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The impact of Corporate Social Responsibility on Corporate Risk Taking and Firm Value

An empirical study on the public listed European companies

By

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Abstract

Title:	The impact of Corporate Social Responsibility on Corporate Risk Taking and Firm Value.
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Key words:	Corporate social responsibility; Corporate Risk Taking; Firm value; ESG score; Stakeholders
Purpose:	The aim of the study is to shed light on how CSR activities affect firm value through its impact on corporate risk taking.
Methodology:	We formed a panel data sample based on the European market and analyzed it by random effects models.
Theoretical Perspective:	The theoretical frameworks of this thesis are Stakeholder theory, Shareholder theory, Agency theory, and Risk management theory.
Empirical Data:	The sample consists of all the public listed European companies which disclosed ESG score within the period from 2014 to 2018.
Conclusion:	We find that the joint effect of CSR and corporate risk taking has a positive impact on firm value. In addition, by investigating the relationship between CSR performance, the deviations from the optimal risk taking, and firm value, we find that involving in CSR activities reduces the deviation from the optimal risk taking which increases the firm value.

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Yao Chen Kliti Celniku

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1. Introduction

Over the last decades, the importance of corporate social responsibility (CSR) has been growing (Gramlich & Finster, 2013). The attention toward CSR started from the academics such as Bowen et al. (1953), Carroll (1979), Jonson (1971) and nowadays an increasing number of firms consider CSR as a priority by issuing a sustainability report. According to Eurosif (2018) , there is a market of over €4 trillion of assets under management which has integrated some form of CSR. Furthermore, this report states that the impact of social responsibility investments (SRI) has been grown from €20 billion assets in 2013 to €108 billion assets in 2018 which means a 52% increase in the last 6 years in Europe.

However, because of the huge focus in CSR, a debate among academics has sparked regarding the role of CSR in maximizing the value of shareholders. Friedman (2007) criticize CSR by arguing that the only responsibility of the corporates is to engage in activities that increase the profits of the corporates. In addition, Preston & O'Bannon (1997) find that overinvestment in CSR is value-destructive especially when it is used by management for private benefits such as gaining bonuses and improving their reputation. On the other hand, Renneboog, Ter Horst, & Zhang (2008) argue that engaging in CSR activities may cause undervalue in the short run but it is value enhancing in the long run and CSR strategies are vital in long-term stability and success. Therefore, these contradictory findings regarding corporate social responsibility activities create confusion about whether corporates' management and investors should participate in such activities.

Furthermore, corporate risk-taking is essential to enhance the value of corporates (Banerjee & Gupta, 2017) . In addition to this, Stulz (2015) argues that there is no profit without some level of risk-taking even though excessive risk taking is considered value-destructive. Furthermore, Low (2009) consider the managerial risk taking as a serious agency problem. He argues that there are managers who are risk-averse in their investment by not investing in risky projects which are very profitable

for their shareholders. Similarly, John, Litov, & Yeung (2008) find that conservative risk choices are associated with self-interest motives such as protecting their career or using the resources of the firm for their personal use. On the other hand, shareholders are focused on any positive net present value (NPV) project, without considering the risk (Faccio, Marchica, & Mura, 2011). However, risky and profitable projects are in the interest of shareholders because it increases the value of the company.

There are very few researches which explain whether CSR activities affect firm value through the impact on corporate risk-taking (Ayadi et al., 2015; Harjoto & Laksmana, 2018; Sassen & Hinze, 2016). Therefore, we investigate how the association of CSR with corporate risk-taking can affects the firm value in Europe. We choose Europe because there are limited research studies in Europe and according to Ho et al. (2012) European companies are leaders in disclosing CSR information, especially after European Commission has passed several directives that promote CSR among European firms in 2013. For this reason, the period from 2014-2018 is chosen. Our main dependent value is Tobin's Q which measures the firm value and we use environmental, social, governance (ESG) score which measures CSR activities, as our main explanatory variable. In addition, capital expenditure, research and development, investments, corporate cash holdings and stock returns volatility capture the corporate risk-taking.

