective governance and thus beneficial in the long run (Naciti, 2019). Accordingly, investing in CSR is not an agency problem (Ferrell et al., 2016). CSR activities, including those directed toward employees, may enhance firm value and be positively associated with innovation.

Agency theory predicts that contractual incentives align the CEO's interests with those of outsiders, thereby inducing managers to invest optimally and innovate (Ferrell et al., 2016; Islam & Rahman, 2023). In that regard, firms can use compensation policies to motivate managers to create long-term value (Flammer et al., 2019). Using incentives as a governance mechanism may lead to optimal investment in CSR, as CEOs may limit non-productive expenses and invest only in CSR when those investments increase firm value. Fabrizi et al. (2014) show that when the CEO's private interests align with those of shareholders, he is less likely to invest in CSR, since CSR investments do not generate short-term profits. Jian and Lee (2015) decompose CSR investment into a normal and an abnormal component. The normal component is the optimal level of CSR investments, and the abnormal component represents agency costs that destroy firm value. The authors show that compensation policies incentivize CEOs to invest more in normal CSR and less in abnormal CSR. This suggests that the CEO is rewarded for investing at an optimal level of CSR and punished when CSR investment deviates from the normal level. An effective governance structure reduces agency costs by penalizing CEOs who overinvest in CSR for personal gain, thereby enhancing the relationship between CSR and corporate innovation. Accordingly, Li et al. (2025) show that executive incentives positively impact innovation through the mediation of CSR.

On the other hand, research has examined the role of CSR in mitigating information asymmetry and agency problems. Cui et al. (2018) find a negative association between CSR and information asymmetry measures. In particular, firms use CSR engagement to provide extra-financial information to stakeholders that goes beyond traditional financial metrics (Alves & Meneses, 2024), sending a positive signal to investors and helping them obtain better access to finance (Hoepner et al., 2025). CSR also reduces reputational risk and allows firms to gain and maintain legitimacy (Cui et al., 2018). This reputation is essential for securing critical resources from stakeholders, particularly external financing for innovation. In this perspective, better CSR is important for firms' innovation as it increases corporate creditworthiness (Hoepner et al., 2025), reduces the cost of debt (Alves & Meneses, 2024), and the cost of equity funding (Lynch & O'Hagan-Luff, 2024).

Due to information asymmetry, Wang et al. (2023) argue that external investors cannot observe firms' innovation processes, leading to high agency costs associated with innovation activities. They think that Environmental, Social, and Governance (ESG) rating disclosure by firms helps alleviate information asymmetry between managers and external investors, thereby promoting corporate innovation. Samet and Jarboui (2017) show that CSR ameliorates firm-level investment efficiency by helping firms address agency and information asymmetry problems. Specifically, CSR increases investment in under-investing firms by mitigating information asymmetry and reduces over-investment by mitigating free cash-flow problems. Hao and He (2022) observe that CSR enhances innovation since CSR disclosure increases firms' transparency and helps investors understand corporate information. The increased firm transparency promotes strong partnerships with stakeholders and facilitates internal and external knowledge sharing. Tan et al. (2024) document that corporate ESG performance indirectly boosts firm value by fostering innovation. Thus, according to this view in agency theory, employee-oriented CSR may positively affect innovation efficiency.

In sum, agency theory is divided on the effects of employee-oriented CSR on innovation efficiency. Some authors believe CSR negatively affects firm performance, while others maintain the opposite. Nevertheless, in agency theory, it is widely accepted that CSR has a positive impact on innovation performance, as it reflects ethical corporate management.

2.2. Stakeholder theory and employee creativity

The literature on stakeholder theory indicates that firms must undertake social responsibility to enhance their competitive advantage and financial performance (Bai, 2022). By definition, stakeholders are those who can affect or be affected by the

achievement of organizational goals (Harrison & Wicks, 2013). These groups were classified into primary stakeholders –who had the financial or material resources, the political or social positions, or the functional or technical skills that made them essential for the survival of the firm–, and secondary stakeholders –who had little in the way of resources, lacked power and possessed only routine, readily available skills– (Harrison & Wicks, 2013; Hosmer & Kiewitz, 2005). Specifically, employees are the primary stakeholders who directly affect the firm.

The stakeholder theory also implies that CSR alleviates agency conflicts and strengthens the relationship between the company and its stakeholders (Bai, 2022). Stakeholder theory encourages firms to acknowledge and consider all their stakeholders, promote understanding, and manage stakeholder demands (Mahajan et al., 2023; Parmar et al., 2010). Firms should proactively consider the interests of both internal and external stakeholders in their decision-making to maximize value creation and preserve long-term success (Mahajan et al., 2023). As Harrison and Wicks (2013) noted, firms that provide more satisfaction to their stakeholders are better able to retain their support. Focusing on stakeholders' interests and treating them well helps create long-term value. Thus, while focusing on profit-making, firms should also actively participate in social welfare activities and improve employee welfare (Bai, 2022). Employee-related CSR helps firms motivate their employees and innovate.

Since employees are the primary stakeholders who directly contribute to firms' success, CSR is helpful for their motivation and creativity (Bauman & Skitka, 2012). For instance, Piserà et al. (2025) and Cheng and Han (2025) observe that CSR practices are associated with higher firm productivity. Bai (2022) notes that better employee-related CSR is essential to corporate innovation. Active CSR helps stimulate employee efficiency and creativity and signals that the company is performing well, thereby strengthening its competitive advantage in recruiting and attracting exceptional workers (Chen et al., 2016). Under the Bauman and Skitka (2012) framework, CSR affects employees' relationships with their company through four paths corresponding to four universal psychological needs: security, self-esteem, belongingness, and meaningful existence. These authors argue that CSR may help satisfy the need for security and safety, as firms with a strong CSR reputation generally invest in their employees' well-being. Employees may infer from CSR that investing their time and effort into the firm's success is safe. CSR serves as the basis for trust and is associated with creativity and innovation performance. Therefore, according to stakeholder theory, employee-oriented CSR may positively affect corporate innovation efficiency.

2.3. Social exchange theory and CSR

Social exchange theory is one of the most influential paradigms for understanding exchange relationships in organizations (Cropanzano & Mitchell, 2005; Shore et al., 2009). It is based on the principle of reciprocity and the assumption that social behavior can be exchanged between two parties (Subba & Rao, 2016). Social exchanges are those involving unspecified commitments where the voluntary actions of individuals are motivated by favors that create undefined future duties, and the nature of the return must be left to the discretion of the one who makes it (Gould-Williams & Davies, 2005; Shore et al., 2009; Subba & Rao, 2016). In employer-employee relationships, social exchange relationships occur when employers consider employees' interests (Cropanzano & Mitchell, 2005). This implies that good actions by organizations toward employees create an obligation of reciprocity on the part of employees that goes beyond contractual agreement behaviors (Gould-Williams & Davies, 2005; Shore et al., 2009). Positive social exchanges generate mutual benefits to the firm and the workforce, in contrast with economic exchanges characterized by contractual arrangements enforceable through legal sanctions (Gould-Williams & Davies, 2005). Employee-oriented CSR is a positive action that may benefit firms and employees.

In social exchange theory, relationships evolve over time into trusting, loyal, and mutually beneficial commitments, which, in turn, foster effective work behavior and positive employee attitudes (Cropanzano & Mitchell, 2005). As mentioned by Shore et al. (2009), these relationships are characterized by a long-term orientation, the exchange of tangible and intangible resources, trust, commitment, and attachment. However, the beneficial exchanges between parties are not negotiated. This necessitates a long-term orientation as the exchange is ongoing and time is needed for the relationship to yield valuable returns. In that relationship, employees might feel motivated to be more involved and engaged in their work if their organization goes beyond what is legally required or economically reasonable to support them (Paruzel et al., 2023; Subba & Rao, 2016). Since CSR benefits firms in the long term (Paruzel et al., 2023; Suto & Takehara, 2022), employee-oriented CSR serves as a foundation for this relationship and may foster innovation.

In line with social exchange theory, employee-oriented CSR may positively affect innovation efficiency. Social exchange theory implies that CSR toward employees fosters organizational trust through a reciprocal exchange mechanism, while CSR toward external stakeholders inculcates organizational trust among employees through a generalized social exchange mechanism (George et al., 2021). Thus, employees may exhibit behaviors that support the firm's goals, manifested through creative and innovative actions (Paruzel et al., 2023), including generating and implementing new ideas that enhance innovation efficiency.

3. Conceptual framework and hypotheses development

This section conceptualizes the link between employee-oriented CSR and innovation efficiency, and how corporate governance moderates this relationship.

3.1. Employee-oriented CSR and innovation efficiency

While the link between CSR and innovation efficiency is not clear in agency theory, stakeholder theory and social exchange theory clearly suggest that CSR toward employees directly enhances innovation efficiency. Under the stakeholder theory, CSR initiatives are

firms' responses to various stakeholders' expectations. In particular, employee-oriented CSR is an ethical management model that integrates employee concerns. Employee expectations regarding workplace relations, safety, and amenities generally compel companies to implement CSR policies (Erhemjamts et al., 2013). CSR is an excellent opportunity to motivate employees since they are primary stakeholders who directly affect firm outcomes (Bauman & Skitka, 2012). As documented in the literature, employee-oriented CSR positively affects job satisfaction, employee-related outcomes, and firms' productivity (Erhemjamts et al., 2013; Paruzel et al., 2023). In that regard, Benlemlih and Bitar (2018) document that CSR components related to employee relations are more relevant to increase corporate efficiency than those related to secondary stakeholders such as human rights and community involvement. Notably, only stakeholders directly linked to the firm's activities, such as employees, enhance firm performance via innovation efficiency.

In the literature, employees are crucial to corporate innovation, and well-treated employees may be motivated to participate actively and creatively in the innovation process (Chen et al., 2016). As Suto and Takehara (2022) noted, employee-oriented CSR entails social responsibility toward workers. It includes workplace safety and security, employee development, and career development opportunities within the organization. In that regard, a higher level of employee well-being and less job strain induced by CSR toward employees increase non-monetary satisfaction and creativity. Based on the social exchange theory, George et al. (2021) consider employees' CSR perceptions an important mechanism that influences organizational trust. An employee-oriented CSR indicates that the firm will treat employees with a similar level of care and benevolence going forward, fostering emotional attachment and commitment among employees (George et al., 2021). Then, employees may adopt an attitude that improves the firm's performance and innovation capabilities.

Under the Suto and Takehara (2022) framework, employee-oriented CSR practices are classified into four types: human capital development, work-life balance, equal opportunity and diversity, and security and safety. Equal opportunity and diversity within an organization activate the intrinsic motivation of employees belonging to social minority groups, thereby enhancing the sense of unity and loyalty to the organization. Employee welfare in the form of work-life balance includes flexible work schedules, guaranteed paid holidays, childcare allowances, and work sharing, which improve employees' mental and physical health. Security and safety in the workplace positively affect employees' psychological and physical health. Bauman and Skitka (2012) observe that employees infer from CSR that investing their time and effort into the firm's success is not imprudent. Indeed, procedures that demonstrate concern for employees and promise a good working environment are more likely to foster trust, which in turn increases organizational commitment and productive workplace behaviors. Employees may be more creative and innovative when they profit directly from the firm's CSR strategy (Paruzel et al., 2023). Thus, employee-related CSR may positively affect corporate innovation efficiency.

Li and Wang (2022) argue that innovation is a complex activity that requires long-term, repeated experimentation, substantial resources, and the accumulation of human capital. As high-quality innovation is more challenging, it requires more sustained employee effort and support from managers. CSR toward employees may promote high-quality innovation and increase both the quantity and quality of innovation. In the same way, Chen et al. (2016) observe that better employee treatment is crucial to innovation success, even after accounting for other factors that incentivize the innovation process. For instance, by offering employees satisfying working conditions, firms can recruit and retain talented people who drive innovation. Liu et al. (2020) argue that firms that can recruit and retain talented, dedicated employees are better able to produce high-quality innovation. They observe that implementing effective employee-related CSR policies may attract critical-skilled talent, strengthen employee engagement and loyalty, and mitigate internal inefficiencies. As a satisfying workplace improves employee productivity and mitigates employees' failure to implement innovation plans, adopting effective employee-related CSR should enhance a firm's success in innovation (Chen et al., 2016; Li & Wang, 2022). Employee-oriented CSR may have a stronger positive impact on innovation efficiency than other CSR components.

