

**Corporate Social Responsibility, Absorptive Capacity, and Collaborative Innovation:
International Evidence**

Sandra Boadu

Thesis submitted to the University of Ottawa
in partial Fulfillment of the requirements for the
M.Sc. in Management

Telfer School of Management
University of Ottawa

© Sandra Boadu, Ottawa, Canada, 2022

Abstract

Collaborative innovation has become increasingly relevant for maintaining competitive advantage. Recent researchers posit that trust, which is core for collaborative innovation can be built through corporate social responsibility (CSR). Yet relatively little is known about the impact of CSR and its dimensions on collaborative innovation. Based on a panel data analysis covering the period 2009 to 2018, this thesis examines the relationship between Collaborative innovation and CSR on publicly listed manufacturing firms around the world and extends the literature by proposing that a firm's absorptive capacity exerts a moderating effect on this relationship. The study finds empirical evidence that supports the assertion that CSR promotes collaborative innovation. Importantly, the effect only manifests through the environmental dimension of CSR. The results also show that firms with higher absorptive capacities are more inclined to collaborate for innovation. However, the effect of CSR, especially the social and corporate governance dimensions on collaborative innovation dwindles in the presence of high absorptive capacity. These results have theoretical implications and provide valuable managerial recommendations for socially responsible firms that seek to form strategic alliances for innovation.

Keywords: Collaborative Innovation, Corporate Social Responsibility, Absorptive Capacity, Patent, Citations

Acknowledgment

My sincere appreciation goes to my supervisor Prof. Samir Saadi, and my examiners, Prof Hui (Julia) Zhu and Prof. Qianru (Cheryl) Qi for their guidance and constructive criticisms which shaped and enriched the quality of this study.

Table of Contents

Abstract	ii
Acknowledgment	iii
List of Tables	vi
List of Figures	vi
1.1 Introduction.....	1
1.2 Gaps and Contributions.....	3
1.3 Research Objectives.....	4
1.4 Research Questions.....	4
1.5 Significance of the Study	4
1.6 Limitations of the Study.....	5
1.7 Chapter Disposition	5
2. Literature review	7
2.1 Introduction.....	7
2.2 Theoretical Review	7
2.2.1 Evolution, Definition, and Theories on CSR.....	7
2.2.1.1 Criticism on CSR	10
2.2.1.2 CSR-The Concept	11
2.2.2 Absorptive Capacity.....	12
2.2.3 Collaborative Innovation	13
2.3 Empirical Review.....	15
2.3.1 CSR and Innovation.....	15
2.3.2 CSR and Collaborative Innovation	17
2.3.2.1 Environmental CSR and Collaborative Innovation	17
2.3.2.2 Social CSR and Collaborative Innovation	18
2.3.3 Absorptive Capacity and Collaborative Innovation.....	19
2.3.4 The moderating role of Absorptive Capacity.....	20
2.4 Conceptual Framework.....	21
2.5 Chapter Summary	22
3. Methodology	23
3.1 Introduction.....	23
3.2 Research Design.....	23
3.3 Data.....	23
3.4 Sampling	24

3.5 Variables	24
3.5.1 Dependent Variable: Collaborative Innovation	24
3.5.2 Independent Variable: Corporate Social Responsibility	26
3.5.2 Moderating Variable: Absorptive Capacity	26
3.5.3 Control Variables	27
3.5.3.1 Firm Size	27
3.5.3.2 Leverage	27
3.5.3.3 Return on Assets (ROA)	27
3.5.3.4 Slack Resources	28
3.5.3.5 Firm Age	28
3.5.3.6 Firm and Year Fixed Effects	28
3.6 Model Specification	29
3.6.1 Collaborative Innovation and CSR	29
3.6.2 Collaborative Innovation, CSR, and Absorptive Capacity	30
3.7 Chapter Summary	30
4. Data analysis	31
4.1 Introduction	31
4.2 Descriptive Statistics	31
4.3 Main Regression Analysis	35
4.4. Additional tests	38
4.4.1 Alternative Measures of Collaborative Innovation	38
4.4.2 Addressing the Truncation Issue using Subsample (excluding years 2016 to 2018)	40
4.5. The moderating role of Absorptive Capacity	41
4.6 Chapter Summary	44
5. Summary, Conclusions, and Recommendations	45
5.1 Introduction	45
5.2 Summary	45
5.3 Conclusions of the Study	46
5.4 Recommendations	47
References	49

List of Tables

Table 1: Variable Definitions.....	29
Table 2:Sample Distribution by Country of Origin and by Year.....	32
Table 3: Frequency distribution of the total number of patents, co-owned patents, and citations by year.....	33
Table 4: Descriptive Statistics	33
Table 5: Correlation Coefficient	34
Table 6:Hausman Specification Test	35
Table 7: The impact of corporate social responsibility on collaborative innovation.....	36
Table 8:Alternative measure of Collaborative innovation (LNJPATENTS).....	38
Table 9: Alternative Proxy of Collaborative Innovation (LNJCITE).....	39
Table 10: Resolving Potential Truncation Issue using sample period 2009 - 2015.....	40
Table 11: Correlation Matrix – Moderation Analysis.....	41
Table 12: Variance Inflation Factors	42
Table 13:The moderating role of Absorptive Capacity (Research Intensity)	43

List of Figures

Figure 1: Conceptual Framework	21
--------------------------------------	----

1.1 Introduction

Corporate Social Responsibility (CSR)¹ is a mainstream idea, one in which firms are expected to integrate the needs and interests of society into their operations (Theodoulidis et al., 2017). The concept has gained traction and occupied the corporate agendas of most firms, especially large firms (Du et al., 2010) amidst the growing public concern about the environment and climate change. It is therefore unsurprising that corporations like Kraft Heinz, Walmart, Golden Star, and Cooper Tire and Rubber, among others, occasionally publish CSR reports that provide information on the significant resources that they expend in promoting the welfare of the society beyond their legal mandate.

Recent research provides ample evidence of the multi-dimensional benefits that firms could reap from their CSR activities. Indeed, findings from the academic literature (Cohen et al., 2017; Chen & Gavius, 2015) and market research indicate that key stakeholders such as investors are likely to reward firms engaged in CSR. For instance, despite the significant sell-offs experienced in the early stage of the coronavirus pandemic, in the second quarter of 2020, the assets under management in funds that adhered to environmental, social, and governance (ESG) principles exceeded \$1trillion US dollars (Morningstar, 2020). In addition, the number of funds that adopted ESG criteria as a fundamental aspect of their security selection process in Europe increased by 4.6% to 2,703 at the end of June 2020 (Morningstar, 2020).

¹ CSR refers to “obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society” [p.6] (Bowen, 1953)

The academic literature posits that CSR encourages corporate innovation. This is because to stay competitive, socially responsible firms need to be innovative (Boehe & Cruz, 2010). Moreover, CSR makes it easier for firms to attract and retain employees with the skills and expertise pertinent to innovation (Willard, 2002; Chkir et al., 2021). Other studies argue that CSR hampers innovation since the costs associated with effecting CSR hinder competition and inhibit the ability of firms to undertake projects crucial for innovation (Bocquet et al., 2013; Gallego-Alvarez et al., 2011).

Beyond this, current studies posit that CSR fosters Collaborative Innovation² (Ji & Miao, 2020; Bereskin et al., 2016). These studies generally maintain that CSR is a reputation-enhancing activity, and the social reputation firms gain from implementing these activities influences trust, which leads to alliances and inter-organizational relationships. Besides, CSR enables firms to create external relations that facilitate idea sharing and the exchange of resources between the firms and outside institutions.

Within the CSR-Collaborative Innovation literature, however, there are still research questions that remain unanswered. One of these pertains to the role knowledge absorption capacity plays in the relationship. Ritala and Hurmelinna-Laukkanen (2013) argue that absorptive capacity is crucial to the success of collaborative innovation since it determines how effective firms are in their abilities to absorb and integrate external knowledge into their operations (Cohen & Levinthal, 1990). Individual firms vary in terms of knowledge acquisition and application and a firm's absorptive capacity determines the extent of the benefits it derives from engaging in collaborative

² *Collaborative innovation refers to “voluntary agreements among independent firms, involving exchange and sharing of resources such as capital, information, knowledge, and technology to achieve a common innovation goal (Feranita et al, 2017)*

innovation.

Similarly, Inglebleek and Dentoni (2016) postulate that absorptive capacity is a precursor of CSR strategies. It enables firms to learn their roles from secondary stakeholders and recognize the value of proactive CSR strategies. For instance, through absorptive capacity, firms can anticipate society's reaction to responsible activities and determine the result of these activities on their bottom line. Firms can also design products, provide services, and operate in ways that would be ethically appealing to consumers. Considering these arguments, we propose that the effects of CSR on collaborative innovation may depend on absorptive capacity.

1.2 Gaps and Contributions

From the introduction, two main gaps have been identified in the literature. First, although there is substantial research on the effect of CSR on corporate innovation, there are few studies on the relationship between CSR and collaborative innovation. To the best of our knowledge, only two studies (Ji & Miao, 2020; Bereskin et al., 2016) have empirically analyzed this nexus. Even so, Ji and Miao (2020) and Bereskin et al. (2016) discussed the CSR-Collaborative innovation relationship within single country contexts; China and U.S.A respectively. In addition, whether absorptive capacity moderates the relationship between CSR and collaborative innovation is largely unexplored. It is, therefore, crucial to investigate the association between CSR and Collaborative innovation in an international setting to extend its empirical application and establish the external validity of the results.

This study, therefore, makes two key contributions to the existing body of literature. First, it complements prior research by assessing the association between the different dimensions of CSR

and Collaborative innovation in an international setting. Second, it introduces the moderating role of absorptive capacity to the debate, which has not been examined by previous researchers.

1.3 Research Objectives

The central objective of this study, therefore, is to examine the impact of CSR on Collaborative innovation, and the extent to which absorptive capacity moderates the CSR-Collaborative innovation nexus.

The specific research objectives are:

- a. To evaluate the effect of CSR on Collaborative Innovation.
- b. To investigate the interaction effect of CSR and Absorptive Capacity on Collaborative Innovation.

1.4 Research Questions

To achieve the research objectives, the following questions will be addressed.

- a. Does CSR have a significant effect on Collaborative Innovation?
- b. To what extent does the impact of CSR on Collaborative Innovation depend on absorptive capacity?

1.5 Significance of the Study

There would be enormous benefits to research and practice. First, this study contributes to the existing body of knowledge by probing the impact of CSR on collaborative innovation in a cross-country setting. By examining these phenomena in a cross-country setting relative to a single country setting, a deeper understanding of these phenomena is provided. This is relevant in these

periods of increased ethical and legal pressures on firms to be socially responsible (Vigneau et al., 2015; Wolf, 2014) and in a business world where innovation is drifting away from being ingrained within the confines of a single firm to a multi-organization domain of different stakeholders.

Further, this study is the first to examine the interaction effect of CSR and knowledge absorptive capacity on collaborative innovation. The outcome provides managerial insights on the extent to which the internal research and development efforts of firms moderate the potential effects of their CSR activities on alliance formation for innovation.

1.6 Limitations of the Study

While this study contributes significantly to the existing literature, there are a few shortcomings. One of these relates to the fact that not all publicly listed manufacturing firms can be included in the study. The accurate number of such firms is unknown. Hence, the study relies on Forbes' 2021 Global 2000 list, a list that ranks the world's largest 2000 public companies based on four equally weighted metrics: assets, market value, sales, and profits. Regardless, the sample used provides a more holistic understanding of the relationship between CSR and collaborative innovation than that used in previous research.

Also, the quality of this study to a large extent depends on the reliability and accuracy of the data sourced from Thomson Reuters Eikon/Refinitiv database, Lens (Patent Lens), Bloomberg, and FactSet databases.

1.7 Chapter Disposition

The study is divided into five chapters. Chapter one covers the background of the study, gaps in previous research, the objectives of the study, research questions, the significance of the study,

and its limitations. Chapter two reviews both the theoretical and empirical literature on corporate social responsibility, collaborative innovation, and absorptive capacity from which testable hypotheses will be formed. The methodology of the research is discussed in chapter three. This chapter consists of the research design, source of data, study population, and the mode of data analysis. Chapter four presents and discusses the findings of the study. Chapter five comprises the summary, conclusions, and recommendations.

2. Literature review

2.1 Introduction

This chapter reviews articles and books published by researchers on Corporate Social Responsibility (CSR), Absorptive Capacity, and Collaborative Innovation. First, it focuses on the evolution of the CSR concept, the significant modifications that have been made to the concept over time and discusses the theoretical literature on absorptive capacity and collaborative innovation. Subsequently, the chapter reviews empirical studies on the various objectives of this study, how the concepts have been verified in practice, the contexts within which they have been applied, the phenomena against which they have been tested, and the methodologies adopted.