Using a large dataset of European firms within the period from 2014 to 2018, we find that a negative association between CSR and corporate risk-taking has a positive impact on firm value. In addition, by investigating the relationship between CSR activities and deviation from the optimal risk taking and how this relation effects firm value using Harjoto & Laksmana (2018) model, we find that involving in CSR activities reduce the deviation from the optimal risk-taking which cause an increase in the firm value. As a result, our findings provide evidence that is engaging in CSR activities help in balancing the corporate risk-taking toward the optimal risk-taking which is the risk that the management of a firm should take to maximize their shareholder value. Therefore, our thesis contributes to the literature that performing

CSR activities serves as a control mechanism to prevent managers from pursuing excessive risk-taking or risk avoidance which help in enhancing the firm value. Also, our paper contributes to the existing literature by analyzing how CSR performance affects firm value through corporate risk-taking.

This paper is constructed as follows: Section 2 presents a brief review of the history of CSR concept and further discussion of relevant literature which is followed by Section 3, where we develop the research hypotheses based in the theoretical background. In Section 4, we present the framework of measuring corporate social responsibility. In addition section 5 explains empirical methods while section 6 includes data sample and data description. Moreover, section 7 explains the empirical result including different diagnostic test description. This thesis concludes in section 8 with a summary of the empirical findings, a discussion of their contribution, and a description of the limitations and recommendations for further researches on this topic.

2. Literature Review

In the second section, we present the previous studies which serve as a point of reference for this thesis. First, a brief summary of the root of the corporate social responsibility concept will be given. Second, further discussion of previous research studies that have been reviewed will be presented. There are similar studies that have investigated the relationship between CSR activities, risk taking, and firm value.

2.1 Corporate Social Responsibility

According to Carroll (2008) , corporate social responsibility concept dated from the 20th century and for many years it was referred to as social responsibility (SR) instead of corporate social responsibility (CSR) because the corporation's prominence in the business sector had not yet been occurred. One of the first author who wrote and articulate a definition for social responsibility was Howard R. Bowen (1953, p.6) who stated "[i]t (SR) refers to the 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". He also included some suggestions in his book about the implementation of SR in businesses through changes in the composition of the board of directors, social education of the managers, and development of the business code of conduct.

During the 1970s, Johnson (1971, p.50) stated, "[a] socially responsible firm is one whose managerial staff balances a multiplicity of interests. Instead of striving only for larger profits for its stockholders, a responsible enterprise also takes into account employees, suppliers, dealers, local communities, and the nation.", which is closer to the stakeholder theory because he mentioned not only the interest of the shareholders but also the interest of all the parties which have a connection with the company and the society as a whole which nowadays are called stakeholders. Furthermore, another author that added to the body of knowledge of CSR was Carroll (1979, p.499) who presented a conceptual framework based on economic, legal, ethical, philanthropic

responsibilities of a firm which were used later as the components of the *pyramid of CSR*. In addition, legislative initiatives were made to create laws dealing with the safety of product and employees, protection of the environment, and employment discrimination (Carroll, 1999).

Furthermore, in the 1980s, the interest in CSR was increased, and some researches were made. One of the first researches was about the relation of CSR and financial performance by Cochran & Wood (1984) who had the objective to find whether socially responsible firms were also profitable firms. They have used the reputation index as a proxy for CSR but also accepted the weaknesses of this CSR measure. As a result, they have found a correlation between asset age and CSR, but it was a weak link. Moreover, during this period, Aupperle, Carroll and Hatfield (1985) investigated the relation between CSR and profitability. They used a forced-choice survey in 818 CEOs who were listed in Forbes and got around 240 usable responses which served to conclude that a negative relationship between CSR and firms' profitability exists.

Besides, Wartick & Cochran (1985, p.758) extended the conceptual framework of Carroll (1979) into a framework based on principles, process and policies where, as principles were the ethical components of social responsibility, as process was the social responsiveness and as policies were social issues management. Moreover, differently from the other periods, in the 1980s, business practices towards employment discrimination, environmental pollution, employee health and safety, consumer abuses, and work-life quality were shown up. It means that CSR has taken the interest of the business world and according to Carroll (2008) one of the reasons was because of the ethical scandals reported in that time which took the public's attention to corporates wrong-doings.