Empirically, George et al. (2021) find an indirect effect of employee-oriented CSR on employee affective commitment through organizational trust. Gould-Williams and Davies (2005) used social exchange theory as a framework to predict three outcomes: employee commitment, employee motivation, and the desire to remain with the organization. They document that trust in management resulted in employee commitment. Suto and Takehara (2022) show that CSR works individually and synergistically with pecuniary rewards to enhance employee motivations for innovation. Paruzel et al. (2023) summarized the findings on the relationship between CSR and employee creativity, confirming that CSR drives innovative behavior. In particular, perceived CSR toward internal stakeholders shows a stronger link with innovative behaviors than that directed at external stakeholders. Empirical studies also show that stronger employee-related CSR is essential to corporate innovation, as it enhances employees' creativity (Bai, 2022). In addition, employee-related CSR is associated with improved inventor productivity through employee stability and efficiency (Chen et al., 2016; Cheng & Han, 2025; Liu et al., 2020; Piserà et al., 2025). While Li and Wang (2022) confirm a positive relationship between CSR toward employees and creativity, their study documents that CSR toward employees does not promote R&D investment but reduces the turnover rate of staff with production and R&D backgrounds. Based on the arguments above, we propose the following hypotheses.

H3. Employee-oriented CSR is positively related to corporate innovation efficiency.

3.2. The moderating role of corporate governance

Proponents of agency theory are divided on the potential impacts of CSR on innovation efficiency. In innovation, even if CSR toward employees can motivate workers to be more creative and productive, efficiency requires cost reduction and optimal investment in R&D. Given that agency conflicts can lead managers to overestimate their investment in CSR and R&D, or to underinvest in R&D in favor of CSR (Gillan et al., 2021; Islam & Rahman, 2023; Masulis & Reza, 2015), agency costs view of CSR implies inefficiency in innovation. An alternative view in agency theory is that CSR is an ethical management that stems from stronger governance and, therefore, constitutes a value-maximizing strategy (Naciti, 2019). Implementing effective CSR enhances firms' credibility and

transparency, increases investor confidence, and fosters and maintains positive stakeholder relationships and legitimacy (Hao & He, 2022). CSR mitigates agency conflicts and strengthens the relationship between firms and stakeholders (Bai, 2022) since socially responsible firms generally operate ethically (Hao & He, 2022). From that perspective, CSR toward employees is an optimal way for managers to use firm resources to maximize long-term value, as it implies ethical operations and effective governance (Ferrell et al., 2016). Thus, it may enhance innovation efficiency.

The stakeholder perspective also implies that employee-oriented CSR enhances firms' competitive advantage, long-term value, and innovation efficiency (Erhemjants et al., 2013). Nevertheless, although employee well-being is fundamental to innovation, employee-oriented CSR may not be the sole determinant of a firm's innovation efficiency, since the association between CSR and innovation remains controversial in agency theory. When free-riding among employees or managers is substantial, the effect of employee-related CSR on innovation efficiency may not be significant (Liu et al., 2020). As noted by Li and Wang (2022), CSR toward employees can increase managerial power. To protect their private interests, managers may take less risk by investing little effort in innovation. Moreover, when managers invest ineffectively in R&D or hire less-qualified employees, one may expect poor innovation efficiency even in the presence of employee-friendly policies (Liu et al., 2020). Based on these, it is not clear that employee-oriented CSR is sufficient to foster innovation efficiency. Corporate governance and incentive schemes that emphasize long-term value creation can alleviate managerial opportunism, thereby moderating this relationship.

Asymmetric information and moral hazard are serious problems for innovation and R&D, given the inherent uncertainty of these activities and the difficulty of monitoring scientists (Howell, 2017). Hence, the importance of effective governance in eliminating the problems of moral hazard and free-riding in innovation (Bobillo et al., 2018; Islam & Rahman, 2023). In addition, in agency theory literature, without effective corporate governance, executives' motivation to engage in CSR may stem from agency problems and the waste of resources (Ferrell et al., 2016). Consequently, CSR performance comes at the expense of good financial performance, as valuable resources are misallocated rather than invested in value-added projects (Erhemjants et al., 2013). In contrast, in firms with stronger governance, CSR may create long-term value (Naciti, 2019). The presence of incentive-based mechanisms and monitoring induces managers to make optimal investments (Ferrell et al., 2016; Jensen & Meckling, 1976). Effective corporate governance helps reduce the moral hazard problem inherent in innovation and CSR and, therefore, may positively moderate the relationship between employee-oriented CSR and innovation efficiency.

Furthermore, it was also shown that effective governance mechanisms are more important than ordinary capabilities in innovation (Bobillo et al., 2018; Makpotche et al., 2024). Firm governance may act as a moderator in the relationship between employee-oriented CSR and innovation efficiency, as agency problems are mitigated when effective governance is combined with active employee-oriented CSR that strongly motivates researchers (Makpotche, 2025). With a solid governance structure, including incentive mechanisms for managers and employees, decisions on CSR and R&D may be optimal. In particular, CSR decisions will primarily aim to maximize the firm's long-term value and, therefore, improve employee creativity and productivity. In addition, the inclusion of incentive mechanisms for managers in corporate governance may promote effective investment decision-making. Governance mechanisms that align managers' and shareholders' interests compel firm leaders to make effective decisions on innovation and CSR. In that regard, managers are penalized for making value-destroying decisions and rewarded for making value-creating decisions. Hence, moral hazard and free-riding issues may be minimized at the management level, and CSR initiatives may focus mainly on fostering creativity and reducing free-riding among employees. Unoptimal investment problems in innovation may be limited. Firm investment decisions may primarily aim to create long-term value for shareholders rather than to satisfy managers' short-term interests. From that perspective, managers have an interest in investing in employee-related CSR only if doing so improves the firm's long-term performance. Management decisions regarding CSR will primarily focus on employee motivation and creativity, and therefore on their ability to contribute to innovation, since the firm's long-term value depends on it. Suboptimal CSR spending may therefore be limited. The effectiveness of CSR and innovation decisions, therefore, depends on the quality of corporate governance.

In sum, appropriate governance mechanisms may improve innovation efficiency by helping firms focus on long-term value creation while limiting agency conflicts. With stronger governance, CSR activities may be optimal decisions instead of agency costs. Combining stronger governance with effective employee-oriented CSR may improve innovation efficiency. Therefore, we formulate the following hypothesis.

H2. Employee-oriented CSR positively affects RQ only in firms with stronger governance.

Furthermore, in the absence of CSR toward employees or incentives for innovation, employees will be less motivated and less creative (Chen et al., 2016; Liu et al., 2020). In addition, asymmetric information exposes firms to hostile takeovers, an external governance mechanism that mitigates agency conflicts (Chemmanur & Tian, 2018). However, active takeover pressures result in managerial myopia (Atanassov, 2013), the tendency of managers to make decisions that boost short-term profits at the expense of the long-term value creation (Sheng et al., 2022; Tong & Zhang, 2024). The higher pressure induced by stronger governance may also lead managers to engage in short-termism and reduce innovation if the governance mechanisms lack incentive schemes aligned with a long-term orientation (Atanassov, 2013). Many academics believe that myopia is a significant challenge for innovative firms. Temporal myopia leads to a persistent strategy over time, while spatial myopia leads to conformity to industry strategy (Ridge et al., 2014). In that regard, Seo et al. (2020) find that managerial myopia leads to short-termism in innovation strategy, pushing managers to focus on incremental innovation to achieve short-term profits. Tong and Zhang (2024) consider inadequate governance mechanisms as the leading cause of managerial myopia. Sheng et al. (2022) show that managerial myopia negatively affects productivity and the firm's long-term performance by reducing innovation. Yu et al. (2024) investigate the consequences of managerial myopia on both the quantity of innovation input and the quality of innovation outputs. They find that managerial myopia reduces investment in R&D and decreases the technological content of patents. Finally, Oongsakul et al. (2022) show that the takeover market as an external governance

mechanism negatively affects innovation efficiency. Indeed, greater pressure from internal corporate governance may also lead to managerial myopia and reduce innovation efficiency, especially in the absence of managerial incentives and CSR toward employees. Therefore, we formulate the following hypotheses.

H3. The direct effect of corporate governance on RQ innovation efficiency is negative.

4. Research design

In this section, we present the data sources, the measurement of the main variables, the descriptive statistics, and the methodology.

4.1. Data sources and sample selection

We begin our sample construction by gathering all firm-level data from the Refinitiv ESG (formerly known as ASSET4 ESG), Compustat, and WRDS RQ databases, covering the period from 2002 to 2021. We specifically collect corporate governance and employee-oriented CSR data from the Refinitiv ESG database. Financial and accounting data are sourced from Compustat North America. The WRDS RQ database provides information on innovation, specifically through metrics such as the Research Quotient (RQ) and R&D intensity. To obtain the final sample, we merge these three databases. Since neither Refinitiv nor WRDS RQ covers all firms listed in Compustat, and vice versa, combining the three datasets eliminates firms that lack financial, ESG, or RQ data. We winsorized all variables at the 1% and 99% levels to reduce the impact of outliers. We obtained a final sample of 1420 U.S. firms, comprising 7097 firm-year observations from 2002 to 2021. Descriptive statistics are presented in [Table 1](#).

4.2. Definition of variables

4.2.1. Dependent variable: innovation efficiency

The primary dependent variable is the firm-level innovation efficiency. Given that our study examines innovation efficiency rather than patent counts, as in previous studies ([Chemmanur & Tian, 2018](#); [Li & Wang, 2022](#)), our focal measure is the Research Quotient (RQ) developed by [Knott \(2008\)](#). RQ is a measure of the firm's R&D productivity, linking R&D expenses to firm growth and market value—more precisely, the firm-specific output elasticity of R&D, indicating the ability to generate revenue from R&D investment ([Knott, 2008](#)). Indeed, the RQ represents the percentage increase in revenues from a 1% increase in R&D investment, all else being equal ([Cooper et al., 2022](#); [Knott, 2008](#)). The RQ values are the exponent γ_i in firm i 's production function derived by estimating the following equation using rolling 7-year windows of the U.S. firms ([Knott, 2008](#)):

$$Y_{it} = A_i K_{it}^{\alpha} L_{it}^{\beta} R_{it-1}^{\gamma} S_{it-1}^{\delta} D_{it}^{\rho} e_{it} \quad (1)$$

where Y_{it} is output, A_i is a firm fixed effect, K_{it} is capital, L_{it} is labor, R_{it-1} is the lagged R&D, S_{it-1} is the lagged spillovers, and D_{it} is advertising.

Using RQ to measure innovation efficiency presents many advantages. Since RQ is elasticity, it is unitless and directly comparable across firms regardless of industry, while patents, for instance, may vary widely in value ([Cooper et al., 2022](#); [Knott, 2008](#)). In contrast

Table 1
Summary statistics.

Variables	Obs	Mean	Median	Std. dev.	Min	Max
RQ (Research Quotient)	10,073	0.0889	0.0872	0.0477	−0.5073	0.6735
Rdintensity (R&D to revenue)	10,038	1.6630	0.0461	49.37	0	3972.7
R&D (R&D to Asset)	10,038	0.0590	0.0299	0.0859	0	1.906
WCSR (Workforce Score)	9246	0.5602	0.5679	0.2531	0.0197	0.9969
HRS (Human Rights Score)	9246	0.2702	0.1332	0.3062	0	0.9893
ComS (Community Score)	9246	0.6974	0.7267	0.1899	0.0330	0.9965
PRS (Product Responsibility Score)	9246	0.4542	0.4245	0.2709	0	0.9910
SC (social performance score)	9267	0.4671	0.4106	0.3104	0.0205	0.9938
GOV (Governance Score)	9267	0.7274	0.7790	0.1879	0.0156	0.9717
Tobin's Q (firm value)	8382	2.8531	2.270	6.756	0.012	98.854
ROA (Return on assets)	8447	0.0629	0.0548	0.0718	−0.8175	0.7261
Firm Size (Log Total Assets)	9257	9.7220	9.392	1.9322	3.037	18.97
Debt ratio	7097	0.2582	0.3505	0.1936	0	0.9651
Cash (Cash-to-total assets)	8849	0.0885	0.0677	0.0799	0	0.8333
Capex (Capex to Asset)	8345	0.0487	0.0385	0.0421	0	0.3837
DivS (Workforce diversity Score)	9267	0.6093	0.6402	0.2535	0.0717	0.9735
EQS (Employment Quality Score)	9267	0.6010	0.6242	0.2142	0.0439	0.9719
HSS (Health and Safety Score)	9267	0.5385	0.5409	0.2814	0.0737	0.9883
TDS (Training and Develop. Score)	9267	0.5500	0.6036	0.2769	0	0.9605

This Table presents summary statistics for the key variables for the sample firms. The sample includes all firm-year observations for the U.S. firms from 2002 to 2021. Employee-related CSR data and corporate governance ratings are expressed as decimals (between 0 and 1).