2.2 Theoretical Review

2.2.1 Evolution, Definition, and Theories on CSR

The idea that businesses have obligations toward society, referred to as CSR has been the focus of much debate over the years. Although it is difficult to establish an accurate date for its commencement, Asongu (2007) traces the beginning of social responsibility to the ancient Roman Empire, where Senators and leaders voiced concerns about firms not doing enough to give back to society. With the introduction of Christian philosophy in the eighteenth and nineteenth centuries, however, social responsibility became a moral standard (Harrison, 1966). Building homes for the homeless, raising orphans, sharing food, and taking care of the poor were predominant in most societies in England and other colonies.

The concept of CSR gained formal prominence in the 1950s with the introduction of Bowen's book on Social Responsibility (Carroll 1999). Bowen (1953) debated that the actions and decisions of businessmen had implications on the quality of life of society and for this reason, are expected to assume some responsibilities to society. Following his publication, scholars' interest in defining CSR grew significantly in the 1960s due to growing society awareness about responsible business behavior and concerns about environmental pollution and exhaustion of resources by businesses (Waterhouse, 2017). The scholars in this era recognized the dominance of economic returns, but also accommodated a wider view of the social responsibilities of a firm (Davis, 1960; Frederick, 1960; McGuire, 1963; Walton, 1967).

The 1970s saw the introduction of the stakeholder approach and the 3-dimensional model by Johnson (1971) and Carroll (1979) respectively. Johnson (1971) suggested that instead of concentrating solely on profit generation and returning higher values to shareholders, firms should focus on meeting the needs of the other stakeholders. In short, meeting the needs of other stakeholders was equivalent to meeting CSR expectations from society. Carroll's (1979) three-dimensional model recommended the integration of responsibilities, social issues, and corporate responsiveness as essential elements of corporate social performance.

By the 1980s, CSR was widely acknowledged as a valid business issue with discussions mostly focused on its implementation and evaluation rather than as a concept (Jones, 1980; Tuzzolino & Armandi, 1981; Cochran & Wood, 1984; Wartick & Cochran, 1985). During the 1990s, Wood (1991) developed three principles of corporate social performance: Principles, Processes, and Outcomes which laid the foundation for more rigorous research and extensive deliberations on CSR. The predominant themes of CSR within this period were its association with financial

performance (Burke & Logsdon, 1996), stakeholder theory (Freeman, 1994), corporate citizenship (Carroll, 1998), and corporate social performance (Swanson, 1995).

Even though the theories on the concept of CSR continued to evolve, much emphasis was placed on empirical research and its operationalization in the 2000s (UNESCAP, 2013). One of such operationalizations was the formation of the United Nations Global Compact in 2000, that among other things, sought to bridge the gaps that existed between meeting human rights and addressing environmental issues by companies, nations, and international organizations (Latapí Agudelo et al. 2019).

On the theoretical front, the major development seen in the 2000s was a redevelopment of Carroll's 4 domains of Corporate Social Responsibility into a 3-domain approach by Schwartz & Carroll (2003). The new domains were economic, legal, and ethical. Other definitions of CSR were also proposed by several authors and researchers as the subject continued to develop, leading to the emergence of Strategic Corporate Social Responsibility (SCSR), which implied incorporating CSR into the strategic objectives of a firm (Lantos, 2001; Smith, 2001). There was also a budding interest in related topics such as stakeholder theory (Freeman, 2001; Friedman & Miles, 2002), corporate citizenship, and sustainability business ethics in this era.

According to Latapí Agudelo et al (2019), "the definitions of CSR of the 2000s reflected the belief that corporations had a new role in society in which they needed to be responsive to social expectations and be motivated by the search for sustainability".

2.2.1.1 Criticism on CSR

Even though aligning business decisions with societal values is naturally appealing, CSR has been the subject of much criticism. A conservative perspective on CSR was suggested by Friedman (1970) who argued that the social responsibility of a firm should be restricted to pursuing economic benefits for shareholders while adhering to the regulations of the community in which it operates. Friedman's proposition is based on the premise that managers as agents owe a duty only to the shareholders who hired them. In effect, any actions managers take contrary to meeting the goal of shareholder wealth maximization like CSR constitutes agency problems and theft of shareholder's resources. In his view, promoting general societal well-being should lie in the purview of the State including social institutions and not-for-profit organizations.

Building on Friedman's assertion, other authors indicate that if firms are operating within the confines of the law, they are already engaging in social responsibility (Mullerat, 2010). This is because the profits firms generate are used to pay employee wages, procure raw materials, goods, and services that provide employment for suppliers, and pay taxes to the government which is channeled to providing services for the society. Therefore, running a business itself is a contribution to society; there is no need to demand firms to fulfill CSR.

Another stream of studies (Doane, 2005; Karnani, 2011) posits that CSR is susceptible to market failures. They argue that markets are not always efficient and thus financial performance and social objectives (ethical outcomes) are not continually aligned. When the market fails, due to information asymmetry, externalities, and market power, there must be a trade-off between maximizing profits and fulfilling societal expectations. Eventually, making profits will supersede ethical principles.

Some studies have also emphasized that CSR is merely a superficial exercise used as a public relation (Faust, 2006; Mullerat, 2010), branding, and marketing (Fleming & Jones, 2013) tool by large and medium firms to project a favorable image to the public. For example, Mombeuil and Zhang (2020) and Hoque et al. (2018) argue that firms practice CSR to offset the public cynicism that emanates from their irresponsible behaviors and unethical business practices.

2.2.1.2 CSR-The Concept

There is no clear-cut definition of Corporate Social Responsibility (CSR) in the literature. Debates about what CSR constitutes, why it should be integrated, and how it should be implemented continue to evolve. Since the seminal work of Bowen (1953) who defined CSR as *“obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society”* [p.6], numerous authors have attempted to define it in several ways.

For instance, while Davis (1960) defined CSR as *“businessmen’s decisions and actions taken for reasons at least partially beyond the firm’s direct economic or technical interest”* [p.70], Epstein (1987), posited that *“ CSR relates primarily to achieving outcomes from organizational decisions concerning specific issues or problems which (by some normative standard) have beneficial rather than adverse effects on pertinent corporate stakeholders. The normative correctness of the products of corporate action have been the main focus of corporate social responsibility”* [p. 104]. To Carroll (1979) *“for a definition of social responsibility to fully address the entire range of obligations business has to society, it must embody the economic, legal, ethical, and discretionary categories of business performance”* [p.499]. Despite the varying definitions of the concept, the various authors agree that to be successful, the CSR strategies of firms must meet the expectations of society (Saeidi et al., 2015).

2.2.2 Absorptive Capacity

The concept of absorptive capacity has received attention across a wide spectrum in the literature. This is partly because the ability to incorporate and use externally derived knowledge is key for innovation and sustained competitive advantage (De Zubeilqui et al., 2016; Ritala & Hurmelinna-Laukkanen, 2013; Leiponen & Helfat, 2010).

Accredited as the founding father of absorptive capacity, Cohen and Levinthal (1990), defined it as a firm's ability to 'recognize the value of new, external information, assimilate it, and apply it to commercial ends' [p.128]. It is based on the idea that the ability to assess and exploit external knowledge depends on the extent of previous related knowledge a firm has. This implies that if a firm holds valuable prior knowledge, then the firm can recognize and identify the value in new knowledge. On the other hand, if a firm does not possess relevant prior knowledge, it is unlikely to identify and appreciate the importance of new knowledge when encountered. Again, absorptive capacity can be developed from a firm's in-house research and development and manufacturing processes. The more investment a firm places in research and development, the more it will be able to recognize the worth of new external knowledge.

Expanding the works of Cohen and Levinthal (1990), Zahra and George (2002) reconceptualized absorptive capacity and defined it as 'a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability' [p. 186]. They postulate that these four capabilities are connective and rely on each other to make absorptive capacity a dynamic capability. They further categorized the four capabilities into potential (acquisition and assimilation) and realized absorptive capacities (transformation and exploitation). Although the roles of potential and realized absorptive capacities in improving firm performance differ, they are complementary. Consequently, firms

that focus only on boosting their potential absorptive capacity may suffer from the costs related to acquisition and assimilation without reaping the benefits from exploitation. Equally, firms that devote their resources to realized absorptive capacity building may accomplish short-term profits without the capacity to respond to environmental changes (Jansen et al., 2005).

In 2007, Todorova and Durisin recommended fundamental changes to the insights provided by Zahra and George (2002). They contend that while the contribution of Zahra and George (2002) to absorptive capacity is rooted in the works of Cohen and Levinthal (1990), it does not follow consistently. For instance, transformation is not a phase after assimilation but an alternative process. Similarly, ‘recognizing the value of new, external knowledge’, the first component of absorptive capacity is not equivalent to ‘acquisition of new external knowledge’ as implied by Zahra and George (2002). Thus, the constituents of potential and realized absorptive capacities specified by Zahra and George are inaccurate. In their view, the sequence of absorptive capacity is to identify the value of new, external knowledge, acquire, assimilate, or transform, and exploit new external knowledge.

Regardless of these diverse modifications to the concept, the substantial argument remains the same. Investing in activities such as research and development or capability building can enhance the ability of a firm to absorb externally generated knowledge (Fabrizio, 2009) that is critical for a firm’s operations.

2.2.3 Collaborative Innovation

Collaborative innovation is viewed as a reform strategy that could foster the innovation potential of firms (Feranita et al, 2017) at a reduced cost (Pai et al, 2012). Defined as the development of innovation across firm boundaries through the exchange of knowledge, ideas, opportunities, and

expertise (Ketchen et al., 2007), collaborative innovation derives its insights from a vast range of theories. These include open innovation (Chesbrough, 2003), co-creation (Prahalad & Ramaswamy, 2004), social innovation (Phills et al., 2008), knowledge-based view, resource-based view, social network, transaction cost, and learning theories (Hartley et. al, 2013) among others.

The resource-based perspective presupposes that collaboration evolves from a firm's demand for certain resources (capital, information, knowledge, technology, etc.) for innovation which may not be available internally due to self-insufficiency related to the inputs (Salancik & Pfeffer, 1978; Barney, 1991). To obtain these resources, it is compelled to form alliances with outside firms that have developed stocks of these assets. This strategy not only eliminates the need to accrue assets over time but also resolves the potential problems associated with tradability (Ahuja, 2000). Likewise, possessing resources that are inaccessible to partners or external firms can make a firm attractive and drive collaboration.

Open innovation, defined as 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively' (Chesbrough et al., 2006, p.1) is another concept underlying collaborative innovation. It emerged from the fact that firms cannot innovate by undertaking all their research and development and marketing activities in-house. Both external and internal sources are useful for the generation and dissemination of the ideas necessary for innovation (Chesbrough, 2003). To stay competitive, firms must leverage the discoveries and business models of others (Chesbrough & Crowther, 2006).

According to the theory on social networks, firms generate external resources and information by establishing connections with innovative firms outside the firm. These connections, which form the firm's innovation network provide a basis for collaborative innovation. Since firms have

limited information about other firms, the information gathered through this embedded network fosters the selection of suitable partners with the assets necessary to undertake collaborative product and service innovation (Zhang et al., 2019; Ferranita et al., 2017).

2.3 Empirical Review

2.3.1 CSR and Innovation

The relationship between CSR and innovation has been analyzed for many years in academic literature. Despite these efforts, the results remain inconclusive. There are still questions on whether there exists a positive, negative, or no relationship between CSR and innovation. For instance, whereas Chkir et al. (2021), Luo and Du (2015), and Nguyen et al. (2020) report a positive and significant relationship, Ullah and Sun (2021) depict no significant relationship and Gallego Alvarez et al. (2011) indicate a negative relationship.

Using a sample of Small and Medium Scale Enterprises (SMEs) in Spain and employing a structural equations model, Santos-Jaén et al. (2021) found a positive and significant relationship between CSR and innovation. Similar results were reported by Forcadell et al. (2021) who argued that engaging in environmental CSR facilitates the development of technological resources which enhances product and process innovation in SMEs. Based on a cross-country study spanning the period 2002 to 2013, Chkir et al (2021) also show evidence of a positive impact of CSR on corporate innovation. Particularly, they document that the influence of CSR on innovation is based on firms' environmental and social CSR and is more prominent in civil law as opposed to common-law countries.