The concept of CSR during the 1990s was used as point-of-departure for other supplementary concepts and themes such as corporate social performance (CSP),

stakeholder theory, business ethics, and sustainability (Carroll, 1999). However, many global companies were created during this period and brought in the literature new concepts such as corporate reputation, community partnership, corporate social policy, and global social investment. Furthermore, a non-profit organization BSR (Business for Social Responsibility) was founded to guide global companies toward CSR professionally. In the 1990s many small companies became larger and well-known because of excellent reputation in CSR practices such as McDonald's, Nike, IBM, Coca-Cola, UPS and many other according to Carroll (2008).

In the 21st century, the contingency theory of corporate social responsibility presented by Husted (2000) stated that CSP is successful when the nature of the social issue and the response is matched, so the strategy depends on the nature of the social issue. Moreover, CSR became a global phenomenon in the 2000s, and as a result, many different definitions were found and studied. For example, Dahlsrud (2008) found that the most used definition was by Commission of the European Communities (2001) which describes Corporate Social Responsibility as "[a] concept whereby companies integrate social and environmental concerns in their business operations and their interaction with their stakeholders voluntarily". This definition includes five dimensions of CSR, which are Voluntariness, Stakeholder, Social, Environmental, and Economic.

2.2 Corporate Risk-Taking

The term *Corporate risk-taking* in this paper is not referred to as risk that is destructive for the value of the firm, but it is referred as a value-enhancing investment which is in line with (Banerjee & Gupta 2017; John, Litov & Yeung, 2008). Similarly, Stulz (2015) found that not all risks are detrimental to the firm value, but there are *favorable* risks, which helps in value-enhancing by reducing uncertainties and bringing positive returns on investment. According to (Laeven & Levine, 2009; Banerjee & Gupta, 2017; John, Litov, & Yeung, 2008, Stulz, 2015) maximizing shareholder wealth needs a better risk management which depends on the governance

structure of the firm such as capital regulations, ownership structure, the protection of investors and the regulations. However, evaluating the risk as ex-ante is very difficult. Even though there are some research papers which have studied the different control mechanism such as management compensation, investor protection, and regulation and linked them with corporate risk-taking.

Additionally (Smith, 1985; Guay, 1999; Hall & Liebman, 1998; Sanders & Hambrick, 2007) studied the impact of equity-based competition of managers in risk-taking incentives and found that equity-based compensation encourages the managers to take risky projects since they are based on managers' performance. Moreover, Bova et al. (2015) studied the relation between stock held by non-executive employees and corporate risk. Their results showed that increasing the amount of company stock owned by non-executives employees, decrease the corporate risk, which was consistent with previous research studies and proves a negative relation between stock compensation and corporate risk-taking incentives. Moreover, Faccio, Marchica and Mura (2011) studied the impact of large shareholder ownership on corporate risk-taking and concluded that the large shareholders who hold smaller equity stakes tend to have a lower level of risk-taking through holding more diversified portfolios.

Moreover, extending the research of La Porta et al. (1997, 1998) which studied the impact of the legal environment in country's capital market, John, Litov and Yeung (2008) investigated the relationship between corporate governance and risk-taking for 39 countries over the period 1992 to 2002. Therefore, they have found a positive relationship between risk-taking and growth and also between firm-level, country-level, and risk-taking measures. Furthermore, the empirical findings show that better investor protection environment leads to excess risk-avoidance and for stakeholders is harder to reduce risk-taking incentives for their self-interest. On the other hand, Acharya, Amihud and Litov (2011) studied the effect of creditor rights in corporate risk-taking with a cross-country analysis. Their empirical findings showed that

countries which have strong creditor rights lead firms to reduce risk by undertaking diversifying acquisition, which means that there is a negative relationship between creditor rights and corporate risk-taking.