Source: Authors own work

with patents or other innovation measures, RQ captures product and process innovation by accounting for revenue maximization and cost reduction (Cooper et al., 2022). RQ innovation efficiency captures both the quantity and the quality of a firm's innovation output and accounts for the R&D expenses incurred to produce it. It accounts for both the quality and quantity of innovation for a given level of R&D investment. However, the number of patents does not account for the amount invested in R&D.

The previous study used patent counts to capture a firm's innovation performance (Chen et al., 2016; Liu et al., 2020). However, not all patents are similar and therefore not comparable. *For example, using patent counts to capture innovation performance implies that a firm that produces 10 patents worth 1 million each (10 million in total) will be considered better in innovation than a company that produces a single patent worth 20 million.* To correct for this weakness, the estimated dollar value of patents is often used (Makpotche, 2025). However, the economic value of patents does not account for the resources firms invest in R&D to produce their innovation output. For example, some companies can produce valuable patents at low cost, while others can obtain the same patents at high cost. On the other hand, using patent counts per R&D expense (or the ratio of the logarithm of 1 plus the number of patents in a given year to the logarithm of 1 plus the firm's R&D investment in the previous year) as a measure of innovation performance also implies that all patents are identical in terms of technological quality and economic value, which is not true. Patent counts per R&D expenses place greater emphasis on the number of patents, neglecting their economic value. Thus, a firm that issues many low-value (and low-importance) patents will be considered more efficient than another firm that issues few high-value patents. *For example, a company that invests 10 million dollars to produce 5 patents worth a total of 20 million dollars will be considered more efficient than a company that invests the same amount (10 million dollars) to produce 2 patents worth a total of 30 million dollars.* Using RQ overcomes all these weaknesses. By considering the resources firms invest in R&D to generate innovation, RQ adequately accounts for both innovation output and input.

Since RQ and patents are not the same indicators, their determinants may also vary. Patents capture solely innovation outputs and can therefore be more sensitive to employee motivation and creativity. RQ considers both innovation outputs and the investments made in R&D to produce them. The determinants of innovation output can differ from those of the input (R&D investment). For example, while employee participation is essential to patent production, employees may be less involved in R&D investment decisions. Long-term investment decisions, such as R&D investments, are often driven by the firm's major strategic orientation, set by management and the board of directors. Decisions on R&D expenses are more likely to be influenced by the company's governance structure than by employee motivation or creativity. Since the determinants of output may differ from those of input, the determinants of RQ may differ from those of both the innovation input and output.

4.2.2. Independent variables: employee-oriented CSR

To measure the firm's employee-oriented CSR, we adopt a similar approach to Chen et al. (2016) and Makpotche (2025). We consider data on the corporate social performance score (from the Refinitiv ESG), which covers the workforce score, the human rights score, the product responsibility score, and the community score.¹ The workforce score captures a firm's ability to ensure job satisfaction, create a healthy and safe workplace, foster diversity and equal opportunities, and provide development opportunities for its employees. The human rights score reflects a firm's effectiveness in observing fundamental human rights conventions. The community score corresponds to the company's dedication to being a responsible citizen, safeguarding public health, and operating ethically. Product responsibility measures a firm's ability to produce high-quality goods and services while prioritizing customer health and safety, maintaining integrity, and protecting data privacy.

Following Chen et al. (2016) and Makpotche (2025), we measure employee-oriented CSR using the workforce score, which comprises four dimensions: workforce diversity and inclusion, training and career development, working conditions and employment quality, and health and safety. We examined the overall workforce score and each of its dimensions.

4.2.3. Moderating variable: corporate governance

The study uses the Refinitiv corporate governance rating as a measure of firm governance, in line with the literature (Flammer, 2021). The corporate governance score from Refinitiv considers issues related to agency problems and CSR concerns, encompassing three key dimensions: CSR strategy, management, and shareholders. CSR Strategy focuses on the company's approach to ESG reporting and transparency. Management accounts for the board structure, including factors such as diversity, independence, and the presence of committees, as well as executive compensation. Serving as an indicator of anti-takeover provisions, the shareholder dimension assesses shareholders' rights and takeover defenses.

4.2.4. Control variables

Following the previous studies on CSR and firms' innovation (e.g., Chen et al., 2016; Li & Wang, 2022; Liu et al., 2020), this paper controls for a series of firm characteristics that may affect RQ. We compute these variables following previous studies. Firm size is the logarithm of the book value of the total assets. The debt ratio is the book value of total debt to the book value of total assets. Return on assets (ROA) is the ratio of the EBIT (earnings before interest and taxes) to the book value of total assets. Tobin's Q (market-to-book ratio) is the market value of total equity to the book value of total assets. The cash-to-asset ratio is the firm's total cash divided by total assets. We also control for capital expenditures to total assets (Capex_to_Asset). We use year and firm dummies to control for year- and firm-fixed effects.

¹ For the definition of the variables, see LSEG Environmental, social and governance scores guide.

4.3. Model specification

To capture the impact of employee-oriented CSR on innovation efficiency, we adopt a similar approach to the previous studies examining the determinants of corporate innovation (Chen et al., 2016; Liu et al., 2020; Sheng et al., 2022; Yu et al., 2024). We estimate the following panel model with fixed effects as our reference model:

$$RQ_{it} = \alpha + \beta_{WCSR} WCSR_{it} + \beta_{gov} GOV_{it} + \beta_{int} WCSR_{it} \cdot GOV_{it} + \gamma_c X_{it} + \rho_1 FirmEffects_{it} + \rho_2 YearEffects_t + \varepsilon_{it} \quad (2)$$

where the dependent variable RQ_{it} is innovation efficiency measured by the RQ of firm i in year t . $WCSR_{it}$ is the employee-oriented CSR measured by the Refinitiv workforce score (or a vector of the dimensions of the workforce score) of the firm i in a given year t , and GOV_{it} is the corporate governance score of the firm i in a given year t . X_{it} is a vector of firm-level control variables in a given year t that may affect innovation efficiency. $YearEffects$ and $FirmEffects$ capture the time and firm fixed effects, respectively. β_{WCSR} , β_{gov} , and β_{int} are the coefficients of interest. We expect a positive impact of workforce score and corporate governance on RQ.

The dependent variable (RQ) collected from the WRDS website is the original data developed by Knott (2008). RQ values are the exponent γ_i in firm i 's production function derived by estimating equation (1) using rolling 7-year windows (Knott, 2008). For instance, RQ of the year t (RQ_{it}) is estimated using data of the years t , $t-1$, $t-2$, $t-3$, $t-4$, $t-5$, and $t-6$; RQ of the year $t+1$ (RQ_{it+1}) is estimated using data of the years $t+1$, t , $t-1$, $t-2$, $t-3$, $t-4$, and $t-5$; and so on. Given that RQ values are computed for each firm-year using rolling 7-year windows, the independent variables for a given year t (X_{it}) are associated with RQ_{it} , which account for data from past years. As the dependent variable (RQ_{it}) cannot be prior to the independent variables, a transformation is necessary. To better align the variables, the independent variables (for each firm i in a given year t) used to estimate our model are the moving averages, also computed using rolling windows of the previous 7 years. For instance, the independent variable of the year t (X_{it}) is computed using data of the years t , $t-1$, $t-2$, $t-3$, $t-4$, $t-5$, and $t-6$; the independent variable of the year $t+1$ (X_{it+1}) is the average of X_i during the years $t+1$, t , $t-1$, $t-2$, $t-3$, $t-4$,

Table 2
The impact of employee-oriented CSR on innovation efficiency.

Dependent variable: Research Quotient (RQ)						
Parameter	Fixed effects	Fixed effects	Fixed effects	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
<i>WCSR</i> (Workforce Score)	−0.0392*** (−3.23)	−0.1014*** (−3.50)	−0.0836*** (−5.47)	−0.0145*** (−6.58)	−0.0371*** (−3.11)	−0.0232** (−1.98)
<i>GOV</i> (Governance)		−0.0442** (−2.03)	−0.0410** (−2.01)		0.0102 (1.05)	0.0013 (0.14)
<i>WCSR*GOV</i>		0.1379*** (2.76)	0.1465*** (4.97)		0.0723*** (4.81)	0.0294** (2.02)
<i>HRS</i>			−0.0345*** (−9.36)			−0.0211*** (−9.63)
<i>ComS</i>			0.0013 (0.21)			−0.0038 (−0.90)
<i>PRS</i>			−0.0124*** (−2.93)			−0.0176*** (−7.16)
<i>R&D</i>	−0.0337 (−0.80)	−0.0256 (−0.63)	−0.0432* (−1.82)	0.0516*** (4.59)	0.0536*** (4.76)	0.0557*** (3.84)
<i>Capex</i>	−0.1035 (−0.90)	−0.1000 (−0.85)	−0.1492** (−2.55)	−0.1518*** (−7.56)	−0.0727*** (−3.52)	−0.0731*** (−3.67)
<i>Tobin's Q*100</i>	−0.003 (−0.12)	−0.004 (−0.15)	0.001 (0.64)	−0.0192 (−4.13)	−0.02*** (−4.32)	−0.02*** (−5.35)
<i>Firm Size</i>	−0.0190*** (−3.94)	−0.0191*** (−3.83)	−0.0105*** (−5.57)	0.0012*** (3.60)	0.0024*** (5.49)	0.0031*** (7.20)
<i>ROA</i>	0.0861* (1.66)	0.0817 (1.52)	0.0710*** (4.24)	0.0825*** (12.68)	0.1013*** (9.30)	0.1056*** (10.35)
<i>Debt Ratio*100</i>	−0.046 (−0.41)	−0.04 (−0.36)	−0.05 (−0.67)	0.0326 (1.00)	−0.01 (−0.55)	0.03 (1.08)
<i>Cash</i>	−0.0267 (−1.02)	−0.0309 (−1.16)	−0.0161 (−0.95)	0.0017 (0.26)	0.0054 (0.65)	0.0021 (0.26)
Firm fixed effects	Yes	Yes	Yes			
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects				Yes	Yes	Yes
R ²	0.1498	0.1598	0.2069	0.4342	0.4362	0.4446
Firms	1420	1420	1420	1420	1420	1420
Nb. Obs	4573	4573	4573	4573	4573	4573

This Table presents the results of the relationship between employee-oriented CSR and RQ using a panel model with fixed effects. The dependent variable is RQ. The coefficients appear first, and the z statistics (or t statistics) are in parentheses. The relevant explanatory variables are the "Workforce Score", "Corporate Governance Score", and the interaction between Corporate Governance and Workforce Score ($WCSR*GOV$). All regressions include a constant, firm fixed effects, and year fixed effects. The symbols *, **, and *** indicate, respectively, that the estimate is significant at the 10%, 5%, and 1% levels. Adjusted R² are in decimals (not in percentage).

Source: Authors own work

and $t-5$; and so on. This approach allows for a better matching of explanatory variables and dependent variables, and thus, prevents the dependent variable from being prior to the explanatory variables. Using the primary independent variables collected directly for year t without this transformation or their lag-1 values to estimate such a model seems inappropriate and may result in endogeneity bias. Given that the study is conducted across several firms rather than just one, and covers a relatively long period (20 years of observations, from 2002 to 2021), and that CSR practices within firms can take many years to evolve significantly, this transformation may allow us to obtain robust results. The transformation also enables the mitigation of the endogeneity problems commonly encountered when examining the impact of ESG factors on firm outcome variables.

4.4. Summary statistics

Table 1 presents the summary statistics for the sample firms. The mean of the RQ is 0.0889, with a median of 0.0872. The RQ ranges from -0.5073 to 0.6735 . The average R&D intensity (*Rdintensity*) is 1.6630, with a median of 0.0461. The average of R&D to total assets (*R&D*) is 0.0590, with a median of 0.0299, a minimum value of 0, and a maximum of 1.906. The workforce score (*WCSR*) has a mean of 0.5602 and a median of 0.5679, with scores from 0.0197 to 0.9969. The average corporate governance rating (*GOV*) is 0.7274, with a median of 0.7790, a minimum of 0.0156, and a maximum of 0.9717. On average, the firm value (*Tobin's Q*) is 2.8531, with a median of 2.270, a minimum of 0.012, and a maximum of 98.854. The correlation matrix is in the appendix (Table A1).