In their study of publicly listed firms on the Shanghai and Shenzhen Stock Exchange over the period 2010 to 2015, Liu et al. (2020) assert that employee-related CSR in the form of performance-driven compensation, care, and safety has a positive and statistically significant effect on innovation. They attribute this outcome to the positive image employee CSR creates among current and prospective employees with the talent to drive innovation. Comparable conclusions were made by Nazir and Islam (2020) and Zhen and Lee (2018) in their studies on hotels in India and public manufacturing companies in the U.S.A respectively. Parallel to these studies, Wagner (2010) shows evidence of a direct link between corporate sustainability performance and innovation among firms in the U.S.A but notes that this connection is moderated by whether the firm under consideration is family or non-family.

Employing a two-stage estimation procedure over the period 2008 to 2010, Poussing (2018) documented that in Luxembourg, CSR influences sustainable innovation positively. Yet this connection is only observed when strategic CSR policies are implemented as opposed to responsive CSR. Along the same line, Cook et al. (2019) reported that higher CSR leads to greater innovation in their study of a large dataset spanning across various industries over the period 1991 to 2012.

Conversely, Gallego Alvarez et al. (2011) reveal that CSR impedes innovation. They discovered this outcome in their study among firms on the Dow Jones Sustainability Index between 2003 and 2007. They argue that carrying out CSR activities could increase costs which inhibits innovation. In the same vein, Bocquet et al. (2013) indicate that responsive CSR practices serve as a hindrance to the product and process innovations of firms in Luxembourg.

Focusing on Japan and adopting a nonparametric frontier analysis, Broadstock et al. (2020) record a nonlinear relationship between CSR and innovation on firms in Japan between 2008 and 2016.

This presupposes that CSR fuels innovation up to a certain threshold after which its implementation causes a decline in the innovation capacity of firms. On their part, Ullah and Sun (2021) provide evidence of an insignificant association between CSR and innovation among 150 companies in 12 developing countries between 2014 and 2019.

2.3.2 CSR and Collaborative Innovation

A review of the literature reveals extended research on the CSR-Innovation link with some recent authors devoting efforts to studying the interrelations between CSR and Collaborative innovation. However, relative to the myriad number of studies on the association between CSR and corporate innovation, there are few studies on the CSR-Collaborative Innovation nexus (Ji & Miao, 2020; Bereskin et al., 2016). Even so, whereas Ji and Miao categorized CSR into three groups: environmental, social, and corporate governance, Bereskin et al. (2016) categorized CSR based on the philanthropic activities: direct and foundation giving in evaluating its impact on collaborative innovation.

2.3.2.1 Environmental CSR and Collaborative Innovation

Ji and Miao (2020) assessed the impact of environmental CSR on the Collaborative innovation of 380 publicly listed manufacturing firms in China over 9 years (2008-2016) and concluded that environmental CSR has a direct and significant influence on collaborative innovation. They argue that engaging in CSR targeted at the environment could provide firms with the opportunity to create relationships and acquire resources relevant for innovation from external institutions. They also note that the association between environmental CSR and collaborative innovation is strengthened by both direct (subsidies, tax reduction) and indirect government (financial

guarantees, publicity, inter-firm network) support. Accordingly, this study proposes the following hypothesis.

H_{1a}: Environmental CSR has a positive effect on Collaborative innovation

2.3.2.2 Social CSR and Collaborative Innovation

Existing literature asserts that firms that embark on social CSR activities such as charity donations, community support, and employee training and development are seen as having the potential to commit to longer-term as opposed to shorter-term strategies (Flammer & Bansal, 2017). Since collaborative innovation is inherently risky (Wegrich, 2018), and necessitates long-term partnerships and trust, firms that participate in social CSR are perceived as more reliable in this regard. Notwithstanding, Ji and Miao (2020) tested the relation between social CSR and Collaborative innovation and reported an insignificant connection. They attributed this outcome to the imperfect nature of the market mechanisms vital for resource allocation in developing countries. Based on the contexts under consideration and prior literature, this study poses the below hypothesis.

H_{1b}: Social CSR fosters Collaborative innovation

2.3.2.3 Corporate Governance and Collaborative Innovation

Ji and Miao (2020) show that corporate governance mechanisms that align shareholders' interests with those of managers promote collaborative innovation. Nonetheless, the relationship between corporate governance and collaborative innovation is only moderated by indirect government support. The study, therefore, proposes the following hypotheses.

H_{1c}: Corporate Governance induces Collaborative innovation

2.3.2.4 Corporate Philanthropy and Collaborative Innovation

Employing direct giving and foundation giving as proxies for CSR, Bereskin et al. (2016) discovered that only direct giving increases the number of co-authored patents and citations among public firms in the U.S.A. They contend that direct giving offers firms the opportunity to learn from external firms (e.g., non-profit organizations) and to establish wider networks for innovation.

Clearly, it is difficult to generalize about the effect of CSR on Collaborative innovation given the different categories of CSR used and the study contexts employed by existing studies. To resolve these limitations, this study tests the CSR-Collaborative innovation link in a cross-country setting. Like Ji and Miao (2020), it disentangles CSR into its components: environmental, social, and corporate governance to reflect and provide an understanding of the distinct strategic purposes and benefits each dimension offers to collaborative innovation. In addition, the study considers the association between general CSR and Collaborative innovation and proposes the hypothesis below.

H_{1d}: Overall CSR fosters Collaborative innovation

2.3.3 Absorptive Capacity and Collaborative Innovation

Extant literature generally argues that absorptive capacity has the propensity to influence collaborative innovation. This contention emanates from the notion that effective strategic alliances depend on a firm's ability to synthesize and use the knowledge it generates from external bodies (competitors, suppliers, customers, government, universities, and research institutes).

For instance, in a survey consisting of 276 manufacturing SMEs in Italy, Muscio (2006) convey a positive impact of absorptive capacity (measured with human resource indicators such as employment of graduates, training, and proportion of employees engaged in research and

development activity) on the ability of firms to form collaborations with external organizations. Similar results were provided by Ritala and Hurmelinna-Laukkanen (2012) who indicated that Finnish firms with competencies in external knowledge acquisition stand a better chance of reaping the innovation benefits of collaborating with competitors than their peers.

On their part, Biedenbach et al. (2018) in a cross-industry research on Swedish firms revealed that gains from university collaborations are contingent on a firm's level of absorptive capacity. Specifically, they report that at low levels of absorptive capacity, partnerships with universities do not translate into conspicuous increases in innovation output.

Contrary to these studies, Rocha (1999) found no evidence that absorptive capacity (Research and development expenditure) induces inter-firm technological cooperation (patents jointly filed by a firm and one or more business partners) among a sample of firms in Japan, Europe, and North America.

2.3.4 The moderating role of Absorptive Capacity

Related literature suggests that absorptive capacity is an essential factor that links the external environment of firms to their internal processes. For this reason, developing effective CSR strategies that could address the concerns of society and facilitate collaborations is conditional on firms' abilities to acquire, assimilate and implement the knowledge of their responsibilities towards society (Ingenbleek & Dentoni, 2016; Delmas et al., 2011). Yet, the role of absorptive capacity in determining the relation between CSR and Collaborative innovation is largely unexplored in the literature. It remains unclear how the connection between CSR and Collaborative

innovation depends on the level of absorptive capacity, a gap this study intends to fill. To achieve this, the study posits the following hypothesis.

H₂: Absorptive capacity strengthens the relation between CSR and Collaborative Innovation

2.4 Conceptual Framework

The conceptual framework, which integrates the hypotheses developed from the literature review is shown in Figure 1.

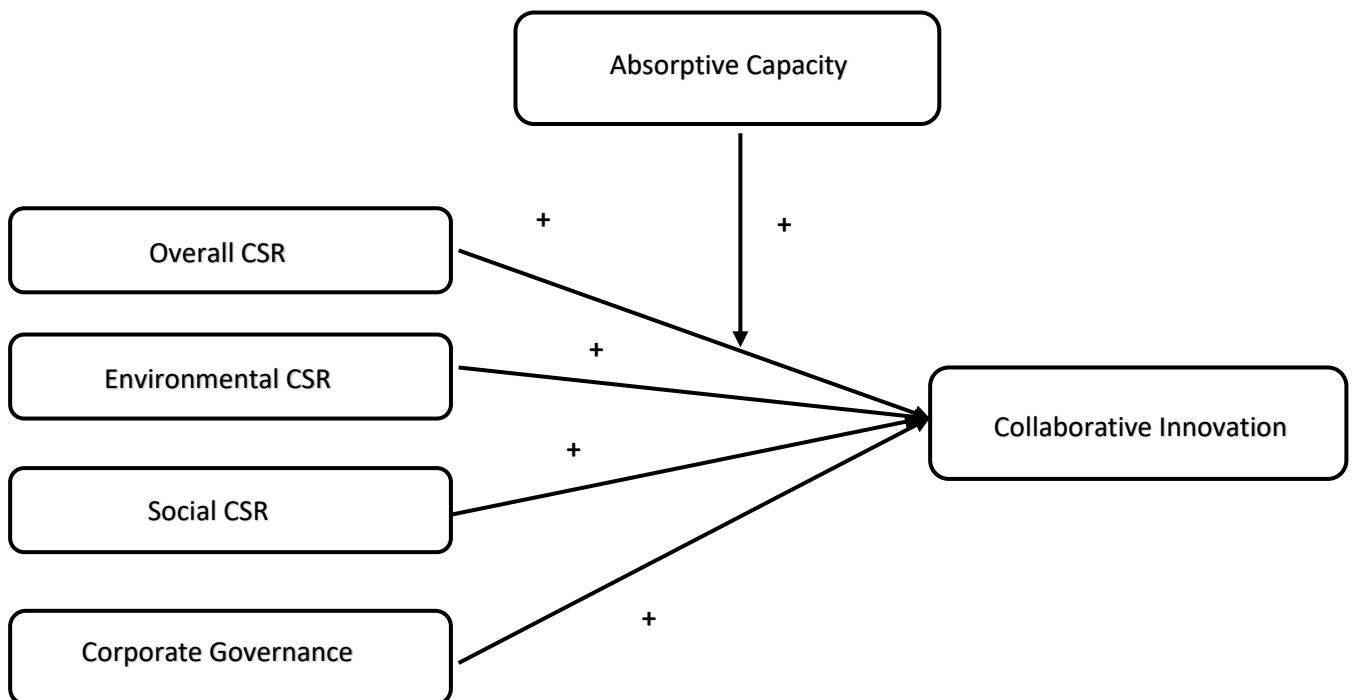


Figure 1: Conceptual Framework

2.5 Chapter Summary

This chapter presented a theoretical and empirical review of the literature on CSR, collaborative innovation, and absorptive capacity. From this review, a conceptual framework from which certain hypotheses were developed was provided to serve as a guide for subsequent analysis.

3. Methodology

3.1 Introduction

This chapter provides details on the techniques adopted for data collection and analysis. It mostly comprises the research design, the sampling procedure, the sources of data, and the methods used in the analysis.

3.2 Research Design

A quantitative research approach is utilized in this study. Quantitative research helps to explain the relationship among variables (Creswell, 2012, p.13). It also allows deductions to be made, as inferences from the test of statistical hypotheses can be used to draw conclusions about the features of the population (Harwell, 2011, p.149). Specifically, a correlational design (Trochim et al., 2016) is embraced to understand the strength and the direction of the association between CSR and Collaborative innovation.

A panel data regression analysis is adopted by replicating observations on the same cross-section of units over time (Wooldridge, 2012, p.11). The panel data analysis offers more information on the data, more degrees of freedom, and less collinearity among the independent variables (Baltagi, 2008). It also controls for cross-sectional unobserved heterogeneity (Brooks, 2008) which when disregarded can lead to biased estimates.

3.3 Data

Data is drawn from three sources: (1) Thomson Reuters Eikon/Refinitiv database which contains data on the environmental, social, and governance ratings of companies worldwide (2) Lens

(Patent Lens) which provides patent data and (3) Bloomberg and FactSet databases, which provide information on firm-specific characteristics.

3.4 Sampling

The target population for the study is all publicly traded manufacturing firms in the world. Public manufacturing firms are considered appropriate for this study because public firms have a higher propensity to integrate CSR practices into their operations (Li et al., 2010; Chapple & Moon, 2005), and manufacturing firms tend to be more innovative (Moshirian et al., 2021). Since the exact number is unknown, this study relies on Forbes' 2021 Global 2000 list, a list that ranks the world's largest 2000 public companies based on four equally weighted metrics: assets, market value, sales, and profits. The manufacturing firms are selected based on Standard Industrial Classification (SIC) codes. Operational data covering the twelve years from 2009 to 2020 are extracted for analysis.