Furthermore, after Sarbanes Oxley Act (SOX) was passed in the U.S.A. in 2002 which required more independent directors and more internal controls, Bargeron, Lehn and Zutter (2010) studied how the new regulations would affect the risk taking. Their empirical results showed a significant reduction in corporate risk-taking after the passage of the Sarbanes Oxley Act (SOX) of 2002. Therefore, it means that the provisions of SOX, such as an expanded role of independent directors, an increase in the director and management liability, and an increase in rules of internal controls, can bound corporate risk taking.

2.3 CSR and Firm Value

As mentioned above, the empirical researches in CSR have started in the 1980s and continue nowadays, and as a result, there are many empirical papers which have studied the relation of CSR and firm performance while on the contrary, the relationship between CSR and firm value is less examined. However, most of the researches that studied the relation between CSR and firm value have found a significant positive relation (Jo & Harjoto, 2011; Cheung et al., 2013; Servaes & Tamayo, 2013; Aouadi & Marsat, 2018; Buchanan, Cao and Chen, 2018; Jiao, 2010). Jo & Harjoto (2011) studied the impact of corporate governance in corporate social responsibility activities and firm value finding a strong positive relationship between internal and external corporate governance and CSR and also between CSR and firm value. Also, their empirical findings showed that CSR activities in internal social improvement within the firm increase the value of firm more than other CSR engagement in broader external social enhancement. In addition, Cheung et al. (2013), investigated how corporate ownership affects the relation between CSR and firm value, and argued that the relation between CSR and firm value matter less in firms with concentrated ownership although it is positively significant. Finally, Jiao (2010)

found a positive relationship between stakeholder welfare, represented by environmental performance and employee welfare, with firm value.

Moreover, Servaes & Tamayo (2013) investigated the impact of CSR in firm value, taking into account the role of customer awareness in U.S companies during the 1991-2000 period. Using three types of CSR scores, (CSR conservative, CSR with industry, and CSR with industry and product) advertising intensity and R&D intensity to proxy the customer awareness, they found that firms with high customer awareness have significant positive relation between CSR and firm value. In addition to this, Aouadi & Marsat (2018) , who studied the impact of environmental, social, and governance (ESG) controversies in firm market valuation from 2002 to 2011 using a worldwide sample, have found that higher CSP score has an impact on market value only for high-attention firms. This means that the larger firms perform better, especially when they are located in countries with greater media freedom, are more searched on the Internet, and are more followed by analysts.

On the other hand, some authors (Marsat & Williams, 2011; Buchanan, Cao & Chen, 2018) disagree with the previous result and have found a negative relationship between CSR and firm value. Using a worldwide sample for the period from 2005 to 2009 and using MSCI ESG database to proxy CSR behavior of firms and FactSet database for financial data, Marsat & Williams (2011) found that costs of CSR activities exceed the benefits from the firm perspective. As a result, for this reason, CSR and firm value have a negative relationship. Furthermore, Buchanan, Cao and Chen (2018) investigate the relation of CSR and firm value during the financial crises of 2008 and how institutional ownership (IO) affects this relation. They used a triple difference approach (DDD) to find the impact of CSR and IO in firm value, and the empirical results showed that CSR firms experience more loss in firm value during the financial crisis compared with non-CSR firms. Additionally, they also found that

CSR and firm value relationship depends on the level of influential institutional ownership.

Moreover, there are also some authors who have not found a significant relationship between CSR activities and firm value (McWilliams & Siegel, 2000; Mulyadi & Anwar, 2012). McWilliams & Siegel (2000) used the model of Waddock & Graves (1997) and included the R&D expenses to investigate the relation between CSR and firm value. Their empirical findings, which consist of 524 firms, showed that CSR and firm value have no relationship. Additionally, Mulyadi & Anwar (2012) who used a double linear regression model and usage of GRI to proxy CSR and Tobin's Q to measure firm value, presented the same result as McWilliams & Siegel (2000) that between CSR and firm value do not exist a significant relationship.