5. Empirical results

Using several specifications, we examine whether the WCSR influences RQ. Finally, we assess the robustness of the results using several approaches.

5.1. Impact of employee-related CSR on RQ, and the role of corporate governance

Table 2 reports the results from the baseline regressions (Columns 1, 2, and 3). We estimate a panel model with firm and year-fixed effects to test our hypotheses. For comparison, we also present the OLS results (Columns 4, 5, and 6), although they are not efficient estimates for panel data. The regressions in Columns 3 and 6 control for other dimensions of social performance, specifically, the human rights score (*HRS*), the community score (*ComS*), and the product responsibility score (*PRS*). In general, the findings suggest that, without stronger governance that may reduce agency costs, higher WCSR results in lower RQ. On the other hand, without a good WCSR that motivates inventors, stronger governance reduces RQ. Improving innovation efficiency requires stronger governance to support better WCSR. The presence of one without the other would result in reduced RQ. Thus, the results contradict hypothesis *H1* but support hypothesis *H2*, which posits that employee-oriented CSR positively affects RQ only in firms with stronger governance.

5.1.1. Direct impact of employee-related CSR on RQ

To test the relationship between employee-oriented CSR and innovation efficiency, we focus on the results in Columns 1, 2, and 3 (Table 2). Contrary to our expectations, all of these specifications indicate that the direct effect of WCSR on RQ is significantly negative. In Column 1, WCSR is negatively and significantly associated with RQ. The coefficient is -0.0392 and significant at a 1% level (t-statistic is -3.23). In Column 2, the coefficient is (-0.1014) and significant at a 1% level (t-statistic is -3.50), and in Column 3, the coefficient is (-0.0836) , also significant at a 1% level (t-statistic is -5.47). An increase in the WCSR leads to a decrease in innovation efficiency, contradicting hypothesis *H1*. However, these results align with Yuan et al. (2023), who previously documented that CSR negatively affects innovation efficiency measured by patent intensity (patent counts to R&D expenses). Since Cooper et al. (2022) find that the correlation between RQ and patent intensity is close to zero, we therefore explore the role of corporate governance and heterogeneity.

5.1.2. The role of corporate governance

To examine the role of firm governance (*GOV*), we first test hypothesis *H3* and find a negative direct impact of corporate governance on RQ. The coefficient associated with *GOV* is negative (-0.0442) and significant at a 5% level (Column 2). The coefficient in Column 3 is -0.0410 , which is also significant at the 5% level. Thus, an increase in the *GOV* score leads to a decrease in RQ, validating hypothesis *H3*, which predicts a direct negative effect of firm governance. These findings align with Ongsakul et al. (2022), who show that the takeover market as an external governance mechanism negatively affects RQ. They also support the managerial myopia view that higher pressure from stronger governance may incite managers to focus on short-term profits, thereby reducing innovation (Tong & Zhang, 2024).

Furthermore, we examine the interaction between WCSR and *GOV* on RQ by incorporating "WCSR*GOV" (workforce score times corporate governance rating) into the models. The results confirm our expectations as the interaction term has a significantly positive impact on RQ. In Column 2, the coefficient is 0.1379 and is significant at the 1% level (t statistic = 2.76). In Column 3, the coefficient is 0.1465 and is significant at the 1% level (t statistic = 4.97). That is, in firms with stronger governance, an increase in the WCSR leads to an increase in RQ. Alternatively, *GOV* positively impacts RQ if WCSR is high. Stronger governance combined with better employee-oriented CSR policies results in enhanced innovation efficiency, as predicted by *H2*. This fascinating result implies that a policy focused solely on strong governance or better employee-oriented CSR can lead to inefficiency. On the other hand, combining the two produces a positive effect. As for firm governance, employee-oriented CSR is necessary but not sufficient to enhance innovation efficiency, suggesting that CSR may increase agency costs if not accompanied by effective governance mechanisms. Our results align

with Makpotche's (2025) recent findings.

5.1.3. Impact of other dimensions of firm social performance

Regarding other social dimensions, the human rights score (*HRS*) is negatively and significantly associated with *RQ* (coefficient is -0.0345 at the 1% level in Column 3). The product responsibility score (*PRS*) is also negative and significant at a 1% level (Column 3). On the other hand, the community score (*ComS*) is positive (0.0013) but not significant (t-statistic is 0.21, Column 3). Thus, except for the community score, all specifications indicate that the dimensions of the social score negatively affect *RQ*.

In summary, the results imply that employee-oriented CSR is beneficial to innovation efficiency only when firm governance is strong. Alternatively, corporate governance benefits innovation efficiency if employees are well treated using CSR strategies. CSR toward employees must therefore go hand in hand with good governance.

5.2. Robustness checks

We check if the results are robust to a variety of specifications. First, we estimated the model using the lagged values of the explanatory variables. Second, we estimate the dynamic version of the fixed effect model. Finally, we estimate the generalized method of moments (GMM) and use propensity score matching. Overall, our results are robust.

5.2.1. Lagged explanatory variables

Given the argument that ESG variables can affect firm output with a lag (Bazel-Shoham et al., 2024), we estimate the baseline

Table 3

Robustness tests: Fixed effects and dynamic models with lagged explanatory variables.

Dependent variables: Research Quotient (RQ)				
Parameter	Fixed effects	Dynamic FE	Fixed effects	Dynamic FE
	(1)	(2)	(3)	(4)
RQ_{t-1}		0.4947*** (10.98)		0.5229 (10.49)
$WCSR_{t-1}$	-0.1175** (-2.34)	-0.0928*** (-2.75)	-0.1277*** (-4.03)	-0.1001*** (-2.77)
GOV_{t-1}	-0.0569** (-2.02)	-0.0591*** (-2.74)	-0.0583*** (-2.57)	-0.0621*** (-2.84)
$WCSR_{t-1} * GOV_{t-1}$	0.1371** (2.28)	0.1152*** (2.83)	0.1182*** (3.07)	0.1052** (2.45)
HRS_{t-1}	-0.0332*** (-4.46)	-0.0242*** (-5.25)		
$ComS_{t-1}$	-0.0048 (-0.45)	-0.0074 (-0.94)		
PRS_{t-1}	-0.0138* (-1.65)	-0.0038 (-0.70)		
$R\&D_{t-1}$	0.0182 (0.42)	0.0394 (1.28)	0.0365 (1.30)	0.0513 (1.67)
$Capex_{t-1}$	-0.2535** (-2.11)	-0.1565* (-1.82)	-0.2191*** (-3.18)	-0.1260 (-1.48)
Tobin's Q_{t-1}	0.0002 (0.39)	0.00007 (0.23)	-0.00007 (-0.25)	-0.0001 (-0.27)
$Firm\ Size_{t-1}$	-0.0131** (-2.29)	-0.0072* (-1.84)	-0.0223*** (-10.89)	-0.0128*** (-3.47)
ROA_{t-1}	0.0805 (1.51)	0.0419 (1.24)	0.0890*** (4.49)	0.0474 (1.38)
$Debt\ Ratio_{t-1}$	0.0001 (0.08)	0.0005 (0.40)	0.0005 (0.41)	0.001 (0.64)
$Cash_{t-1}$	-0.0191 (-0.63)	-0.0013 (-0.07)	-0.0412** (-2.08)	-0.0147 (-0.71)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R^2	0.2044	0.3746	0.1567	0.3542
Firms	1420	1420	1420	1420
Nb. Obs	4098	4098	4098	4098

This Table presents the results of the relationship between employee-oriented CSR and *RQ*, using the lagged values of the explanatory variables. We estimate panel models with fixed effects and dynamic fixed effects. The dependent variable is *RQ*. The coefficients appear first, and the z statistics (or t statistics) are in parentheses. The relevant explanatory variables are the "WCSR", "GOV", and the interaction between Corporate Governance and Workforce Score ($WCSR * GOV$). All regressions include a constant, firm fixed effects, and year fixed effects. The sample includes all firm-year observations from 2002 to 2021. The symbols *, **, and *** indicate, respectively, that the estimate is significant at the 10%, 5%, and 1% levels. Adjusted R^2 are in decimals.

Source: Authors own work

model using one-year lagged explanatory variables rather than contemporaneous ones. Using lagged variables mitigates endogeneity concerns, especially the simultaneity bias, because some internal firm decisions that affect CSR may also affect corporate outcomes. For instance, a positive shock to R&D activity may cause executives to adopt an employee-friendly strategy that better motivates their engineers. The results reported in Table 3 (Columns 1 and 3) confirm the previous findings. As in the baseline model, only the lagged community score has no significant impact on RQ. The lagged workforce score ($WCSR_{t-1}$), the lagged corporate governance score (GOV_{t-1}), the lagged human rights score (HRS_{t-1}), and the lagged product responsibility score (PRS_{t-1}) have a significantly negative impact on RQ. Finally, we also find a positive effect of the interaction term ($WCSR_{t-1} * GOV_{t-1}$) on the RQ, confirming the baseline results. Thus, our results are robust when using the lagged explanatory variables.

5.2.2. Estimating the dynamic version of the model

The panel model with fixed effects controls for firm-level unobservable effects but does not account for the autoregressive nature of RQ. Regarding innovation, current performance can be closely linked to past performance, as seen with large companies operating in the most innovative sectors (e.g., Microsoft, Google, Apple, and Samsung). A firm's ability to innovate may undoubtedly depend on human capital, technological capital, and the quality of its past innovations. Companies that have innovated the most in the past are more likely to have the best inventors who will positively influence their future innovations. To examine the autoregressive nature of

Table 4

Robustness tests: Dynamic fixed effects, IV models, and system-GMM estimations.

Dependent variables: Research Quotient (RQ)						
Parameter	Dynamic models				2SLS IV approach	
	Dynamic FE	System-GMM	Dynamic FE	System-GMM	First Stage	2nd Stage
	(1)	(2)	(3)	(4)	(5)	(6)
RQ_{t-1}	0.4840*** (17.06)	0.3009*** (10.01)	0.5102*** (16.36)	0.3374*** (10.60)		
$WF_Turnover$					0.0340*** (36.78)	
$WCSR$	-0.1154*** (-3.86)	-0.0867*** (-3.36)	-0.1275*** (-3.91)	-0.0490** (-1.97)		-0.020*** (-4.66)
GOV	-0.0484*** (-2.62)	-0.0310* (-1.67)	-0.0517*** (-2.65)	-0.0301* (-1.87)		
$WCSR*GOV$	0.1350*** (3.77)	0.09384*** (2.90)	0.1290*** (3.37)	0.0899*** (2.71)		
HRS	-0.0229*** (-4.95)	-0.0156*** (-5.70)				
$ComS$	-0.0027 (-0.42)	0.0044 (0.62)				
PRS	-0.0079* (-1.67)	-0.0061* (-1.83)				
$R\&D$	-0.0289 (-0.91)	0.0780*** (3.77)	-0.0164 (-0.50)	0.0759*** (3.62)	0.553*** (6.22)	0.080*** (5.48)
$Capex$	-0.0827 (-1.08)	-0.0518* (-1.84)	-0.0460 (-0.63)	-0.0408 (-1.36)	0.723*** (4.58)	-0.104*** (-4.20)
$Tobin's\ Q$	0.0002 (1.22)	-0.0004* (-1.66)	-0.0001 (0.54)	-0.0001 (-0.52)	0.004*** (4.13)	-0.000 (-0.43)
$Firm\ Size$	-0.00805** (-2.20)	0.0035*** (4.38)	-0.0136*** (-3.94)	0.0028*** (3.53)	0.058*** (17.09)	0.004*** (5.28)
ROA	0.0193 (0.70)	0.0697*** (5.08)	0.0238 (0.88)	0.0513*** (3.49)	0.415*** (6.66)	0.088*** (8.63)
$Debt\ Ratio$	-0.0004 (-0.65)	0.0021** (2.02)	-0.0003 (-0.51)	0.0011 (0.99)	-0.018*** (-4.16)	-0.001 (-0.91)
$Cash$	-0.0158 (-0.86)	0.0192* (1.70)	-0.0274 (-1.49)	0.0203* (1.78)	0.081 (1.46)	0.014 (1.53)
Arellano-Bond test for AR1		-1.90*		-1.5		
Arellano-Bond test for AR2		1.11		1.31		
Hansen overidentification test		12.14		10.06		
F statistic					347.17	
R^2	0.3859		0.3651		0.6372	0.1636
Firms	1420	1420	1420	1420	1420	1420
Nb. Obs	4467	2970	4467	2970	4573	4573

This Table presents the estimates from the system-GMM in Columns 2 and 4, the estimates from the dynamic fixed effects in Columns 1 and 3, and the results from IV regressions in Columns 5 and 6. The coefficients appear first, and the z statistics (or t statistics) are in parentheses. The relevant explanatory variables are the "WCSR", "GOV," and the interaction between Corporate Governance and Workforce Score ($WCSR*GOV$). RQ_{t-1} is the lag 1 of RQ. We use the lags 1-2 of RQ as instruments for the dependent variable, and the lags 1-4 of the explanatory variables as instruments for the explanatory variables. We report the Arellano-Bond serial correlation test statistics and the Hansen overidentification statistic tests. The symbols *, **, and *** indicate, respectively, that the estimate is significant at the 10%, 5%, and 1% levels. Adjusted R^2 are in decimals.