3.5 Variables

3.5.1 Dependent Variable: Collaborative Innovation

Following existing literature (Guan et al., 2021; Chang et al., 2021; Francis et al., 2018), patent-based metrics are used to measure a firm's collaborative innovation activities. Precisely, citation count defined as the natural logarithm of one plus the number of citations that a jointly owned patent receives in a year will be used as the main measure of collaborative innovation. This study uses citation count as opposed to patent count since the latter merely reflects quantity. It does not capture variation in the economic and technological importance of innovations (Hall et al., 2005; Trajtenberg, 1990).

To check whether the findings are robust to the proxy of collaborative innovation, patents owned by the focal firm (the sampled firm) in conjunction with other firms are used as the second proxy of collaborative innovation. This is denoted as the natural logarithm of one plus the annual number of jointly owned patents filed in a year and eventually granted (Ji & Miao, 2020). 1 is added to the number of joint patents before taking the logarithm to ensure that there are no missing values for firms with zero collaborative patents in a year (Cumming et al., 2020). Patent counts are based on the application year rather than the grant year since the former is closer to the actual date of the innovation (Hall et al., 2001; Griliches et al., 1987).

As with all patent data, both measures of collaborative innovation are susceptible to truncation issues. First, patents filed in a year are only available in the database after they have been granted, and it takes an average of 2 years from the time of submission for a patent to be granted (Hall et al., 2001). Thus, the total number of patents finally granted for applications filed toward the end of the sample may be underestimated (Yang, 2021; Kong et al., 2020). Second, patents may continue to receive citations from other patents for a long period. Yet only citations cumulated up till the last year of available data can be observed (Xu, 2020) suggesting underrepresentation in citation counts especially for more recent patents.

To mitigate the truncation problem associated with the lag between the application and grant year, this study follows Chkir et al. (2021) and Hishleifer et al. (2012) by ending the sample period in 2018. In the case of citations, the fixed effects approach recommended by Hall et al. (2001) is used. The raw citation counts for co-owned patents for each firm are scaled by the mean number of citations of co-owned patents in the same year (Francis et al., 2018; Boubakri et al., 2021).

3.5.2 Independent Variable: Corporate Social Responsibility

The main independent variable is CSR. To measure this variable, the environmental, social, and corporate governance pillar scores obtained from the Thomson Reuters Eikon database is used. The environmental pillar score reflects the relative performance of a firm for resource use, emissions, and environmental product innovation. The social pillar score measures how well the firm performs with respect to human rights, workforce, society, and product responsibility. The governance pillar score considers the management, shareholders, and CSR strategy of firms. The ESG Score which is the weighted sum of all pillar scores is used as the composite measure of CSR (Refinitiv, 2021). The scores range between 0 and 100 with higher scores projecting higher ESG performance.

3.5.2 Moderating Variable: Absorptive Capacity

Prior studies document that firms that carry out research and development (RD) activities internally are better able to recognize and exploit external information. Hence, absorptive capacity is a consequence of RD investment (Oh, 2017; Cohen & Levinthal, 1990). In line with Oh (2017) and De Jong & Freel (2010), the RD intensity of a firm is used as a proxy for absorptive capacity. Operationally, this is defined as RD expense divided by sales. However, current absorptive capacity is a by-product of firms' knowledge accumulation from historical and current RD efforts. Thus, the study uses the five-year cumulative RD expenses, assuming the output of each dollar of RD expense declines linearly by 20% each year (Chan et al., 2001; Oh, 2017) as a measure of RD.

3.5.3 Control Variables

Following the literature, this study controls for firm-specific variables that may influence collaborative innovation. These include firm size, Leverage, return on assets (ROA), slack resources, and firm age (Zhang et al., 2019; Ji et al., 2019; Hsu et al., 2014; Chang et al., 2015).

3.5.3.1 Firm Size

Size plays a significant role in determining whether firms will form strategic alliances with other entities for innovation. Generally, the findings of previous studies on the relationship between firm size and collaborative innovation have been positive. Prior studies argue that larger firms have a higher inclination to engage in collaborative innovation because they are better resourced financially and operationally (Ji & Miao, 2020; Arundel & Geuna, 2004; Bayona et al., 2001). The firm size will be measured by taking the natural logarithm of total assets in a year.

3.5.3.2 Leverage

Following Tsang et al. (2021), leverage is measured as the ratio of total liabilities to total assets in a year. Piga and Vivarelli (2003) suggest that insufficient internal financial resources can limit a firm's capacity to conduct innovation independently. Hence firms with higher leverage are more likely to collaborate for innovation.

3.5.3.3 Return on Assets (ROA)

Consistent with existing studies, ROA is included to capture profitability or financial performance (Chkir et al., 2021; Boubakri et al., 2021; Guan et al., 2021). Prior studies provide conflicting theoretical conclusions on the effect of profitability on collaborative innovation. Link and Bauer (1987) posit that firms with lower profits are more likely to collaborate for innovation due to cost-

sharing. Similarly, more profitable firms are more inclined to collaborate since they are less vulnerable to the uncertainty innovation poses and the substantial financial support it requires. ROA is computed as the ratio of operating income before depreciation to total assets in a fiscal year.

3.5.3.4 Slack Resources

Previous studies argue that the availability of slack resources (excess or unused resources) is a disincentive to collaborative innovation. Firms with abundant absorbed and unabsorbed slack resources are more disposed to conduct independent as opposed to collaborative innovation (Zhang et al., 2019). Following Iyer and Miller (2008), absorbed slack is measured as the ratio of selling, general, and administrative expenses (SGA) to sales, and unabsorbed slack is measured using the current ratio (current assets divided by current liabilities).

3.5.3.5 Firm Age

Related studies show that firm age can influence the decision to collaborate. Yet, there is no consensus on the direction of this relationship. Tether (2002) reports that newer or start-up firms with limited resources are more inclined to collaborate for innovation. Zhang et al. (2019) on the other hand found no significant influence of age on collaborative innovation. Firm age is denoted as the length of time in years between the initial creation of a firm and the present time.

3.5.3.6 Firm and Year Fixed Effects

Firm fixed effects is introduced to control for the impact of latent time-invariant firm characteristics on collaborative innovation. Similarly, year-fixed effects is included to account for macroeconomic events across time that may influence the innovation output of all the sampled firms.

Table 1: Variable Definitions

Variables	Measurements
Dependent variable: Collaborative Innovation	
<i>LNCITATIONS</i>	Logarithm of 1 plus the number of citations received by the jointly owned patents in year <i>t</i>
<i>LNJPATENTS</i>	Logarithm of 1 plus the number of jointly owned patents in year <i>t</i>
<i>LNJCITE</i>	Logarithm of 1 plus the number of citations received by a jointly owned patent divided by the mean number of citations of all jointly owned patents in year <i>t</i>
Independent variable:	
Environmental CSR	Environmental Pillar score
Social CSR	Social Pillar score
Corporate governance	Governance Pillar score
CSR	ESG Score
Moderating variable: Absorptive Capacity	
Research Intensity (RI)	$RD/Sales; RD_{it} = RD_{it} + 0.8 * RD_{it-1} + 0.6 * RD_{it-2} + 0.4 * RD_{it-3} + 0.2 * RD_{it-4}$
Firm-level Control variables:	
Firm Size	Ln (Total Assets)
Leverage	Total Liabilities/Total Assets
ROA	EBITDA/Total Assets
Absorbed Slack	Selling, general and administrative expense/Sales
Unabsorbed Slack	Current Asset/Current Liabilities
Firm Age	Time between initial creation of firm and present time

3.6 Model Specification

3.6.1 Collaborative Innovation and CSR

To analyze the impact of CSR on collaborative innovation the following firm-fixed effects regression model is estimated.

$$LNCITATIONS_{i,t} = \beta_0 + \beta_1 CSR_{i,t} + \sum \beta FirmControls + YEARFE + \varepsilon_{i,t} \dots (1)$$

where *LNCITATIONS* is the main proxy of collaborative innovation, *CSR* represents the measures of CSR (environmental pillar score, social pillar score, governance pillar score, and ESG score), *FirmControls* are firm-level control variables, *YEARFE* includes firm and year fixed effects and $\varepsilon_{i,t}$ is the error term.

3.6.2 Collaborative Innovation, CSR, and Absorptive Capacity

To analyze the moderating role of absorptive capacity in the CSR-Collaborative Innovation link, Model 2 is used.

$$LNCITATIONS_{i,t} = \gamma_0 + \gamma_1 CSR_{i,t} + \gamma_2 ACP_{i,t} + \gamma_3 CSR_{i,t} * ACP_{i,t} + \sum \beta FirmControls + YEARFE + \varepsilon_{i,t} \dots\dots\dots(2)$$

3.7 Chapter Summary

This chapter provided a detailed explanation of the methods used in achieving the objectives of this study. This included clarity on the design of the research, the sources of data and the proxies selected to measure the various constructs.

4. Data analysis

4.1 Introduction

This chapter provides the empirical results derived from analyzing the data set for the study. First, it reports the sample distribution by country and year and provides summary statistics of the variables used in the main regression. It then provides preliminary analyses and discussions on the objectives of the study.

4.2 Descriptive Statistics

Table 2 shows the sample distribution by country and year. The sample consists of 2859 observations representing 291 firms from 28 countries over the 2009 to 2018 period. The year distribution indicates that the observations are evenly distributed across the study period. To account for variation across years, the study controls for year-fixed effects in the regression. Like preceding international studies on innovation (Boubakri et al., 2021; Chkir et al, 2021), firms from the United States dominate the sample accounting for 61.32% of the sample size.

Table 3 presents the frequency distribution of the total number of patents, co-owned patents, and citations received by the co-owned patents by year in the sample. On average, over three thousand patents filed and eventually granted were co-owned during the period 2009 to 2018 receiving more than two thousand citations per year.

Table 2: Sample Distribution by Country of Origin and by Year

Country	N	%	Year	N	%
Australia	10	0.35	2009	280	9.79
Belgium	10	0.35	2010	281	9.83
Brazil	10	0.35	2011	282	9.86
Canada	92	3.22	2012	284	9.93
China	60	2.10	2013	285	9.97
Colombia	10	0.35	2014	286	10.00
Denmark	10	0.35	2015	289	10.11
Finland	50	1.75	2016	290	10.14
France	60	2.10	2017	291	10.18
Germany	70	2.45	2018	291	10.18
Hong Kong	10	0.35	Total	2859	100.00
Ireland	70	2.45			
Israel	10	0.35			
Italy	10	0.35			
Japan	190	6.65			
Luxembourg	20	0.70			
Mexico	20	0.70			
Netherlands	50	1.75			
Norway	10	0.35			
Russia	10	0.35			
Singapore	10	0.35			
South Korea	30	1.05			
Spain	20	0.70			
Sweden	50	1.75			
Switzerland	80	2.80			
Taiwan	10	0.35			
United Kingdom	124	4.34			
United States	1753	61.32			
Total	2859	100			

Table 3: Frequency distribution of the total number of patents, co-owned patents, and citations by year

Year	Total number of patents	Total number of co-owned patents	Total number of citations received by co-owned patents
2009	69167	4415	26479
2010	68845	4050	21468
2011	68625	3898	17825
2012	67829	3713	14237
2013	67228	3654	9662
2014	66593	3366	7110
2015	63453	3083	5070
2016	58308	2797	2703
2017	51711	1968	1365
2018	43537	1572	528
Grand Total	625,296	32,516	106,447

Table 4: Descriptive Statistics

Variables	N	Mean	Median	Std. D
Citations	2859	37.23	0	170.76
Joint patents	2859	11.37	1	40.58
ESG score	2660	58.59	63.25	21.52
Environmental score	2660	55.02	60.85	28.62
Social score	2660	59.58	62.83	23.99
Governance score	2660	59.76	63.25	22.56
Size	2810	10.01	9.69	2.33
LEV	2833	0.57	0.56	0.21
ROA	2814	0.14	0.13	0.2
AS	2798	0.27	0.22	0.69
UAS	2788	2.17	1.62	5.96
Age	2848	3.88	4.11	0.97
RI	2499	0.20	0.09	0.49

Table 4 provides summary statistics of the variables used in the main regression analysis. On average, there are 11 joint patents and 37 citations per firm and year. ESG score has a mean of 58.59% with a standard deviation of 21.52. The mean size of firms in the sample, measured by the natural logarithm of total assets is 10.01. As a percentage of total assets, on average, leverage (LEV) and profitability (ROA) account for 57% and 14% respectively.