Chen & Lee (2017) have studied the influence of CSR in firm value in Taiwan to find whether CSR has to exceed a threshold in order to add value to the firms. They have used corporate social responsibility index (CSRI) for listed companies in Taiwan Stock Exchange for the 2010-2013 period as the proxy for corporate social responsibility. Using a panel smooth transition regression (PSTR) in order to determine the value transition threshold that investment in CSR should exceed to create value for corporates, they conclude that the CSR and firm value have a non-linear relationship even-though are positively correlated. Also, they have found that the threshold value of CSRI is around 13 for firms in Taiwan, which have to be exceeded so that CSR investment can add value in the firm. Otherwise, firms will not experience notable benefits.

Finally, as can be seen, most of the research papers have found a positive relationship between corporate social responsibility engagements and firm value. However, as the previous researches showed, there are some empirical findings which have found different results such as negative, non-linear or no relationship between CSR and firm

value that present an inconsistency in the literature about the relationship between corporate social responsibility and firm value.

2.4 CSR, Corporate Risk-Taking and Firm Value

There have been some attempts to find the relationship between corporate social responsibilities, managerial risk-taking incentives, and firm value. Studies have been applied in various markets but mostly in the United States, resulting in different relationships and interpretations. Therefore, it is a gap between the studies that found a positive relationship with those which found a negative relation between CSR and risk-taking, which will have an impact on the firm value too.

Ayadi et al. (2015) investigated the relationship between corporate social responsibility (CSR) and managerial risk-taking, considering the differences in the governance structure. They used a sample of 1959 U.S. firms from 1995 to 2009. Using many ordinary least square approaches, they found that firms with high CSR strength scores engage in higher risk-taking activities while the firms with high CSR concerns score engage in lower risk-taking activities which means that they are positively related. Moreover, they found that corporate governance accentuates the relation between CSR and risk-taking and conclude that CSR is value-enhancing based on previous literature.

Harjoto & Laksmana (2018) studied the impact of corporate social responsibility on risk taking and how it will affect directly and indirectly the firm value. They used two types of regression, multivariate regression to find the effect of CSR on the deviation from the optimal risk-taking and path regression to examine the direct and indirect impact of corporate social responsibility on firm value. Therefore, the empirical findings showed that corporate social responsibility is negatively associated with deviation from the optimal risk-taking. Furthermore, path regression results shown a significant positive indirect link between CSR and firm value. Harjoto & Laksmana

(2018) conclude that CSR reduces deviation from optimal corporate risk-taking, which increases the firm value indirectly.

Similarly, Sassen & Hinze (2016) investigated the impact of corporate social responsibility on market-based firm risk in Europe. Using panel data regression model, they found that higher corporate social performance decreases total and idiosyncratic risk. Furthermore, based on their empirical findings corporate social performance had a significant negative relationship with all risk measures, therefore, they conclude that higher corporate social performance can lead to an increase in the value of the firm through lower firm risk.

3. Theoretical Framework and Hypothesis Development

In this section, the theoretical framework will be thoroughly explained. We start by describing various theories such as stakeholder theory, shareholder theory, agency theory, and risk management theory. Then we explain the theoretical relationships between CSR, corporate risk-taking, and firm value. Lastly, we formulate our research hypotheses.

3.1 Theoretical Framework

3.1.1 Stakeholder Theory

According to Donaldson & Preston (1995), the idea of corporate stakeholders has now become common place in different fields of literature. Initially, Freeman (1984, p.53) defined a stakeholder of a firm is "[a]ny individual or group who can affect or is affected by the achievement of an organization's purpose," and he pointed out that the managers of the organization need to identify all stakeholders and strategically balance their interests. Also, Freeman (1984, p.25) defined primary stakeholders to the firm include customers, communities, employees, suppliers and shareholders and secondary stakeholders, which consists of government, competitors, media and other special interest groups, to the firm. For primary stakeholders, that are the shareholders, the continuing participation of those groups is necessary for the survival of the corporation. While for secondary stakeholders, that includes customers, investors, creditors, and society, can significantly harm or improve the performance of the corporation which is not essential for the survival (Wijnberg, 2000).

In contrast to the shareholder theory, which argues that the main responsibility of corporate managers is to maximize shareholder wealth, the stakeholder theory requires managers to consider all stakeholders while the shareholder is one of them (Freeman, 1994). The stakeholder theory claims that since all stakeholders jointly affect and participate in the development of the corporation, thus the primary

objective of corporates' managers is to maximize all stakeholders' wealth because that is the best way to maximize the wealth of shareholders (Freeman, 1994).