Source: Authors own work

RQ, we estimate the dynamic version of the model.

The results reported in Table 4 (Columns 1 and 3) confirm the findings of the baseline estimations. The interaction between employee-oriented CSR and corporate governance ($WCSR*GOV$) remains positive and significant, confirming the baseline results. We also find a positive impact of the lagged RQ (RQ_{t-1}) on innovation efficiency (Columns 1 and 3). That is, the efficiency of past innovations significantly affects the present. In Column 1, the community score remains nonsignificant, while other social dimensions ($WCSR$, HRS , and PRS) and corporate governance are negative and significant. Finally, we estimate the dynamic panel model using lagged values of all explanatory variables and obtain similar results (Table 3, Columns 2 and 4). Thus, the findings from the basic specification are robust.

5.2.3. Instrumental variable approach (IV approach)

We employ the instrumental variable (IV) method to circumvent endogeneity. The biggest challenge is finding a valid CSR instrument for employee-oriented CSR. A valid instrumental variable must meet three key criteria to estimate adequately a causal effect when endogeneity is present: first, "relevance"—the instrument must be strongly correlated to the endogenous explanatory variable; second, the "exclusion restriction"—the instrument should influence the outcome "only through" its connection with the endogenous instrumented variable; and third, "exogeneity"—the instrument must be uncorrelated with the error term (Atanasov & Black, 2016). To find an appropriate instrument for employee-oriented CSR, we follow a method commonly used in empirical studies (Yu et al., 2024; Makpotche, 2025). We employ a similar instrument to Makpotche (2025). Specifically, our instrument for employee-oriented CSR ($WCSR$) is the average employee turnover rate for each industry, calculated for a given firm in a specific year by excluding the firm's own turnover rate. Excluding the firm's own data enables the development of an instrument external to the company, thereby making it exogenous. Employee turnover indicates how many workers leave an industry each year, and is from the Refinitiv ESG database. It includes individuals who choose to leave voluntarily as well as those who are terminated. The scores rank from 0 to 100. According to Makpotche (2025), a high score suggests that the industry struggles to retain employees, possibly due to poor working conditions. Accordingly, employee turnover may be strongly and negatively related to $WCSR$. Negative associations are expected because higher employee turnover reflects a lower $WCSR$ score. In line with Makpotche (2025), we align the instrument with $WCSR$ by calculating its opposite as 100 minus the 'employee turnover' value, which should have a positive correlation with $WCSR$.

We present the 2SLS IV regression results in Table 4 (columns 5 and 6). As shown, the results from the first Stage (Column 5) indicate that industry-level employee turnover ($Turnover$) has a significant and positive correlation with $WCSR$ at the 1% level, supported by a Cragg–Donald F-statistic of 347.17, which suggests no weak instrument concerns. In the second Stage, we observe a negative and statistically significant impact of $WCSR$ on RQ innovation efficiency (Column 6). The estimated coefficient is -0.020 , significant at the 1% level, which supports our baseline findings.

5.2.4. Dynamic system-GMM

Endogeneity bias can arise from simultaneity, reverse causality, measurement errors, and omitted variables. Although using lagged variables and the IV method helps reduce simultaneity bias, serial correlations may persist if shocks to RQ persist over several years. To circumvent the endogeneity problem so that our results reveal the causal effect rather than a correlation, we adopted the GMM method. More specifically, we opted for System-GMM as the literature considers it the most efficient among the three GMM approaches (Blundell et al., 1992; O'Connor & Rafferty, 2012). This method relies on "internal" instruments using lagged variables and enables the simultaneous estimation of dynamic panel models in both difference and level forms (Arellano & Bond, 1991; Roodman, 2009).

To estimate the system-GMM, Arellano and Bond (1991) suggest employing lagged variables as instruments in the regression, because these lagged regressors are orthogonal to the error term. Building on this recommendation and prior research (O'Connor & Rafferty, 2012; Roodman, 2009; Blundell et al., 1992), we employ lags 1 to 4 as instruments for the explanatory variables, and lags 1 to 2 for the dependent variable. We assess the instruments' validity with Hansen's overidentification test and the Arellano-Bond tests for serial correlations. The regression results (Table 4, Columns 2 and 4) confirm the baseline findings. As reported, $WCSR$ remains negative and significant. GOV is significant only at the 10% level, and the interaction term ($WCSR*GOV$) is positive and significant. In

Table 5
Post-matching diagnostics test results.

Variables	Mean		%bias	t-test		
	Treated	Control		t	p > t	V(T)/V(C)
<i>HRS</i>	0.4168	0.39733	5.9	1.06	0.29	1.03
<i>ComS</i>	0.80606	0.80464	0.7	0.16	0.872	0.96
<i>PRS</i>	0.55532	0.53308	7.5	1.38	0.168	0.86 ^a
<i>GOV</i>	0.83908	0.83089	5.1	1.3	0.193	1.14
<i>R&D</i>	0.0546	0.05628	-2.2	-0.58	0.561	0.77 ^a
<i>Capex</i>	0.0382	0.03814	0.2	0.04	0.965	0.75 ^a
<i>Tobin's Q</i>	6.123	5.9506	0.9	0.23	0.816	5.47 ^a
<i>Firm Size</i>	9.4833	9.4972	-0.9	-0.19	0.851	0.9
<i>ROA</i>	0.13134	0.13129	0	0.01	0.992	0.53 ^a
<i>Debt Ratio</i>	1.5015	1.4867	0.1	0.02	0.982	1.05
<i>Cash</i>	0.1241	0.1275	-3	-0.68	0.497	0.81 ^a

^a if variance ratio outside [0.87; 1.15].

addition, the Arellano-Bond tests for serial correlation (AR1 and AR2 tests) and the Hansen overidentification tests are not significant (only the AR1 test is significant at the 10% level), indicating that the instruments are valid. Thus, there is consistent evidence that only the interaction between WCSR and firm governance has a significantly positive impact on RQ.

5.2.5. Propensity score matching (PSM)

To ensure our results are not affected by endogeneity bias and to estimate the causal effect of WCSR on RQ innovation efficiency, we also adopt the PSM approach, selecting control firms using the nearest-neighbor method. Following a similar approach to Makpotche (2025), we capture employee-oriented CSR by "Employment Awards". Firms that receive an employment quality award are placed in the treatment group, while those without an award belong to the control group. Using this method, we match 365 treated firms with 365 control firms operating in the same industry based on their human rights score, community score, product responsibility score, corporate governance rating, firm size, Tobin's Q, ROA, Debt Ratio, Capex-to-asset ratio, and Cash-to-total assets ratio. The diagnostic tests (Table 5) show no significant difference in the means between the treated and control firms. The estimated average treatment effect in the population (ATE) and the average treatment effect on the treated (ATET) are both significantly negative (Table 6), reinforcing our initial findings.

5.2.6. Alternative measures of innovation efficiency

We employ two alternative measures of innovation efficiency to examine whether our results depend on the proxy used. First, we adopt the patent intensity, a measure of innovation efficiency, proposed by Hirshleifer et al. (2013), and used in earlier studies (see Yuan et al. (2023) and Basse-Mama (2018)). We build upon Hirshleifer et al. (2013) to measure patent intensity (PI) as the ratio of firm *i*'s patents granted in year *t* ($Patents_{i,t}$) scaled by its 5-year cumulative R&D expenses assuming an annual depreciation rate of 20% in the year ending in year *t*-2, where $R\&D_{i,t-2}$ denotes firm *i*'s R&D expenses in year *t*-2, and so on.

$$PI_{i,t} = \ln \left(1 + \frac{Patents_{i,t}}{R\&D_{i,t-2} + 0.8 * R\&D_{i,t-3} + 0.6 * R\&D_{i,t-4} + 0.4 * R\&D_{i,t-5} + 0.2 * R\&D_{i,t-6}} \right) \quad (2)$$

We employ a similar approach to compute a second measure of innovation efficiency (PV), using the ratio of the estimated dollar value of firm *i*'s all patents granted in year *t* (PatentValue) to the 5-year cumulative R&D expenses. The estimated market value of firms' patents better reflects the technological and economic quality of innovation output.

$$PV_{i,t} = \ln \left(1 + \frac{PatentValue_{i,t}}{R\&D_{i,t-2} + 0.8 * R\&D_{i,t-3} + 0.6 * R\&D_{i,t-4} + 0.4 * R\&D_{i,t-5} + 0.2 * R\&D_{i,t-6}} \right) \quad (4)$$

We compute these indicators using the Kogan et al. (2017) data (KPSS Technological Innovation Data). The results in Table 7 (Columns 1-3 and 4-6) confirm the baseline findings. The WCSR and corporate governance remain negatively and significantly related to the two alternative measures of innovation efficiency (PI and PV). In addition, the interaction terms are positive and significant. Thus, there is consistent evidence that only the interaction between employee-oriented CSR and corporate governance has a positive impact on RQ. There is also consistent evidence that the impact of employee-oriented CSR on innovation efficiency does not depend on the specific proxy used for innovation efficiency.

6. Further analysis

We previously showed that WCSR positively affects RQ only in firms with effective governance. This section examines whether the results are driven by heterogeneity across subsamples. We also determine which dimension of WCSR matters when examining innovation efficiency. Finally, we discuss the relationship between WCSR and R&D intensity, as well as the impact of RQ on firm value.

6.1. Heterogeneity analysis

Since our baseline results contradict the hypothesis that WCSR positively affects RQ, additional tests are needed to determine whether it holds for specific samples. In that regard, the study examined heterogeneity effects by constructing subsamples based on the median values of specific factors. The heterogeneity analysis aims to evaluate whether variability in characteristics, endowments, or behaviors among firms influences the results. Following a common approach in the literature, we divided the total sample into several

Table 6

Robustness tests: Matching and treatment effects.

	Coefficient	Std. err.	t	P> t	[95% conf. interval]
Ln_Patent					
ATE x100	-0.346**	0.1770	-1.96	0.048	[-0.527 -0.126]
Empl_AwardDum (1 vs 0)					
ATET x100	-0.6319***	0.1455	-4.34	0.000	[-0.917 -0.346]
Empl_AwardDum (1 vs 0)					

ATE: Average treatment effect in the population - ATET: Average treatment effect on the treated.

Source: Authors own work

Table 7

Robustness tests: Alternative measure of innovation efficiency.