Table 5: Correlation Coefficient

	<i>LNCITATIONS</i>	<i>ESG</i>	<i>ES</i>	<i>SS</i>	<i>GS</i>	<i>SIZE</i>	<i>LEV</i>	<i>ROA</i>	<i>AS</i>	<i>UAS</i>
<i>LNCITATIONS</i>										
<i>ESG</i>	0.110***									
<i>ES</i>	0.103***	0.901***								
<i>SS</i>	0.076***	0.917***	0.784***							
<i>GS</i>	0.107***	0.726***	0.507***	0.491***						
<i>SIZE</i>	0.189***	0.463***	0.486***	0.364***	0.358***					
<i>LEV</i>	-0.055**	0.221***	0.233***	0.207***	0.133***	0.129***				
<i>ROA</i>	-0.009	-0.005	-0.009	0.002	-0.007	-0.072***	-0.049*			
<i>AS</i>	0.104***	-0.074***	-0.133***	0.006	-0.103***	-0.147***	-0.138***	-0.133***		
<i>UAS</i>	0.032	-0.284***	-0.295***	-0.257***	-0.168***	-0.233***	-0.444***	0.048*	0.203***	
<i>Age</i>	0.077***	0.304***	0.320***	0.277***	0.168***	0.191***	0.184***	0.043*	-0.105***	-0.188***

Table 5 displays the Pearson correlation matrix among the variables to be used in the baseline regression. In line with theoretical predictions, ESG score (ESG), Social score (SS), and Governance score (GS) are positively and significantly correlated with LNCITATIONS (LNC) providing initial evidence of the association between corporate social responsibility and collaborative innovation. Except for leverage (LEV) and profitability (ROA) which correlate negatively with LNCITATIONS, the other control variables Firm Size (SIZE), Absorbed Slack

resources (AS), Unabsorbed Slack resources (UAS), and Age are positively correlated with collaborative innovation.

4.3 Main Regression Analysis

Before running the panel regression, a Hausman test was performed to determine whether a fixed-effects or random-effects model estimation was appropriate. The rule of thumb for this test is that when $p < 0.05$, there is a correlation between the error terms and the independent variables, and a fixed-effects estimation is suitable else the random effects estimator is more applicable. The test revealed that a fixed effects estimator is appropriate as depicted in Table 6.

Table 6: Hausman Specification Test

data: LNCITATIONS ~ ESG + SIZE+ LEV + ROA + AS + UAS + Age
chisq = 185.88, df = 7, p-value < 2.2e-16
alternative hypothesis: one model is inconsistent

Table 7 reports the results from the regression analysis of the link between CSR and collaborative innovation, after controlling for potential precursors of collaborative innovation activities, and year and firm fixed effects. The coefficient of ESG score (see Column 1) is positive and statistically significant at 5%, implying that well-performing firms across all three categories of CSR (*environmental, social, and corporate governance*) are more likely to collaborate for innovation. This provides empirical support for the view that CSR promotes collaborative innovation (Ji & Miao, 2020; Bereskin et al., 2016).

The coefficient of *Environmental score* is also positive and statistically significant at 10% (Column 2) whereas the coefficients of *Social score* and *Corporate Governance score* (see Columns 3 and 4) are insignificant. These results reveal that the effect of CSR on collaborative innovation manifests through its environmental dimension as opposed to the social and corporate governance dimensions. Perhaps, due to the growing attention on sustainability issues and concerns about mitigating climate change, environment-related CSR activities are evaluated more favorably by stakeholders. Consequently, external firms are more likely to collaborate with firms engaged in environmental social responsibility.

Table 7: The impact of corporate social responsibility on collaborative innovation

<i>Variables</i>	<i>ESG Score</i>	<i>Environmental Score</i>	<i>Social Score</i>	<i>Governance Score</i>
	(1)	(2)	(3)	(4)
<i>CSR measure</i>	0.006** (0.0026)	0.004* (0.0022)	0.002 (0.0021)	0.003 (0.0016)
<i>SIZE</i>	0.248*** (0.0601)	0.250*** (0.0600)	0.258*** (0.0600)	0.257*** (0.0597)
<i>LEV</i>	-1.572*** (0.2641)	-1.558*** (0.2647)	-1.582*** (0.2646)	-1.606*** (0.2641)
<i>ROA</i>	0.506*** (0.1773)	0.501*** (0.1774)	0.510*** (0.1774)	0.520*** (0.1773)
<i>AS</i>	0.493*** (0.1481)	0.499*** (0.1481)	0.497*** (0.1483)	0.485*** (0.1482)
<i>UAS</i>	-0.036 (0.0323)	-0.034 (0.0324)	-0.036 (0.0324)	-0.037 (0.0324)
<i>Age</i>	0.252 (0.1796)	0.247 (0.1801)	0.276 (0.1794)	0.273 (0.1791)
<i>Year fixed effect</i>	Yes	Yes	Yes	Yes
<i>Firm fixed effect</i>	Yes	Yes	Yes	Yes
<i>N</i>	2602	2602	2602	2602
<i>R squared</i>	0.2476	0.2473	0.2464	0.2471
<i>F-Statistic</i>	47.3692***	47.3097***	47.0644***	47.2289***

This table shows the estimation results obtained from regressing collaborative innovation (LNCITATIONS) on the four measures of corporate social responsibility (*ESG score*, *Environmental score*, *social score*, and *Governance score*) and the firm-specific control

variables. Firm and Year fixed effects are also included. ‘***’, ‘**’ and ‘*’ denotes statistical significance at the 1%, 5%, and 10% level respectively.

Size has a positive and statistically significant impact on collaborative innovation implying that larger firms have a higher probability to co-create. This corresponds with earlier findings that larger firms are better resourced financially and operationally to engage in joint innovation (Dooley et al., 2015; Carboni, 2012; Arundel & Geuna, 2004).

The effect of leverage on collaborative innovation is negative and significant. This indicates that firms with higher leverage are more likely to conduct their innovation activities independently than cooperate with others. This result contradicts the observations of Piga and Vivarelli (2003) that lack of internal financial resources increases the potential for joint innovation.

Profitability, measured by return on assets (ROA) also has a positive and significant effect on collaborative innovation suggesting that the likelihood of forming alliances with other firms for innovation is higher for firms with higher profits. This conflicts with the results reported by Link and Bauer (1987).

Contrary to Zhang et al. (2019), absorbed slack resources has a positive and significant effect on collaborative innovation. This indicates that firms with abundant absorbed slack resources are more likely to engage in cooperative research and development. The other firm-specific control variables like unabsorbed slack resources and age show a non-significant effect on collaborative innovation.

4.4. Additional tests

4.4.1 Alternative Measures of Collaborative Innovation

LNJPATENTS, denoted as the natural logarithm of one plus the number of jointly owned patents in a year was employed as an alternative measure of collaborative innovation to determine whether the findings are robust to using different measures of collaborative innovation. To do this, the main regression model was re-estimated, and the results are reported in Table 8. Like the main regression, the ESG combined score, and Environmental score have a positive and significant effect on collaborative innovation.

Following Chkir et al. (2021) and Hirshleifer et al. (2012), to address the truncation problem associated with innovation data, LNJCITE, defined as the natural logarithm of one plus the citation count received by a joint patent divided by the average of citations received by all the joints patents in the year is employed as an alternative measure of collaborative innovation. Table 9 shows the results of re-estimating the baseline regression with LNJCITE as the dependent variable.

Table 8: Alternative measure of Collaborative innovation (LNJPATENTS)

<i>Variables</i>	<i>ESG Score</i>	<i>Environmental Score</i>	<i>Social Score</i>	<i>Governance Score</i>
	(5)	(6)	(7)	(8)
<i>CSR measure</i>	0.003**	0.002*	0.002	0.001
	(0.0015)	(0.0012)	(0.0012)	(0.0009)
<i>SIZE</i>	0.115***	0.117***	0.117***	0.122***
	(0.0339)	(0.0339)	(0.0339)	(0.0338)
<i>LEV</i>	-0.730***	-0.724***	-0.728***	-0.745***
	(0.1492)	(0.1495)	(0.1494)	(0.1492)
<i>ROA</i>	-0.008	-0.011	-0.008	-0.003
	(0.1001)	(0.1002)	(0.1002)	(0.1002)
<i>AS</i>	0.219***	0.222***	0.224***	0.217***
	(0.0837)	(0.0837)	(0.0837)	(0.0838)
<i>UAS</i>	-0.053***	-0.052***	-0.053***	-0.053***
	(0.0183)	(0.0183)	(0.0183)	(0.0183)

<i>Age</i>	0.002	0.001	0.009	0.017
	(0.1015)	(0.1017)	(0.013)	(0.012)
<i>Year fixed effect</i>	Yes	Yes	Yes	Yes
<i>Firm fixed effect</i>	Yes	Yes	Yes	Yes
<i>N</i>	2602	2602	2602	2602
<i>R squared</i>	0.0965	0.0960	0.0960	0.0951
<i>F-Statistic</i>	15.3667***	15.2881***	15.2722***	15.1336***

This table shows the estimation results obtained from regressing collaborative innovation (LNJPATENTS) on the four measures of corporate social responsibility (*ESG score*, *Environmental score*, *social score*, and *Governance score*) and the firm-specific control variables. Firm and Year fixed effects are also included. ‘***’, ‘**’ and ‘*’ denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 9: Alternative Proxy of Collaborative Innovation (LNCITE)

	ESG Score	Environmental Score	<i>Social Score</i>	<i>Governance Score</i>
ESG	0.002 **	0.002 **	0.002***	-0.000
	(0.0009)	(0.0007)	(0.0007)	(0.0005)
SIZE_TA	0.031	0.031	0.030	0.037*
	(0.0205)	(0.0205)	(0.0205)	(0.0204)
LEV	-0.283 ***	-0.276***	-0.276***	-0.291***
	(0.0902)	(0.0904)	(0.0902)	(0.0903)
ROA	0.154 **	0.152 **	0.152**	0.157***
	(0.0605)	(0.0606)	(0.0605)	(0.0606)
AS	0.109**	0.111**	0.114**	0.108**
	(0.0506)	(0.0506)	(0.0506)	(0.0507)
UAS	-0.027**	-0.026**	-0.027**	-0.026**
	(0.0110)	(0.0111)	(0.0110)	(0.0111)
Age	0.034	0.031	0.035	0.048
	(0.0613)	(0.0615)	(0.0612)	(0.0612)
<i>Year fixed effect</i>	Yes	Yes	Yes	Yes
<i>Firm fixed effect</i>	Yes	Yes	Yes	Yes
<i>N</i>	2602	2602	2602	2602
<i>R squared</i>	0.0208	0.0207	0.0222	0.0184
<i>F-Statistic</i>	3.0524***	3.0401***	3.2790***	2.6991***

This table shows the estimation results obtained from regressing collaborative innovation (LNCITE) on the four measures of corporate social responsibility (*ESG score*, *Environmental score*, *social score*, and *Governance score*) and the firm-specific control variables. Firm and Year fixed effects are also included. ‘***’, ‘**’ and ‘*’ denote statistical significance at the 1%, 5%, and 10% levels respectively.

4.4.2 Addressing the Truncation Issue using Subsample (excluding years 2016 to 2018)

To assess the robustness of the findings to the issue of truncation, the baseline model is re-estimated using a dataset that spans the period 2009 to 2015 (Table 10). Like the results reported in Table 8, ESG score and environmental score have a positive and significant effect on collaborative innovation (LNCITATIONS) when the years 2016, 2017, and 2018 are dropped from the original sample.

Table 10: Resolving Potential Truncation Issue using sample period 2009 - 2015

	ESG Score	Environmental Score	<i>Social Score</i>	<i>Governance Score</i>
ESG	0.008 **	0.007 **	0.003	0.003 *
	(0.0034)	(0.0029)	(0.0027)	(0.0019)
SIZE_TA	0.293 ***	0.294 ***	0.299 ***	0.305 ***
	(0.0858)	(0.0858)	(0.086)	(0.0857)
LEV	-1.20***	-1.15***	-1.19***	-1.23***
	(0.3512)	(0.3517)	(0.3518)	(0.3520)
ROA	0.471 **	0.460 **	0.471 **	0.49 **
	(0.1970)	(0.1972)	(0.1973)	(0.1972)
AS	0.32**	0.33**	0.33**	0.32**
	(0.1502)	(0.1501)	(0.1503)	(0.1503)
UAS	- 0.092**	-0.090**	-0.093**	-0.095**
	(0.0420)	(0.0420)	(0.0420)	(0.0420)
Age	0.256	0.235	0.290	0.29
	(0.2542)	(0.2554)	(0.2541)	(0.2537)
<i>Year fixed effect</i>	Yes	Yes	Yes	Yes
<i>Firm fixed effect</i>	Yes	Yes	Yes	Yes
<i>N</i>	1765	1765	1765	1765
<i>R squared</i>	0.1294	0.1291	0.1268	0.1277
<i>F-Statistic</i>	16.9247***	16.8684***	16.5344***	16.63***

This table shows the estimation results obtained from regressing collaborative innovation (LNCITATIONS) on the four measures of corporate social responsibility (*ESG score*, *Environmental score*, *social score*, and *Governance score*) and on the firm-specific control variables to address the truncation problem. Firm and Year fixed effects are also included. ‘***’, ‘**’ and ‘*’ denote statistical significance at the 1%, 5%, and 10% levels respectively.