Dependent variable: Patents to R&D, and Patents market value to R&D						
Parameter	PI(patent intensity)			PV		
	Fixed effects	Fixed effects	Fixed effects	Fixed effects	Fixed effects	Fixed effects
	(1)	(2)	(3)	(4)	(5)	(6)
WCSR	-1.274* (-1.71)	-12.57*** (-2.92)	-15.95*** (-4.02)	-1.9512** (-2.18)	-13.57*** (-3.22)	-16.81*** (-4.00)
GOV		-6.077** (-2.16)	-8.954*** (-3.48)		-6.393** (-2.18)	-8.921*** (-3.12)
WCSR*GOV		13.69*** (2.69)	18.35*** (3.84)		15.23*** (2.95)	19.06*** (3.74)
HRS			-3.33*** (-7.11)			-2.619*** (-5.43)
ComS			1.511** (2.34)			1.674** (2.24)
PRS			0.7873* (1.86)			1.033** (2.22)
Capet	0.4213 (0.06)	0.9489 (0.13)	-2.243 (-0.31)	-6.503 (-0.86)	-5.824 (-0.75)	-8.189 (-1.01)
Tobin's Q	-0.0637** (-2.15)	-0.0643** (-2.23)	-0.0567** (-2.34)	-0.0530* (-1.77)	-0.0539* (-1.85)	-0.0481* (-1.93)
Firm Size	-2.628*** (-13.03)	-2.595*** (-12.23)	-2.014*** (-9.11)	-2.288*** (-11.57)	-2.268*** (-10.93)	-1.894*** (-8.59)
ROA	2.016 (0.81)	1.708 (0.75)	0.3791 (0.18)	1.893 (0.77)	1.504 (0.68)	0.1908 (0.09)
Debt Ratio	0.2354** (1.96)	0.2385** (2.06)	0.2214** (2.16)	0.2137* (1.77)	0.2172* (1.88)	0.1966* (1.90)
Cash	-0.0979 (-0.05)	-0.4429 (-0.24)	-0.1182 (-0.07)	1.374 (0.75)	0.8943 (0.48)	0.7170 (0.39)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.3233	0.3355	0.4032	0.2428	0.2593	0.3040
Nb. Obs	1366	1366	1366	1366	1366	1366

This Table presents the results of the relationship between employee-oriented CSR and innovation efficiency using a panel model with fixed effects. The dependent variables are patent intensity (PI), and the estimated dollar value of patents scaled by R&D expenses (EI). The coefficients appear first, and the t-statistics are in parentheses. All regressions include a constant, firm fixed effects, and year fixed effects. The sample includes all firm-year observations from 2002 to 2021. The symbols *, **, and *** indicate, respectively, that the estimate is significant at the 10%, 5%, and 1% levels. Adjusted R² are in decimals (not in percentage).

Source: Authors own work

subsamples and conducted the analysis for each subsample (Hao & He, 2022; Yu et al., 2024).

Given the negative association between WCSR and RQ, and the positive moderating role of stronger corporate governance, the question is whether firms must reduce their CSR toward employees to enhance their innovation efficiency when operating in a poor governance environment. Agency theory suggests that excessive CSR spending beyond necessary levels creates agency costs that diminish efficiency (Islam & Rahman, 2023; Krüger, 2015; Masulis & Reza, 2015). Conversely, insufficient investment in CSR can result in low employee motivation, which in turn may decrease productivity and creativity (Bai, 2022; Suto & Takehara, 2022). Specifically, poor investment in CSR toward employees to boost employee productivity and creativity may harm RQ (Chen et al., 2016; Liu et al., 2020; Paruzel et al., 2023). In that regard, beyond a certain level, CSR spending might become ineffective, while below another point, it may not motivate employees sufficiently to be creative. To explore this possibility, we split the initial sample into two subgroups based on the median value of WCSR: high-WCSR (above the median) and low-WCSR (below the median). Then, we examine whether the effect of WCSR on RQ differs between the two groups.

First, in contrast to the baseline results, we observed in the low-WCSR group that increasing WCSR is associated with higher RQ, regardless of corporate governance score (Table 8, Column (2)). The WCSR has a positive direct effect on RQ in this subsample. This suggests that when WCSR is initially too low, it reduces employee motivation and creativity, resulting in lower RQ. Hence, when the WCSR level is low, raising it does not increase agency costs. Instead, it enhances employee motivation and fosters greater creativity because employees' initial working conditions were less favorable. Furthermore, we find that corporate governance is also positive for this subgroup, but significant only at the 10% level. In addition, the interaction term is positive and significant, indicating that the impact of WCSR on RQ in this subsample is more pronounced among firms with better corporate governance.

The results (Table 8) in Column (1) also show that the impact of WCSR on RQ in the high-WCSR group is similar to the baseline results. The only difference is the complete moderation of corporate governance (GOV is nonsignificant while it's negative and significant in the baseline model). The WCSR has a negative direct effect on RQ in the high-WCSR subsample. The finding indicates that when the level of WCSR reaches a specific point, further increases in WCSR result in a decrease in RQ, in the absence of effective

Table 8
Heterogeneity analysis.

Dependent variables: RQ								
Parameter	WorkforceScore		Firm Size		R&D intensity		Tobin' Q	
	High	Low	Big	Small	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WCSR	−0.1375*** (−3.37)	0.2834*** (2.78)	−0.142*** (−3.12)	0.0451 (0.67)	−0.0504 (−1.00)	−0.184*** (−3.37)	−0.120*** (−2.80)	−0.129*** (−2.85)
HRS	−0.0272*** (−3.31)	−0.0352*** (−2.85)	−0.036*** (−3.63)	−0.036*** (−3.90)	−0.029** (−2.39)	−0.037*** (−4.60)	−0.028*** (−3.87)	−0.058*** (−3.36)
ComS	−0.0118 (−1.05)	0.0139 (0.89)	−0.0207* (−1.72)	0.0197 (1.33)	0.0055 (0.41)	−0.0106 (−0.89)	0.0006 (0.07)	−0.0156 (−0.54)
PRS	−0.0070 (−0.77)	−0.0366*** (−2.74)	−0.0088 (−0.85)	−0.0201** (−2.04)	−0.0097 (−0.77)	−0.0141 (−1.45)	−0.0071 (−0.84)	−0.0255 (−1.08)
GOV	−0.0234 (−0.77)	0.0655* (1.68)	−0.0252 (−0.81)	−0.0197 (−0.58)	0.0506 (1.50)	−0.102*** (−2.99)	−0.0384* (−1.81)	−0.0450* (−1.78)
WCSR*GOV	0.1399*** (2.80)	0.3445** (2.53)	0.1566*** (2.94)	−0.0584 (−0.76)	0.0324 (0.53)	0.2215*** (3.55)	0.1207** (2.36)	0.1828** (2.37)
Capex	−0.1316 (−0.93)	−0.4850*** (−2.78)	−0.1308 (−0.92)	−0.2728 (−1.52)	−0.2291 (−1.23)	0.0369 (0.25)	−0.2439 (−1.28)	0.0841 (0.53)
Tobin's Q	0.0001 (0.50)	−0.0004 (−0.36)	0.0002 (0.72)	−0.0004 (−0.62)	0.0000 (0.00)	0.0002 (0.67)	0.0002 (0.77)	0.0010 (0.30)
Firm Size	−0.0175*** (−2.77)	−0.0052 (−0.57)	−0.0137* (−1.91)	−0.0060 (−0.85)	−0.0113 (−1.31)	−0.0098 (−1.42)	−0.016*** (−3.33)	0.0094 (0.80)
ROA	0.0828 (1.38)	0.0391 (0.51)	0.0575 (1.02)	0.0388 (0.67)	0.0840 (1.54)	0.0254 (0.29)	0.0853 (1.23)	−0.0182 (−0.21)
Debt Ratio	−0.0006 (−0.61)	0.0001 (0.04)	−0.0008 (−0.67)	0.0007 (0.35)	−0.0022 (−0.57)	−0.0005 (−0.50)	−0.0009 (−1.08)	0.0073 (1.38)
Cash	−0.0173 (−0.62)	−0.0619 (−0.97)	−0.0722** (−2.03)	0.0432 (1.30)	0.0118 (0.39)	−0.0247 (−0.47)	0.0142 (0.57)	−0.0957 (−1.31)
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.2595	0.1606	0.2362	0.1709	0.2183	0.2117	0.2505	0.1717
Firms	710	710	710	710	710	710	710	710
Nb. Obs	2285	2285	2285	2285	2285	2285	2285	2285

corporate governance. This suggests that, beyond a certain level, additional CSR investment can generate agency costs and reduce RQ, particularly when corporate governance is weak. However, if firm governance is strong, the increase in CSR may continue to enhance RQ.

The results on high-WCSR versus low-WCSR indicate a non-linear effect of WCSR on RQ, suggesting that there is a threshold beyond which increasing investment in WCSR could harm the firm's innovation performance, especially if no effective governance mechanisms are in place to counterbalance the adverse effects. Increasing WCSR may be more beneficial for firms with lower WCSR than for firms with higher WCSR. Thus, the negative sign observed in the baseline analysis does not inherently imply that poor WCSR is associated with a higher RQ. Furthermore, high levels of WCSR may be advantageous only if corporate governance is robust, and very poor WCSR cannot be beneficial, even when firm governance is strong. Finally, when WCSR is at an intermediate (optimal) level, it can positively affect innovation efficiency. The findings support the literature, which suggests that excessive investment in CSR raises agency costs, while underinvestment diminishes employee motivation and creativity (Liu et al., 2020; Paruzel et al., 2023), ultimately leading to a lower RQ. The marginal effect of WCSR on RQ benefits more when WCSR is initially low.

Another question we attempt to address in this section is whether firms that invest most in innovation use CSR to enhance their employees' creativity and, as a result, achieve a better RQ. The same question is also relevant for investment opportunities, as firms with the greatest investment potential are likely to have greater opportunities to innovate and, consequently, to invest more in R&D. In terms of CSR, agency conflicts can lead the manager to reduce investment in R&D (Chemmanur & Tian, 2018). Indeed, to free up more resources for CSR spending that serves their own interests, managers may reduce investment in innovation (Atanassov, 2013). Moreover, high R&D expenditure (high R&D intensity) implies significant resources allocated to innovation at the expense of other expenditures within the company (Sheng et al., 2022; Tong & Zhang, 2024). When R&D investment deviates from its optimal level, this could negatively affect RQ, regardless of the company's CSR policy. Agency theory suggests that opportunistic managers might cut back on R&D investments to allocate more resources to CSR initiatives that benefit themselves, potentially sacrificing long-term value creation (Gillan et al., 2021; Jensen & Meckling, 1976). In this scenario, increased CSR spending is more likely to be used to enhance the manager's image among employees or justify poor management, rather than to boost employee creativity or productivity (Barnea & Rubin, 2010). These inefficient CSR spending practices create agency costs that could decrease RQ (Krüger, 2015; Masulis & Reza, 2015). Conversely, firms that allocate resources optimally to R&D may have less available for other activities and might need to seek external funding to support their investments. In that regard, they will invest in CSR only when it is necessary to meet their performance goals or to send a positive signal that can help attract external funding. In that context, CSR expenditures may not increase agency costs and primarily serve to enhance employee productivity and creativity, thereby positively affecting RQ. To examine these

perspectives, we first split our sample into two groups based on R&D intensity (high versus low).

By investigating the subsamples of firms characterized by high versus low R&D intensity, we aim to assess whether firms with low R&D levels experience agency conflicts or overinvest in CSR beyond what is necessary, and, as a result, have a lower RQ. For the high-R&D-intensity subgroup, the results (Column 5 of Table 8) show that WCSR has no significant direct impact on RQ. The corporate governance score and the interaction term are positive but nonsignificant, contradicting the baseline results. On the other hand, the results for the low-R&D-intensity firm subgroup (Column 6) are similar to the baseline findings. WCSR and corporate governance continue to have a negative direct impact on RQ. In addition, the interaction term is positive, suggesting that WCSR has a positive effect on RQ only for firms with better corporate governance for this subsample. Since low R&D intensity indicates lower R&D investment, our findings suggest that without strong governance, firms can sacrifice long-term investment by cutting R&D spending to redirect resources toward overinvestment in WCSR, thereby increasing agency costs and decreasing RQ. Thus, our baseline results are mainly driven by the low-R&D-intensity subsample.

Similarly to R&D intensity, when a firm's investment opportunities are limited, particularly in innovation, R&D investments are reduced; a sharp increase in CSR spending will not significantly increase the firm's innovation output. Thus, we explore whether the impact of WCSR on RQ differs given the firm's investment opportunities by considering the subsamples of high versus low Tobin's Q. We find that the impact of WCSR on RQ does not depend on Tobin's Q (Columns 7-8). The findings from the subsamples of growing and mature firms align with those from the entire sample, confirming our initial results.

Finally, assuming that agency conflicts may differ in big versus small firms, we examined subsamples of big and small firms (above and below the median). We found that the big-firm subsample mainly drives our results. Specifically, the impact of WCSR on RQ in the big firms is similar to the baseline results, except that corporate governance has no direct effect (Column 3, Table 8). In contrast, the results for the small firms subgroup differ (Column (4)). WCSR and corporate governance are nonsignificant, and there is no moderation effect. These findings suggest that the subsample of big firms mainly drives our baseline results. We see this result as indicating that large firms possess more financial resources and require more external control. In contrast, small firms tend to have fewer resources and are usually family-owned and operated by owners. Therefore, poor governance may affect large firms more negatively than smaller ones.

Table 9
Non-linearity analysis.