4.5. The moderating role of Absorptive Capacity

Table 11 shows the Pearson correlation matrix among the variables to be used for the moderation analysis. According to Cohen et al. (2013), adding explanatory variables with correlation coefficients exceeding 0.5 can make the regression model susceptible to marginal changes in specification, rendering any conclusions drawn inappropriate (Brooks, 2009). This is because such explanatory variables perform the same function. To address this issue of multicollinearity, the literature suggests dropping one of the highly correlated independent variables from the model to avoid misspecification. This is usually done using the Variance Inflation Factor (VIF) which quantifies the gravity of multicollinearity through a stepwise procedure. A general rule of thumb is that VIFs above 4 require further exploration and that exceeding 10 shows multicollinearity.

Table 11: Correlation Matrix – Moderation Analysis

	LNC	ESG	ES	SS	GS	SIZE	LEV	ROA	AS	UAS	Age	RI
LNC												
ESG	0.123***											
ES	0.128***	0.896***										
SS	0.068**	0.913***	0.774***									
GS	0.130***	0.721***	0.498***	0.473***								
SIZE	0.225***	0.436***	0.480***	0.334***	0.325***							
LEV	-0.082***	0.166***	0.187***	0.159***	0.095***	0.046*						
ROA	-0.014	-0.021	-0.025	-0.01	-0.016	-0.094***	-0.045*					

AS	0.074***	-0.070**	-	0.02	-	-	-	-				
UAS	0.009	-	-	-	-	-	-	0.026	0.221***			
Age	0.062**	0.309***	0.329***	0.268***	0.193***	0.184***	0.172***	0.031	-	-		
RI	0.190***	-0.007	-0.055*	0.053*	-0.033	-	-	-	0.187***	0.228***		
						0.122***	0.277***	0.114***	0.710***	0.312***	-	0.237***

Table 12: Variance Inflation Factors

ESG	RI	SIZE	LEV	ROA	UAS	AS	Age
1.38	4	1.33	1.30	1.04	1.42	4	1.14

Table 12 presents the variance inflation factors for each of the explanatory variables. The results demonstrate that there is a high correlation between Research Intensity and absorbed slack resources. Since research intensity is the moderating variable under consideration, absorbed slack is dropped in the regression analysis with the interaction effect.

Table 13 presents the findings of the moderating effect of absorptive capacity on the collaborative innovation-CSR link. The results continue to show that overall CSR (Column 1) and Environmental CSR (Column 2) are positive and have a significant effect on collaborative innovation. Likewise, across all the dimensions of CSR, absorptive capacity has a positive and significant effect on collaborative innovation which corroborates previous studies (Belderbos et al., 2004).

However, the interaction between ESG score and Absorptive Capacity is negative and significant (Column 1) suggesting that absorptive capacity negatively moderates the relationship between

CSR and collaborative innovation. In other words, higher absorptive capacities weaken the relationship between CSR and collaborative innovation. This outcome could be due to firms' need to protect the uniqueness of their innovation and reduce unintended knowledge leakage. Columns 3 and 4 also reveal that absorptive capacity particularly moderates the influence of the social and governance dimensions of CSR on collaborative innovation.

Table 13: The moderating role of Absorptive Capacity (Research Intensity)

	ESG Score	Environmental Score	<i>Social Score</i>	<i>Governance Score</i>
	(1)	(2)	(3)	(4)
ESG	0.006 ** (0.0031)	0.005 ** (0.0025)	0.004 (0.0027)	0.004* (0.0020)
RI	0.562*** (0.1559)	0.198*** (0.0686)	0.793*** (0.2033)	0.528*** (0.1613)
ESG*RI	-0.017*** (0.0066)			
ES*RI		-0.006 (0.0048)		
SS*RI			-0.019*** (0.0061)	
GS*RI				-0.013** (0.0057)
SIZE_TA	0.226 *** (0.0844)	0.222 *** (0.0842)	0.246 *** (0.0842)	0.242*** (0.0834)
LEV	-1.80*** (0.2824)	-1.78*** (0.2833)	-1.77*** (0.2828)	-1.81*** (0.2823)
ROA	0.50 *** (0.1820)	0.50 *** (0.1825)	0.506 *** (0.1818)	0.522 *** (0.1818)
UAS	- 0.044 (0.0347)	- 0.044 (0.0347)	- 0.042 (0.0347)	- 0.042 (0.0347)
Age	0.304 (0.2311)	0.274 (0.2312)	0.333 (0.2303)	0.313 (0.2307)
<i>Year fixed effect</i>	Yes	Yes	Yes	Yes
<i>Firm fixed effect</i>	Yes	Yes	Yes	Yes
<i>N</i>	2409	2409	2409	2409
<i>R squared</i>	0.2639	0.2626	0.2643	0.2629
<i>F-Statistic</i>	44.6774***	44.3785***	44.7707***	44.4651***

This table shows the estimation results obtained from regressing collaborative innovation (LNCITATIONS) on the four measures of corporate social responsibility (*ESG score*, *Environmental score*, *social score*, and *Governance score*) and the interaction between these

different dimensions and absorptive capacity. Firm and Year fixed effects are also included. ‘***’, ‘**’ and ‘*’ denote statistical significance at the 1%, 5%, and 10% levels respectively.

4.6 Chapter Summary

This chapter presented the findings and the discussions of each research objective. First, it provided descriptive statistics on all the variables used in estimating each objective. The first objective was achieved by regressing collaborative innovation on CSR and some firm-level control variables. The findings revealed that CSR enhances collaborative innovation. For the second objective, which is investigating the joint effect of CSR and absorptive capacity on collaborative innovation, the study discovered that the effect of CSR on collaborative innovation was weaker at higher levels of absorptive capacity.

5. Summary, Conclusions, and Recommendations

5.1 Introduction

This chapter is divided into three sub-headings. The first sub-heading provides a summary of the study objectives, the procedures used to achieve the research objectives, and the findings of the research. Next, the conclusions of the study are provided, from which essential recommendations for practice and further research are made.

5.2 Summary

The central objective of this study was to examine the impact of CSR on collaborative innovation. It also sought to investigate the moderating role of absorptive capacity on the relation between CSR and collaborative innovation. The study employed an unbalanced panel data of 291 manufacturing firms extracted from Forbes' 2021 Global 2000 list. Data covering the years 2009 to 2018 was sourced from Thomson Reuters Eikon/Refinitiv database, Lens (Patent Lens), Bloomberg, and FactSet databases. The data was analyzed using descriptive and inferential statistics, and statistical results were generated using the R software. The findings of the study include the following:

- a. Environmental CSR encourages collaborative innovation (H_{1a} is supported). This corroborates the findings of Ji and Miao (2020) who reported a positive and statistically

significant relationship between environmental CSR and collaborative innovation in Chinese firms.

- b. The impact of social CSR on collaborative innovation is insignificant (H_{1b} is not supported). This presupposes that social CSR does not promote strategic alliance formation for innovation. This is consistent with the results discovered by Ji and Miao (2020).
- c. Corporate governance does not drive collaborative innovation (H_{1c} is not supported). This differs from Ji and Miao (2020) who posit that corporate governance influences the collaborative innovation capabilities of firms. The differences in findings could be attributed to the diverse study contexts used and the disparity in corporate governance structures across countries.
- d. The effect of overall CSR on collaborative innovation is positive and significant (H_{1d} is supported). This is consistent with the views that CSR fosters innovation (Cook et .al, 2019; Poussing, 2016) and extends its influence on collaborative innovation.
- e. Absorptive capacity weakens the relationship between CSR and collaborative innovation (H_2 is not supported), particularly, the social and governance dimensions of CSR. As absorptive capacity increases, the effect of CSR on firms' propensity to collaborate for innovation dwindles.

5.3 Conclusions of the Study

Today, firms can gain competitive advantage by leveraging the knowledge, expertise, and resources of other firms for innovation. Whether CSR can stimulate inter-firm relationships to boost collaborative innovation remains underexplored in the literature. Using a dataset of 291 manufacturing firms from 28 countries, this study provides empirical evidence that CSR drives

collaborative innovation. More importantly, the effect of CSR on collaborative innovation is conditional on the CSR dimension under consideration. The study finds that the effect of CSR on collaborative innovation is manifested through the environmental dimension relative to the social and governance pillars. The study further finds that the impact of CSR on collaborative innovation, particularly, its social and corporate governance dimensions decrease at higher levels of absorptive capacity. The findings are robust to alternative measures of collaborative innovation and potential truncation problems.

5.4 Recommendations

The findings and conclusions of this study provide essential managerial implications and recommendations for further research. These are summarized below.

Managerial Implications:

- a. This study provides evidence that CSR supports collaborative innovation. Thus, managerial decisions aimed at promoting strategic alliance formation should include CSR, especially environment-related activities.
- b. Based on the results, absorptive capacity positively influences collaborative innovation but negatively moderates the relationship between CSR and collaborative innovation. These findings underscore the need for managers to create a balance between investing in absorptive capacity and engaging in CSR when seeking to collaborate with other firms for innovation.

Future Research Directions:

- a. Although the study tackled the research objectives by using 291 publicly listed manufacturing firms, future research could use a larger sample and control for country-level characteristics that could influence collaborative innovation to deepen understanding in the field of CSR and collaborative innovation.
- b. Some studies on innovation argue that there is a bi-causal relationship between CSR and corporate innovation (Shen et al., 2016; Hlioui & Yousfi, 2020). Future studies could extend this line of reasoning to collaborative innovation by considering the reverse causation between CSR and joint innovation.
- c. The sample considered in this study was dominated by firms from developed countries. Further studies could explore this association in emerging economies where the practice of CSR is particularly challenging and resource constraints could make collaborative innovation more appealing.
- d. Although this study sheds light on the interaction effect and roles of CSR and absorptive capacity, how they interact to influence collaborative innovation remains unclear. Future research could explore the latent factors and dynamics underlying the joint effect.

References

- Ahuja, G. (2000). The duality of collaboration: Inducements and opportunities in the formation of interfirm linkages. *Strategic management journal*, 21(3), 317-343.
- Arundel, A., & Geuna, A. (2004). Proximity and the use of public science by innovative European firms. *Economics of Innovation and New Technology*, 13(6), 559–580. <https://doi.org/10.1080/1043859092000234311>
- Asongu, J. J. (2007). The History of Corporate Social Responsibility. *Journal of Business and Public Policy* 1(2), 18.
- Baltagi, B. (2008). *Econometric analysis of panel data* (Vol. 1). John Wiley & Sons.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.
- Bayona, C., García-Marco, T., & Huerta, E. (2001). Firms' motivations for cooperative R&D: An empirical analysis of Spanish firms. *Research Policy*, 30(8), 1289–1307. [https://doi.org/10.1016/S0048-7333\(00\)00151-7](https://doi.org/10.1016/S0048-7333(00)00151-7)
- Belderbos, R., Carree, M., Diederer, B., Lokshin, B., & Veugelers, R. (2004). Heterogeneity in R&D cooperation strategies. *International Journal of Industrial Organization*, 22(8–9), 1237–1263. <https://doi.org/10.1016/j.ijindorg.2004.08.001>
- Bereskin, F. L., Campbell, T. L., & Hsu, P.-H. (2016). Corporate Philanthropy, Research Networks, and Collaborative Innovation: Corporate Philanthropy, Research Networks, and Collaborative Innovation. *Financial Management*, 45(1), 175–206. <https://doi.org/10.1111/fima.12078>
- Biedenbach, T., Marell, A., & Vanyushyn, V. (2018). Industry-university collaboration and absorptive capacity: an empirical study in a Swedish context. *International Journal of Technology Management*, 76(1-2), 81-103.
- Bocquet, R., Le Bas, C., Mothe, C., & Poussing, N. (2013). Are firms with different CSR profiles equally innovative? Empirical analysis with survey data. *European Management Journal*, 31(6), 642–654. <https://doi.org/10.1016/j.emj.2012.07.001>
- Boehe, D. M., & Barin Cruz, L. (2010). Corporate Social Responsibility, Product Differentiation Strategy and Export Performance. *Journal of Business Ethics*, 91(S2), 325–346. <https://doi.org/10.1007/s10551-010-0613-z>
- Boubakri, N., Chkir, I., Saadi, S., & Zhu, H. (2021). Does national culture affect corporate innovation? International evidence. *Journal of Corporate Finance*, 66, 101847. <https://doi.org/10.1016/j.jcorpfin.2020.101847>
- Bowen, H. R. (1953). *Social responsibilities of the businessman*. University of Iowa Press

- Broadstock, D. C., Matousek, R., Meyer, M., & Tzeremes, N. G. (2020). Does corporate social responsibility impact firms' innovation capacity? The indirect link between environmental & social governance implementation and innovation performance. *Journal of Business Research*, 119, 99–110. <https://doi.org/10.1016/j.jbusres.2019.07.014>
- Brooks, C. (2008). *Introductory Econometrics for Finance* (2nd ed.). New York: Cambridge University Press
- Burke, L., & Logsdon, J. M. (1996). How corporate social responsibility pays off. *Long Range Planning*, 29(4), 495–502. [https://doi.org/10.1016/0024-6301\(96\)00041-6](https://doi.org/10.1016/0024-6301(96)00041-6)
- Carboni, O. A. (2012). An empirical investigation of the determinants of R&D cooperation: An application of the inverse hyperbolic sine transformation. *Research in Economics*, 66(2), 131–141. <https://doi.org/10.1016/j.rie.2012.01.002>
- Carroll, A. B. (1979). A Three-Dimensional Conceptual Model of Corporate Performance. *Academy of Management Review*, 4(4), 497–505. <https://doi.org/10.5465/amr.1979.4498296>
- Carroll, A. B. (1999). Corporate social responsibility. *Business & Society*, 38(3), 268–295
- Carroll, A. B. (1998). The Four Faces of Corporate Citizenship. *Business and Society Review*, 100–101(1), 1–7. <https://doi.org/10.1111/0045-3609.00008>
- Chan, L. K. C., Lakonishok, J., & Sougiannis, T. (2001). The Stock Market Valuation of Research and Development Expenditures. *The Journal of Finance*, 56(6), 2431–2456. <https://doi.org/10.1111/0022-1082.00411>
- Chang, X., Fu, K., Low, A., & Zhang, W. (2015). Non-executive employee stock options and corporate innovation. *Journal of Financial Economics*, 115(1), 168–188. <https://doi.org/10.1016/j.jfineco.2014.09.002>
- Chang, X., Chen, Y., Wang, S. Q., Zhang, K., & Zhang, W. (2019). Credit default swaps and corporate innovation. *Journal of Financial Economics*, 134(2), 474–500. <https://doi.org/10.1016/j.jfineco.2017.12.012>
- Chapple, W., & Moon, J. (2005). Corporate Social Responsibility (CSR) in Asia: A Seven-Country Study of CSR Web Site Reporting. *Business & Society*, 44(4), 415–441. <https://doi.org/10.1177/0007650305281658>
- Chen, E., & Gavius, I. (2015). Does CSR have different value implications for different shareholders? *Finance Research Letters*, 14, 29–35. <https://doi.org/10.1016/j.frl.2015.07.001>
- Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.

- Chesbrough, H., Vanhaverbeke, W., & West, J. (Eds.). (2006). *Open innovation: Researching a new paradigm*. Oxford University Press on Demand
- Chesbrough, H., & Crowther, A. K. (2006). Beyond high tech: early adopters of open innovation in other industries. *R&d Management*, 36(3), 229-236
- Chkir, I., El Haj Hassan, B., Rjiba, H., & Saadi, S. (2021). Does corporate social responsibility influence corporate innovation? International evidence. *Emerging Markets Review*, 46, 100746. <https://doi.org/10.1016/j.ememar.2020.100746>
- Cochran, P. L., & Wood, R. A. (1984). Corporate Social Responsibility and Financial Performance. *Academy of Management Journal*, 27(1), 42–56. <https://doi.org/10.2307/255956>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152.
- Cohen, J., Holder-Webb, L., & Khalil, S. (2017). A Further Examination of the Impact of Corporate Social Responsibility and Governance on Investment Decisions. *Journal of Business Ethics*, 146(1), 203–218. <https://doi.org/10.1007/s10551-015-2933-5>
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Routledge.
- Cook, K. A., Romi, A. M., Sánchez, D., & Sánchez, J. M. (2019). The influence of corporate social responsibility on investment efficiency and innovation. *Journal of Business Finance & Accounting*, 46(3–4), 494–537. <https://doi.org/10.1111/jbfa.12360>
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed). Pearson.
- Cumming, D., Ji, S., Peter, R., & Tarsalewska, M. (2020). Market manipulation and innovation. *Journal of Banking & Finance*, 120, 105957
- Davis, K. (1960). Can Business Afford to Ignore Social Responsibilities? *California Management Review*, 2(3), 70–76. <https://doi.org/10.2307/41166246>
- de Jong, J. P. J., & Freel, M. (2010). Absorptive capacity and the reach of collaboration in high technology small firms. *Research Policy*, 39(1), 47–54. <https://doi.org/10.1016/j.respol.2009.10.003>
- Delmas, M., Hoffmann, V. H., & Kuss, M. (2011). Under the Tip of the Iceberg: Absorptive Capacity, Environmental Strategy, and Competitive Advantage. *Business & Society*, 50(1), 116–154. <https://doi.org/10.1177/0007650310394400>

- De Zubielqui, G. C., Jones, J., & Lester, L. (2016). Knowledge inflows from market-and science-based actors, absorptive capacity, innovation and performance—a study of SMEs. *International Journal of Innovation Management*, 20(06), 1650055.
- Doane, D., & Abasta-Vilaplana, N. (2005). *The myth of CSR* (Vol. 3, No. 3, pp. 22-29). Stanford social innovation review
- Dooley, L., Kenny, B., & Cronin, M. (2016). Interorganizational innovation across geographic and cognitive boundaries: Does firm size matter?: Interorganizational innovation across geographic and cognitive boundaries. *R&D Management*, 46(S1), 227–243. <https://doi.org/10.1111/radm.12134>
- Du, S., Bhattacharya, C. B., & Sen, S. (2010). Maximizing business returns to corporate social responsibility (CSR): The role of CSR communication. *International journal of management reviews*, 12(1), 8-19.
- Epstein, E. M. (1987). The Corporate Social Policy Process: Beyond Business Ethics, Corporate Social Responsibility, and Corporate Social Responsiveness. *California Management Review*, 29(3), 99–114. <https://doi.org/10.2307/41165254>
- Fabrizio, K. R. (2009). Absorptive capacity and the search for innovation. *Research Policy*, 38(2), 255–267. <https://doi.org/10.1016/j.respol.2008.10.023>
- Faust, C. (2006). *What's wrong with corporate social responsibility?* (Corporate Watch Report 2006). Oxford
- Feranita, F., Kotlar, J., & Massis, A. D. (2017). Collaborative innovation in family firms: Past research, current debates and agenda for future research. *Journal of Family Business Strategy*, 8(3), 137–156. <https://doi.org/10.1016/j.jfbs.2017.07.001>
- Flammer, C., & Bansal, P. (2017). Does a long-term orientation create value? Evidence from a regression discontinuity. *Strategic Management Journal*, 38(9), 1827-1847
- Fleming, P. (2012). *The end of corporate social responsibility: Crisis and critique*. Sage.
- Forbes (2020). *Global 2000. The World's Largest Public Companies*. Retrieved November 1, 2020, from <https://www.forbes.com>
- Forcadell, F. J., Úbeda, F., & Aracil, E. (2021). Effects of environmental corporate social responsibility on innovativeness of spanish industrial SMEs. *Technological Forecasting and Social Change*, 162, 120355. <https://doi.org/10.1016/j.techfore.2020.120355>
- Francis, B. B., Kim, I., Wang, B., & Zhang, Z. (2018). Labor law and innovation revisited. *Journal of Banking & Finance*, 94, 1–15. <https://doi.org/10.1016/j.jbankfin.2018.06.007>
- Frederick, W. C. (1960). The growing concern over business responsibility. *California Management Review*, 2(4), 54–61

- Freeman, R. E. (1994). The Politics of Stakeholder Theory: Some Future Directions. *Business Ethics Quarterly*, 4(4), 409–421. <https://doi.org/10.2307/3857340>
- Freeman, R. E. (2001). A stakeholder theory of the modern corporation. *Perspectives in Business Ethics*, 3, 144.
- Friedman, M. (1970). The social responsibility of business is to increase its profits. *The New York Times Magazine*.
- Friedman, A. L., & Miles, S. (2002). Developing stakeholder theory. *Journal of management studies*, 39(1), 1-21
- Gallego-Álvarez Isabel, Manuel Prado-Lorenzo José, & García-Sánchez Isabel-María. (2011). Corporate social responsibility and innovation: A resource-based theory. *Management Decision*, 49(10), 1709–1727. <https://doi.org/10.1108/00251741111183843>
- Griliches, Z. (1987.). The value of patents as indicators of inventive activity. 43.
- Guan, Y., Zhang, L., Zheng, L., & Zou, H. (2021). Managerial liability and corporate innovation: Evidence from a legal shock. *Journal of Corporate Finance*, 69, 102022. <https://doi.org/10.1016/j.jcorpfin.2021.102022>
- Guo, B., Pérez-Castrillo, D., & Toldrà-Simats, A. (2019). Firms' innovation strategy under the shadow of analyst coverage. *Journal of Financial Economics*, 131(2), 456–483. <https://doi.org/10.1016/j.jfineco.2018.08.005>
- Hall, B. H., Jaffe, A. B., & Trajtenberg, M. (2001). The NBER patent citation data file: Lessons, insights and methodological tools.
- Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. *RAND Journal of Economics*, 16-38.
- Harrison, B. (1966). Philanthropy and the Victorians. *Victorian Studies*, 9(4), 353–374.
- Hartley, J., Sørensen, E., & Torfing, J. (2013). Collaborative Innovation: A Viable Alternative to Market Competition and Organizational Entrepreneurship. *Public Administration Review*, 73(6), 821–830. <https://doi.org/10.1111/puar.12136>
- Harwell, M. (2011). Research Design in Qualitative/Quantitative/Mixed Methods. In C. Conrad & R. Serlin, *The SAGE Handbook for Research in Education: Pursuing Ideas as the Keystone of Exemplary Inquiry* (pp. 147–164). SAGE Publications, Inc. <https://doi.org/10.4135/9781483351377.n11>
- Hirshleifer, D., Low, A., & Teoh, S. H. (2012). Are overconfident CEOs better innovators? *The journal of finance*, 67(4), 1457-1498.
- Hlioui, Z., & Yousfi, O. (2020). CSR and innovation: two sides of the same coin. In *Corporate Social Responsibility*. IntechOpen.

- Hoque, N., Rahman, A. R. A., Molla, R. I., Noman, A. H. Md., & Bhuiyan, M. Z. H. (2018). Is corporate social responsibility pursuing pristine business goals for sustainable development? *Corporate Social Responsibility and Environmental Management*, 25(6), 1130–1142. <https://doi.org/10.1002/csr.1527>
- Hsu, P.-H., Tian, X., & Xu, Y. (2014). Financial development and innovation: Cross-country evidence. *Journal of Financial Economics*, 112(1), 116–135. <https://doi.org/10.1016/j.jfineco.2013.12.002>
- Ingenbleek, P., & Dentoni, D. (2016). Learning from Stakeholder Pressure and Embeddedness: The Roles of Absorptive Capacity in the Corporate Social Responsibility of Dutch Agribusinesses. *Sustainability*, 8(10), 1026. <https://doi.org/10.3390/su8101026>
- Iyer, D. N., & Miller, K. D. (2008). Performance feedback, slack, and the timing of acquisitions. *Academy of Management Journal*, 51(4), 808-822.
- Jansen, J. J. P., Van Den Bosch, F. A. J., & Volberda, H. W. (2005). Managing Potential and Realized Absorptive Capacity: How do Organizational Antecedents Matter? *Academy of Management Journal*, 48(6), 999–1015. <https://doi.org/10.5465/amj.2005.19573106>
- Ji, H., & Miao, Z. (2020). Corporate social responsibility and collaborative innovation: The role of government support. *Journal of Cleaner Production*, 260, 121028. <https://doi.org/10.1016/j.jclepro.2020.121028>
- Ji, H., Xu, G., Zhou, Y., & Miao, Z. (2019). The Impact of Corporate Social Responsibility on Firms' Innovation in China: The Role of Institutional Support. *Sustainability*, 11(22), 6369. <https://doi.org/10.3390/su11226369>
- Johnson, H. L. (1971). *Business in contemporary society: Framework and issues*. Belmont, CA: Wadsworth
- Jones, T. M. (1980). Corporate social responsibility revisited, redefined. *California Management Review*, 22(3), 59-67
- Karnani, A. (2011). “Doing Well by Doing Good”: The Grand Illusion. *California Management Review*, 53(2), 69–86. <https://doi.org/10.1525/cm.2011.53.2.69>
- Ketchen, D. J., Ireland, R. D., & Snow, C. C. (2007). Strategic entrepreneurship, collaborative innovation, and wealth creation. *Strategic Entrepreneurship Journal*, 1(3–4), 371–385. <https://doi.org/10.1002/sej.20>
- Kong, D., Wang, Y., & Zhang, J. (2020). Efficiency wages as gift exchange: Evidence from corporate innovation in China. *Journal of Corporate Finance*, 65, 101725. <https://doi.org/10.1016/j.jcorpfin.2020.101725>
- Kramer, M. R., & Porter, M. (2011). *Creating shared value* (Vol. 17). FSG.