Dependent variable: RQ			
Parameter	Full	Full	Full
	(1)	(2)	(3)
WCSR	-0.0672 (-1.12)	-0.0583 (-0.95)	0.0396 (0.92)
WCSR*WCSR	-0.0986*** (-2.95)	-0.0868** (-2.38)	-0.0823** (-2.04)
HRS	-0.0187*** (-2.63)		
ComS	0.0040 (0.42)		
PRS	-0.0189** (-2.14)		
GOV	-0.0663* (-1.88)	0.0688* (-1.81)	
WCSR*GOV	0.1625** (2.31)	0.1532** (2.06)	
Capex	-0.2024 (-1.34)	-0.1813 (-1.24)	-0.1966 (-1.37)
Tobin's Q	0.0003 (1.48)	0.0002 (0.92)	0.0002 (0.99)
Firm Size	0.0106** (-1.96)	-0.0175*** (-3.57)	-0.0181*** (-3.97)
ROA	0.0750 (1.24)	0.0743 (1.15)	0.0787 (1.27)
Debt Ratio	-0.0012 (-1.50)	-0.0012 (-1.44)	-0.0013 (-1.46)
Cash	-0.0400 (-1.43)	-0.0566* (-1.95)	-0.0540* (-1.87)
Industry effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
R ²	0.1737	0.1405	0.1319
Firms	1420	1420	1420
Nb. Obs	4573	4573	4573

6.2. Examining the non-linearity of the relationship

We have just shown that WCSR has a positive direct effect on RQ in the low-WCSR subsample and a negative direct effect on RQ in the high-WCSR subsample. This suggests the nonlinearity of the direct relationship between WCSR and RQ. To account for nonlinearity, we included the *WCSR squared* in the regressions. Table 9 shows the results of estimating the model on the entire sample. As shown, WCSR is not significant in all three models (Columns 1-3). However, the *WCSR square* ($WCSR \times WCSR$) is negative and significant at the 1% level in model 1 and at the 5% level in models 2 and 3. This confirms that the direct relationship between WCSR and RQ is nonlinear. The negative sign indicates that the relationship takes the shape of an inverted "U". The effect of WCSR on RQ first increases, reaches a maximum, and then decreases. In columns 1 and 2, we found a positive moderation of corporate governance, consistent with our previous results. This indicates that the moderating role of corporate governance is not affected by the model specification.

6.3. Dimensions of workforce score and innovation efficiency

As mentioned earlier, the WCSR covers four key areas: diversity and inclusion, employment quality and working conditions, career development and training, and health and safety. This section examines how each dimension relates to RQ innovation efficiency. The

Table 10

Dimensions of employee-oriented CSR and innovation efficiency.

Dependent variables: Research Quotient (RQ)					
Parameter	Fixed effects	Fixed effects	Fixed effects	Fixed effects	Fixed effects
	(1)	(2)	(3)	(4)	(5)
<i>DivS</i>	-0.0782*** (-2.55)	-0.1073*** (-4.66)			
<i>EQS</i>	0.0227 (0.84)		-0.0301 (-1.32)		
<i>HSS</i>	-0.0141 (-0.55)			-0.0586*** (-2.85)	
<i>TDS</i>	-0.0454* (-1.66)				-0.0750*** (-3.56)
<i>GOV</i>	0.0137 (0.60)	-0.0214 (-1.05)	0.0051 (0.26)	0.0112 (0.65)	-0.0031 (-0.19)
<i>DivS*GOV</i>	0.0666** (1.97)	0.0823*** (2.84)			
<i>EQS*GOV</i>	-0.0303 (-0.90)		0.0089 (0.31)		
<i>HSS*GOV</i>	-0.0115 (-0.36)			0.0242 (0.96)	
<i>TDS*GOV</i>	0.0297 (0.86)				0.0480** (2.18)
<i>R&D</i>	-0.0374 (-1.55)	-0.0297 (-1.23)	-0.02534 (-1.04)	-0.0339 (-1.40)	-0.0313 (-1.29)
<i>Capex</i>	-0.1541*** (-2.57)	-0.1228** (-2.05)	-0.1296** (-2.14)	-0.1434** (-2.38)	-0.1413** (-2.35)
<i>Tobin's Q</i>	-0.00004 (-0.20)	-0.00005 (-0.28)	-0.00008 (-0.38)	-0.00007 (-0.37)	-0.0001 (-0.50)
<i>Firm Size</i>	-0.0156*** (-8.46)	-0.0197*** (-11.40)	-0.0220*** (-12.91)	-0.0195*** (-11.16)	-0.0190*** (-10.83)
<i>ROA</i>	0.0935*** (5.34)	0.0786*** (4.58)	0.0999*** (5.64)	0.0897*** (5.21)	0.0942*** (5.45)
<i>Debt Ratio</i>	-0.0002 (-0.23)	-0.0002 (-0.17)	-0.00008 (-0.10)	-0.00004 (-0.04)	-0.00004 (-0.05)
<i>Cash</i>	-0.0242 (-1.41)	-0.0244 (-1.42)	-0.0315* (-1.81)	-0.0260 (-1.51)	-0.0263 (-1.53)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
R ²	0.1775	0.1590	0.1422	0.1567	0.1567
Firms	1420	1420	1420	1420	1420
Nb. Obs	4573	4573	4573	4573	4573

This Table presents the impacts of the dimensions of employee-oriented CSR on RQ using a panel model with fixed effects. The coefficients appear first, and the z statistics (or t statistics) are in parentheses. The relevant explanatory variables are the four dimensions of WCSR, GOV, and the interaction between GOV and each of the four WCSR dimensions. All regressions include a constant, firm fixed effects, and year fixed effects. We control for *firm size*, *Tobin's Q*, *ROA*, *debt ratio*, *Capex to Asset*, and *cash-to-asset ratio*. The sample includes all firm-year observations from 2002 to 2021. The symbols *, **, and *** indicate, respectively, that the estimate is significant at the 10%, 5%, and 1% levels. Adjusted R² are in decimals (not in percentage).

Source: Authors own work

results (Table 10) show that only working conditions and employment quality (EQS) do not significantly affect RQ (Columns 1 and 3). The interaction between EQS and corporate governance (EQS*GOV) is also nonsignificant. Thus, our baseline results are not driven by EQS. On the other hand, other dimensions of WCSR negatively affect RQ. In particular, our baseline findings are driven primarily by workforce diversity and inclusion (DivS) and training and career development (TDS). DivS negatively and significantly affects RQ (Columns 1 and 2), and its interaction with corporate governance (DivS*GOV) is positive and significant. The effect of training and career development (TDS) is similar. In the presence of the other dimensions of the WCSR, TDS is negative and significant only at a 10% level (Column 1). However, without other dimensions, it is significant at a 1% level (Column 5), and the interaction term (TDS*GOV) is positive and significant (Column 5). The effect of health and safety (HSS) is nuanced. In the presence of the other dimensions, HSS is not significant (Column 1). However, without other dimensions, it becomes negative and significant (Column 4), but its interaction with corporate governance (HSS*GOV) is nonsignificant (Column 4). Thus, the baseline results seem mainly driven by workforce diversity and inclusion, training and career development, and health and safety rather than working conditions and employment quality.

6.4. Employee-oriented CSR and R&D intensity

Our baseline results reveal that WCSR positively affects RQ only in firms with stronger governance. In contradiction to our expectations, the direct effect of WCSR on RQ is negative. Since RQ measures innovation output relative to innovation input, we also examine whether WCSR affects the firm's ability to invest in innovation (i.e., innovation input). CSR can motivate staff and stimulate R&D investment within firms. We computed R&D intensity as the firm's R&D expenses (dollars) divided by total revenues (Rdintensity). The results (Table 11, Column 1) show that WCSR positively and significantly affects R&D intensity. Although we find no direct effect of corporate governance, the interaction term (WCSR*GOV) positively and significantly affects R&D intensity, suggesting that WCSR's positive impact on R&D intensity is more pronounced for firms with stronger governance. Based on the sample mean of

Table 11

Further analyses: Impact on R&D intensity, and firm value (Tobin Q).

Dependent variables			
Parameter	Rdintensity	QTobin	QTobin
	(1)	(2)	(3)
RQ			4.6408** (1.97)
WCSR	0.2739** (2.48)	25.68*** (6.45)	1.5282 (0.59)
GOV	-0.0178 (-0.20)	17.13*** (6.15)	2.1757 (1.09)
WCSR*GOV	0.2183*** (2.71)	4.04** (2.42)	-0.2588 (-0.08)
HRS	-0.0057 (-0.30)	5.225*** (7.58)	0.7955** (1.96)
ComS	0.0345 (1.03)	0.2988 (0.26)	0.6159 (0.87)
PRS	-0.0172 (-0.78)	4.0270*** (5.55)	0.5840 (1.27)
Capex	-0.4217* (-1.70)	8.665 (1.21)	34.80*** (5.99)
Tobin's Q	0.0004 (0.61)		
Firm Size	-0.0227*** (-4.19)	-4.4783*** (-13.14)	-1.023*** (-6.16)
ROA	-0.4090*** (-5.11)		
Debt Ratio	-0.0014 (-0.46)	1.4773*** (43.63)	3.77*** (101.34)
Cash	0.0599 (0.76)	-0.1507 (-0.05)	11.92*** (6.75)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R ²	0.2069	0.3061	0.8361
Firms	1420	1420	1420
Nb. Obs	4573	6013	4584

This Table presents the relationships between employee-oriented CSR and R&D intensity, employee-oriented CSR and firm value, and RQ and firm value. The dependent variables are R&D intensity (rdintensity) and firm value (QTobin). The coefficients appear first, and the z statistics (or t statistics) are in parentheses. All regressions include a constant, firm fixed effects, and year fixed effects. The symbols *, **, and *** indicate, respectively, that the estimate is significant at the 10%, 5%, and 1% levels. Adjusted R² are in decimals (not in percentage).

Source: Authors own work

1.663, a one-percentage-point increase in WCSR results in an increase in the R&D intensity of about 0.455 percentage points, and a one-percentage-point increase in the interaction term leads to an additional increase in the R&D intensity of about 0.363 percentage points. These findings are not surprising, as the impact of corporate governance on innovation remains controversial in the literature (O'Connor & Rafferty, 2012; Atanassov, 2013). Unsurprisingly, the human rights, community, and product responsibility scores do not affect R&D intensity, supporting the idea that not all dimensions of CSR matter for innovation (Benlemlih & Bitar, 2018; Chen et al., 2016).

6.5. Workforce score, innovation efficiency, and firm value

To complete our analysis, we first examine the relationship between the workforce score and firm value measured by Tobin's Q. The results are reported in Table 11. As presented in Column 2, we find a significant positive effect of the workforce score on firm value. That is, the stock market positively valorizes employee-related CSR. Unsurprisingly, corporate governance, as well as the interaction term, has a significantly positive impact on firm value, supporting the studies that documented the positive relationship between corporate governance and firm value (Ammann et al., 2011; Jo & Harjoto, 2011). Human rights and product responsibility scores are also positively related to firm value, but the community score does not significantly impact firm value.

Cooper et al. (2022) show that RQ positively affects firm value. We re-examine this relationship by controlling for corporate governance and the four dimensions of corporate social performance. Our results confirm that RQ remains positively associated with firm value (Table 11, Column 3). Based on the sample mean of 3.5199, a one-percentage-point increase in the RQ results in about a 16.33 percentage-point increase in the firm value. More interestingly, by controlling for the workforce score and corporate governance, we find no significant impact of these variables on firm value. Thus, the effects of the workforce score and corporate governance on firm value are entirely absorbed by RQ through their relationship with RQ. The results complement Cooper et al. (2022) and indicate that the RQ can be used to predict firm value. In the absence of RQ, the workforce score, the governance score, and the interaction between governance and the workforce score may be predictors.

7. Discussion and implications

Our findings show that WCSR positively affects RQ exclusively in firms with robust governance. When corporate governance is weak, WCSR's direct effect on RQ turns negative, which explains our overall results for the full sample. Likewise, the direct impact of corporate governance on RQ is negative in firms with low WCSR, indicating that firms should work to enhance both their WCSR and governance. Improved employee-oriented CSR or stronger governance alone do not boost innovation efficiency. Like WCSR, firm governance quality is necessary but not sufficient to increase RQ. A stronger governance structure, combined with effective WCSR, could better address the free-riding problem that hampers innovation. Given heterogeneity effects, the results are mainly driven by the high-WCSR subsample. The impact of WCSR on RQ is more beneficial for firms with low WCSR. Enhanced WCSR positively affects RQ in low-WCSR firms, suggesting a non-linear effect of WCSR on RQ and indicating that there is a threshold beyond which increasing investment in WCSR may reduce the firm's innovation efficiency if no effective governance mechanism is in place to counterbalance the adverse effects of excessive CSR expenses.