- Latapí Agudelo, M. A., Jóhannsdóttir, L., & Davídsdóttir, B. (2019). A literature review of the history and evolution of corporate social responsibility. *International Journal of Corporate Social Responsibility*, 4(1), 1. <https://doi.org/10.1186/s40991-018-0039-y>
- Lantos, G. P. (2001). The boundaries of strategic corporate social responsibility. *Journal of Consumer Marketing*, 18(7), 595–632.
- Leiponen, A., & Helfat, C. E. (2010). Innovation objectives, knowledge sources, and the benefits of breadth: Research Notes and Commentaries. *Strategic Management Journal*, 31(2), 224–236. <https://doi.org/10.1002/smj.807>
- Link, A. N., & Bauer, L. L. (1987). An economic analysis of cooperative research. *Technovation*, 6(4), 247-260.
- Liu, B., Sun, P.-Y., & Zeng, Y. (2020). Employee-related corporate social responsibilities and corporate innovation: Evidence from China. *International Review of Economics & Finance*, 70, 357–372. <https://doi.org/10.1016/j.iref.2020.07.008>
- Luo, X., & Du, S. (2015). Exploring the relationship between corporate social responsibility and firm innovation. *Marketing Letters*, 26(4), 703–714. <https://doi.org/10.1007/s11002-014-9302-5>
- McGuire, J. W. (1963). *Business and society*. New York: McGraw-hill
- Mishra, D. R. (2017). Post-innovation CSR Performance and Firm Value. *Journal of Business Ethics*, 140(2), 285–306. <https://doi.org/10.1007/s10551-015-2676-3>
- Mombeuil, C., & Zhang, B. (2020). Authentic or cosmetic: stakeholders' attribution of firms' corporate social responsibility claims. *Social Responsibility Journal*.
- MorningStar (2020). *Global Sustainable Fund Flows*. Retrieved September 22, 2020, from <https://www.morningstar.com/lp/global-esg-flows>
- Moshirian, F., Tian, X., Zhang, B., & Zhang, W. (2021). Stock market liberalization and innovation. *Journal of Financial Economics*, 139(3), 985–1014. <https://doi.org/10.1016/j.jfineco.2020.08.018>
- Mullerat, R. (2010). *International corporate social responsibility: the role of corporations in the economic order of the 21st century*. Kluwer Law International BV.
- Muscio, A. (2007). The Impact of Absorptive Capacity on SMEs Collaboration. *Economics of Innovation and New Technology*, 16(8), 653–668. <https://doi.org/10.1080/10438590600983994>
- Nazir, O., & Islam, J. U. (2020). Influence of CSR-specific activities on work engagement and employees' innovative work behavior: An empirical investigation. *Current Issues in Tourism*, 23(24), 3054–3072. <https://doi.org/10.1080/13683500.2019.1678573>

- Nguyen, P.-A., Kecskés, A., & Mansi, S. (2020). Does corporate social responsibility create shareholder value? The importance of long-term investors. *Journal of Banking & Finance*, *112*, 105217. <https://doi.org/10.1016/j.jbankfin.2017.09.013>
- Oh, J.-M. (2017). Absorptive capacity, technology spillovers, and the cross-section of stock returns. *Journal of Banking & Finance*, *85*, 146–164. <https://doi.org/10.1016/j.jbankfin.2017.08.016>
- Pai, D. C., Tseng, C. Y., & Liou, C. H. (2012). Collaborative innovation in emerging economies: Case of India and China. *Innovation*, *14*(3), 467-476.
- Phills, J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering social innovation. *Stanford Social Innovation Review*, *6*(4), 34-43.
- Piga, C., & Vivarelli, M. (2003). Sample selection in estimating the determinants of cooperative R&D. *Applied Economics Letters*, *10*(4), 243–246. <https://doi.org/10.1080/1350485022000044156>
- Poussing, N. (2019). Does corporate social responsibility encourage sustainable innovation adoption? E empirical evidence from L Luxembourg. *Corporate Social Responsibility and Environmental Management*, *26*(3), 681–689. <https://doi.org/10.1002/csr.1712>
- Prahalad, C. K., & Ramaswamy, V. (2004). *The future of competition: Co-creating unique value with customers*. Harvard Business Press.
- Refinitiv (2021). *Environmental, Social, and Governance Scores*. Retrieved October 1, 2021, from https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf
- Ritala, P., & Hurmelinna-Laukkanen, P. (2013). Incremental and Radical Innovation in Coopetition-The Role of Absorptive Capacity and Appropriability: Incremental and Radical Innovation in Coopetition. *Journal of Product Innovation Management*, *30*(1), 154–169. <https://doi.org/10.1111/j.1540-5885.2012.00956.x>
- Rocha, F. (1999). Inter-Firm Technological Cooperation: Effects Of Absorptive Capacity, Firm-Size, And Specialization. *Economics of Innovation and New Technology*, *8*(3), 253–271. <https://doi.org/10.1080/10438599900000011>
- Santos-Jaén, J. M., Madrid-Guijarro, A., & García-Pérez-de-Lema, D. (2021). The impact of corporate social responsibility on innovation in small and medium-sized enterprises: The mediating role of debt terms and human capital. *Corporate Social Responsibility and Environmental Management*, *csr.2125*. <https://doi.org/10.1002/csr.2125>
- Saeidi, S. P., Sofian, S., Saeidi, P., Saeidi, S. P., & Saeidi, S. A. (2015). How does corporate social responsibility contribute to firm financial performance? The mediating role of

- competitive advantage, reputation, and customer satisfaction. *Journal of Business Research*, 68(2), 341–350. <https://doi.org/10.1016/j.jbusres.2014.06.024>
- Salancik, G. R., & Pfeffer, J. (1978). *The external control of organizations: A resource dependence perspective* (pp. 167-199). New York: Harper & Row.
- Schwartz, M.S., & A.B. Carroll (2003). Corporate social responsibility: a three-domain approach. *Business Ethics Quarterly*, 503-30
- Shen, R., Tang, Y., & Zhang, Y. (2016). Does Firm Innovation Affect Corporate Social Responsibility?
- Shin, H., Sharma, A., Nicolau, J. L., & Kang, J. (2021). The impact of hotel CSR for strategic philanthropy on booking behavior and hotel performance during the COVID-19 pandemic. *Tourism Management*, 85, 104322. <https://doi.org/10.1016/j.tourman.2021.104322>
- Smith, N. C. (2001). Changes in corporate practices in response to public interest advocacy and actions. In P. N. B. a. G. T. Gundlach (Ed.), *Handbook of Marketing and Society*. Thousand Oaks
- Swanson, D. L. (1995). Addressing a theoretical problem by reorienting the corporate social performance model. *The Academy of Management Review*, 20(1), 43–64.
- Tang, Z., Hull, C. E., & Rothenberg, S. (2012). How Corporate Social Responsibility Engagement Strategy Moderates the CSR-Financial Performance Relationship: CSR Engagement Strategy. *Journal of Management Studies*, 49(7), 1274–1303. <https://doi.org/10.1111/j.1467-6486.2012.01068>.
- Tether, B. S. (2002). Who co-operates for innovation, and why An empirical analysis. *Research Policy*, 21.
- Theodoulidis, B., Diaz, D., Crotto, F., & Rancati, E. (2017). Exploring corporate social responsibility and financial performance through stakeholder theory in the tourism industries. *Tourism Management*, 62, 173–188. <https://doi.org/10.1016/j.tourman.2017.03.018>
- Todorova, G., & Durisin, B. (2007). Absorptive capacity: Valuing a reconceptualization. *Academy of Management Review*, 32(3), 774–786. <https://doi.org/10.5465/amr.2007.25275513>
- Trajtenberg, M. (1990). A Penny for Your Quotes: Patent Citations and the Value of Innovations. *The RAND Journal of Economics*, 21(1), 172. <https://doi.org/10.2307/2555502>
- Trochim, W. M. K., Donnelly, J. P., & Arora, K. (2016). *Research methods: the essential knowledge base* (2nd ed.). Cengage Learning

- Tsang, A., Wang, K. T., Liu, S., & Yu, L. (2021). Integrating corporate social responsibility criteria into executive compensation and firm innovation: International evidence. *Journal of Corporate Finance*, 70, 102070. <https://doi.org/10.1016/j.jcorpfin.2021.102070>
- Tuzzolino, F. & Armandi, B. R. (1981). A need-hierarchy framework for assessing corporate social responsibility. *The Academy of Management Review*, 6(1), 21–28.
- Ullah, S., & Sun, D. (2021). Corporate social responsibility corporate innovation: A cross-country study of developing countries. *Corporate Social Responsibility and Environmental Management*, 28(3), 1066–1077. <https://doi.org/10.1002/csr.2106>
- United Nations Economic and Social Commission for Asia and the Pacific. (2013). Developments in the concept of corporate social responsibility (CSR). In United Nations Economic and Social Commission for Asia and the Pacific, *From Corporate Social Responsibility to Corporate Sustainability* (pp. 9–26). UN. <https://doi.org/10.18356/1c39e4c3-en>
- Vigneau, L., Humphreys, M., and Moon, J. (2015). How do firms comply with international sustainability standards? processes and consequences of adopting the global reporting initiative, *Journal of Business Ethics* 131(2), 469–486.
- Wagner, M. (2010). Corporate Social Performance and Innovation with High Social Benefits: A Quantitative Analysis. *Journal of Business Ethics*, 94(4), 581–594. <https://doi.org/10.1007/s10551-009-0339-y>
- Walton, C. C. (1967). *Corporate social responsibilities*. United States of America: Wadsworth Publishing Company
- Wartick, S. L., & Cochran, P. L. (1985). The evolution of the corporate social performance model. *Academy of Management Review*, 10(4), 758–769.
- Waterhouse, B. C. (2017). The personal, the political and the profitable: Business and protest culture, the 1960s-1980s. *Financial History*, Spring, 2017, 14–17
- Wegrich, K. (2019). The blind spots of collaborative innovation. *Public Management Review*, 21(1), 12-20.
- Willard, B. (2002). *The Sustainability Advantage: Seven Business Case Benefits of a Triple Bottom Line*. New Society Publishers, Gabriola Island, BC.
- Wolf, R. (Ed.). (2014). *Empowering organizations through corporate social responsibility*. IGI Global.
- Wood, D. J. (1991). Corporate social performance revisited. *The Academy of Management Review*, 16(4), 691–718
- Wooldridge, J. (2012). *Introductory econometrics: A modern approach*. Cengage Learning.

- Xu, Z. (2020). Economic policy uncertainty, cost of capital, and corporate innovation. *Journal of Banking & Finance*, *111*, 105698. <https://doi.org/10.1016/j.jbankfin.2019.105698>
- Yang, H. (2021). Institutional dual holdings and risk-shifting: Evidence from corporate innovation. *Journal of Corporate Finance*, *70*, 102088. <https://doi.org/10.1016/j.jcorpfin.2021.102088>
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of management review*, *27*(2), 185-203.
- Zhang, Z., Xie, X., & Qi, B. (2019). Independent or Collaborative Innovation: Evidence from Chinese Mobile Internet Firms. *The Journal of Comparative Economic Studies*, 121-140
- Zheng, Y., & Lee, H. H. (2018, July). Why steve jobs avoided CSR: the impact of CSR on innovation. In *Academy of Management Proceedings* (Vol. 2018, No. 1, p. 12679). Briarcliff Manor, NY 10510: Academy of Management