The negative direct impact of employee-oriented CSR supports Yuan et al. (2023), who documented that the aggregate CSR score negatively impacts patent intensity. However, our results contradict theories that suggest a positive link between CSR and innovation. In particular, it refutes the predictions of stakeholder theory, resource-based theory, and social exchange theory. It also contradicts empirical studies documenting a positive effect of CSR on employee creativity (Liu et al., 2020), inventor productivity (Erhemjants et al., 2013), and innovation (Chen et al., 2016), and the findings of Benlemlih and Bitar (2018) that high employee-related CSR increases investment efficiency. These contradictions highlight the particular character of RQ and the need to consider firm governance in CSR and innovation.

The findings support the view that CSR may increase agency conflicts in an environment characterized by poor governance (Krüger, 2015; Masulis & Reza, 2015). They align with Liu et al. (2020), who argue that employee-oriented CSR alone is insufficient to address free-riding, which reduces innovation within firms. They also support Li and Wang (2022), who noted that CSR toward employees increases managerial power and induces managers to reduce innovation to protect their private interests. Finally, employee-oriented CSR may also negatively affect RQ if managers hire incompetent employees, as mentioned (Liu et al., 2020). All this suggests that corporate governance remains an essential factor for CSR to positively impact efficiency in innovative companies.

On the other hand, the negative direct effect of corporate governance on RQ contradicts the argument that stronger governance favors efficiency by limiting agency costs and helps managers focus on long-term value creation (Ferrell et al., 2016; Jensen & Meckling, 1976). However, it concurs with Ongsakul et al. (2022), who found a negative impact of external governance, as measured by hostile takeovers, on RQ. It also supports the managerial myopia hypothesis (Sheng et al., 2022; Yu et al., 2024). Moreover, the effect of corporate governance on innovation is controversial in the literature (Chemmanur & Tian, 2018; O'Connor & Rafferty, 2012). Stronger governance must be associated with long-term managerial incentives and better CSR toward employees to enhance innovation efficiency.

Internal governance acts as a moderator, transforming the relationship between employee-oriented CSR and innovation efficiency from negative to positive, despite directly negatively impacting RQ. This finding confirms that agency problems should be mitigated when stronger governance is combined with active employee-oriented CSR that strongly motivates researchers. Then, the impact of employee-oriented CSR on RQ depends on the quality of firm governance, and vice versa. The findings imply that a policy focused exclusively on strong corporate governance or on better employee-related CSR can result in inefficiencies in innovation. At the same

time, the combination of the two may produce a positive effect. Without stronger governance that limits agency costs, employee-oriented CSR reduces innovation efficiency. Alternatively, in the absence of employee-oriented CSR that motivates technicians, stronger governance may reduce innovation efficiency. Improving innovation efficiency requires a combination of stronger governance and better CSR toward employees. Just as employee-oriented CSR, corporate governance quality is a necessary but not sufficient condition for enhancing innovation efficiency.

The results contrast stakeholder theory and partially support the agency theory perspective on CSR. The study reignites the debate on the positive effects of CSR on innovation and long-term financial performance. The results demonstrate that internal and external factors can influence the impact of CSR on a firm's output. In particular, improved internal corporate governance must precede any CSR policy. Effective governance is needed not only to incentivize leaders to invest optimally in innovation, but also to prevent leaders from spending company resources on complacent CSR policies. In particular, regarding CSR toward employees, strong governance should enable managers to implement policies that benefit both employees and the company. In the absence of effective corporate governance, conflicts of interest can arise during the implementation of CSR strategies. In this sense, rather than prioritizing efficiency, firm managers can favor CSR policies that enhance their legitimacy among employees or consolidate their power, making them indispensable within the company even in the event of underperformance or poor resource allocation. By doing so, managers can seek to gain employees' sympathy and support when their mismanagement is questioned. Thus, our findings align with the view that if corporate governance weakens, opportunistic managers invest suboptimally under the guise of CSR.

This study reveals a cautious approach to corporate CSR discourse. It suggests an audit of the company's CSR policies to ensure they meet stakeholders' expectations and align with the company's strategic objectives. However, the present study does not call into question previous work that found a positive link between CSR and innovation output, as measured by the number of patents issued by the firm. Since these studies do not account for the costs associated with patent production, our study offers a complementary perspective by demonstrating that innovation efficiency, which considers both outputs and their associated costs, is possible only when corporate governance is effective.

The findings have many implications for academic research and policymakers. They offer new insights for managers and policymakers on how to use CSR tools to enhance efficiency. The main policy implication is that employee-oriented CSR is beneficial for innovation efficiency only if effective governance mechanisms exist within the firm. Then, the study extends the existing literature on corporate innovation, CSR, corporate governance, and corporate finance. Firms must implement adequate governance mechanisms that promote trust and collaboration among employees while preventing managerial myopia. Finally, the findings suggest that a strong emphasis on CSR toward employees is necessary to enhance innovation efficiency in a stronger governance environment or when the firm-level CSR is initially low. Given the controversy in the literature over the impact of corporate governance on innovation, the study sheds light on CSR toward employees as a mechanism through which firm governance positively affects the quality and quantity of innovation within firms.

Furthermore, a thorough analysis reveals that the negative effect of employee-oriented CSR on RQ, and the positive impact of the interaction term, stem mainly from workforce diversity and inclusion and from training and career development. We do not have strong evidence that the other dimensions of employee-oriented CSR, especially employment quality and health and safety, affect RQ. Our results are mainly driven by workforce diversity and inclusion, and training and career development, rather than by working conditions and employment quality or health and safety. The working conditions and employment quality do not significantly affect RQ; the interaction term is also nonsignificant. The effect of health and safety is also nuanced. Workforce diversity and inclusion negatively affects RQ, while its interaction with corporate governance has a positive impact. However, this does not necessarily mean that diversity and inclusion lead to inefficiency. One can explain the observed impact by the fact that, in the absence of strong governance to effectively monitor decision-making within firms, diversity and inclusion policies can lead managers to recruit low-skilled employees to create a good image with their community, at the expense of efficiency. Managers can also prioritize diversity for personal interests, to enhance their legitimacy or improve their image among employees. On the other hand, diversity alone does not guarantee creativity or motivation. Therefore, stronger governance can address these issues by implementing effective control mechanisms and recruitment policies that balance diversity and competence. In addition to employee competence, diversity and inclusion must also be supported by effective policies that motivate employees to increase efficiency.

The impact of training and career development suggests that employee training alone is insufficient to increase creativity, and several reasons can explain this. First, to be effective, training and career development must be accompanied by other motivational policies that promote the retention and engagement of trained staff. If trained employees are not properly motivated, they can leave the company in search of better opportunities elsewhere. This represents a loss for the company that invested in training. The second reason concerns the type of training offered. If a firm invests in training that does not improve employee creativity or only enables the completion of daily tasks, one cannot expect significant innovation performance. Finally, the last reason relates to the type of staff trained. Not all employees are involved in the R&D and innovation process to the same degree. If a company recruits unskilled staff and trains them to perform routine tasks, this increases training expenses but is unlikely to affect innovation. Only investments in training technicians directly involved in R&D can benefit innovation within companies. In companies with poor governance, agency conflicts can arise in employee training. When corporate governance weakens, the manager may, for example, invest inefficiently in training unrelated to employee productivity or creativity to show employees that the firm cares about them. In the presence of effective governance, training and career development policies may result from long-term objectives aimed at improving firm value. In that regard, in innovative firms, training will be directly geared toward improving the productivity and creativity of employees who contribute to innovation.

In sum, the study suggests that firms may focus primarily on training and career development, as well as on workforce diversity and inclusion, when implementing their innovation strategy. From that perspective, firms must implement effective governance

mechanisms that favor appropriate diversity and training policies. More specifically, governance mechanisms must help firms build diverse yet competent teams, define training policies that foster innovation and long-term performance, and reduce agency conflicts and improve managers' and employees' motivation to innovate. The findings suggest that a strong emphasis on workforce diversity and inclusion can result in sacrificing certain factors that may positively impact innovation efficiency, such as employee competence during recruitment. For instance, if managers form diverse teams with less competent technicians, innovation efficiency cannot be expected, even with better working conditions. Firms need to put in place governance mechanisms that give equal importance to diversity as to competence and other motivational factors that enhance creativity and productivity. Training and career development policies must be accompanied by appropriate motivational mechanisms and, above all, be geared toward improving employee creativity and productivity.

8. Conclusion

This study examines the impact of employee-oriented CSR on innovation efficiency using a sample of 1420 U.S. firms for 2002–2021, and explores how corporate governance moderates this relationship. It captures innovation efficiency by the RQ developed by Knott (2008), and measures employee-oriented CSR by the Refinitiv workforce score. Following the literature (Chen et al., 2016; Makpotche, 2025), the study argues that better employee-related CSR combined with stronger corporate governance may help limit free-riding, stimulate workers' efficiency and creativity, and attract talented technicians who drive innovation.

The findings reveal that WCSR positively affects RQ only in firms with stronger governance. The impact of WCSR on RQ is not linear. The direct effect of WCSR on RQ is negative when corporate governance weakens. Reciprocally, in firms with low WCSR, corporate governance negatively affects RQ, suggesting that companies should improve both their WCSR and governance. Just as employee-oriented CSR, firm governance quality is a necessary but not sufficient condition for enhancing innovation efficiency. Associating stronger governance with effective employee-oriented CSR may better alleviate the free-riding problem that limits innovation. Furthermore, the relationship between WCSR and RQ follows an inverted "U" shape: WCSR first increases, reaches a maximum, and then decreases. While enhanced WCSR negatively affects RQ among high-WCSR firms, having better WCSR is positively related to RQ among low-WCSR firms, suggesting that there is a threshold beyond which increasing investment in WCSR could undermine innovation if there are no effective governance mechanisms in place to counterbalance the adverse effects. Thus, firm governance and employee-oriented CSR must be jointly improved to enhance innovation efficiency.

This paper contributes to the literature by being the first to explore the connection between employee-related CSR and RQ innovation efficiency, and how internal governance influences this relationship. It adds to the existing literature on corporate innovation and finance by showing that effective governance must be paired with proactive, employee-oriented CSR to enhance innovation efficiency. More interestingly, it warns that both firm governance and employee-CSR, when considered separately, may lead to inefficiency.

Since the RQ data are not available for non-U.S. firms, the study is limited to the U.S.A. As no theory clearly predicts the negative relationship, our results present a puzzle. This prompted us to conduct several robustness tests and complementary analyses. Future research should consider other countries. Other governance mechanisms, such as the board characteristics, transparency, and the presence of a poison pill or golden parachute at the firm, should also be considered.

Informed consent

No informed consent is applicable.

Author statement

This manuscript contains original research results and is not under consideration for publication elsewhere.

Research involving human & animal Participants

Not applicable.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that might influence the work reported in this paper.

Appendix

Table A1
Appendix

	RQ	WCSR	HRS	ComS	PRS	GOV	R&D	Capex	Tobin's Q	FirmSize	ROA	DebtRatio	Cash
RQ	1												
WCSR	−0.090	1											
HRS	−0.156	0.55	1										
ComS	−0.047	0.64	0.427	1									
PRS	−0.167	0.49	0.511	0.479	1								
GOV	−0.013	0.54	0.363	0.465	0.356	1							
R&D	0.117	0.04	−0.102	−0.05	−0.113	−0.136	1						
Capex	−0.102	0.076	0.09	0.141	0.057	0.063	0.134	1					
Tobin's Q	−0.022	0.048	0.03	0.075	0.051	0.010	0.044	−0.009	1				
FirmSize	0.054	0.57	0.447	0.493	0.281	0.339	−0.183	0.125	0.026	1			
ROA	0.147	0.207	0.194	0.228	0.195	0.151	−0.135	0.006	0.129	0.111	1		
DebtRatio	−0.083	0.000	0.066	0.055	0.092	0.056	−0.119	−0.019	0.859	0.056	−0.001	1	
Cash	0.116	−0.087	−0.173	−0.14	−0.121	−0.203	0.498	−0.093	−0.008	−0.316	−0.014	−0.15	1

Data availability

The authors do not have permission to share data.

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