3.1.2 Shareholder Theory

According to Friedman (1962), corporations have no responsibility to the public or society and the only responsibility of corporations is to generate profits for their shareholders. Also, the corporates' managers should act as employees to the shareholders, which means managers should act only to shareholders' interest and use the corporate funds in ways that are authorized by shareholders. As for the reason of this argument, Friedman (1962) pointed out that shareholders expect to receive returns, so they invest in corporations, while managers are spending corporations' funds which are owned by shareholders to engage in different activities. Therefore, shareholders take risks for their investing. For instance, if the corporations appear financial crisis, the capitals that owned by shareholders suffer first so that shareholders have assets-damaged risk (Fontrodona & Sison, 2006). Furthermore, advocates of shareholder theory argue that shareholders have property right which should be protected. If managers use resources for other purposes rather than to increase shareholders' wealth, then this is undermining shareholders' private property because shareholders as the property owners lose their rights to decide how to use this resources (Sternberg, 2004).

From the perspective of shareholder theory, the primary responsibility of corporate managers is to maximize their shareholders' wealth. Thus managers' decisions on investing in activities should be based on directly generating profits for shareholders (Friedman, 1962).

3.1.3 Agency Theory

Jensen & Meckling (1976) defined the agency theory as an interest conflict between principles (owners) and agents (managers) due to the separation of corporate ownership and control rights. Also, in agency theory, information is like a commodity

which is costly and can be purchased, sold, and transferred to other parties (Eisenhardt, 1989). Thus, when agents are motivated to make decisions based on their own benefits like secure their reputations rather than on behalf of principles to maximize principle's profits, information asymmetry problem occurs (Jensen & Meckling, 1976). Also, because of information asymmetry problem, which argues that agents have more information than principles since managers are the ones who make decisions on running the business, there are two main problems associated with this agent-principle relationship. First, it is expensive and difficult for principles to regulate and monitor agents' behavior, and second, agents and principles may have different desires toward financial goals (Eisenhardt, 1989). Therefore, it is not easy for principles to verify what agents are really doing and whether they make decisions properly or not.

Furthermore, Jensen & Meckling (1976) argued that due to the different attitudes toward risk between agents and principles, they might prefer different investing and operating projects which also leads to interest conflicts. Thus, in order to make agents' interests in line with principles', normally, incentive and compensation contracts are generated. However, such contracts can cause worse problems such as when agents are over-motivated and exhibit excessive risk-seeking behavior (Eisenhardt, 1989).

3.1.4 Risk Management Theory

Corporate total risk can be divided into two components, systematic risk, and idiosyncratic risk (Sharpe, 1964). Systematic risk represents companies' sensitivity to general market movements such as government policy, international economic forces, and acts of nature. Thus, systematic risk cannot be diversified since companies have no power to control those external factors. On the contrary, idiosyncratic risk is related to firms' specific characteristics and managers can minimize this risk through different portfolios (Sharpe, 1964).

According to risk management theory, risk is defined as the possible variation of expected portfolio returns and firms engage in risk management activities to reduce risk and add value since market imperfections make volatility costly (Panaretou, 2014). From Lintner's (1965) view, the best possible diversification strategy is the one which produces the most desirable portfolio, and with the most favorable combination of risk and expected return, but it will never be the strategy with the lowest attainable risk. In this case, for corporate managers, the responsibility related to diversification issue is that they have to make decisions on what set of business to be in and how to manage the linkages among those businesses (Montgomery & Singh, 1984). Thus, corporate risk taking may differ regarding different corporate portfolios.

3.2 Hypothesis Development

A large number of previous empirical researches focus on studying the relationship between CSR and firm value, but very few have studied the impact of CSR on firm value through corporate risk taking. Our article mainly analyzes whether there is a difference in corporate risk taking with various firm CSR performance and how it affects firm value.

3.2.1 CSR, Corporate Risk Taking, and Firm Value

First, from the perspective of the stakeholder theory, CSR engagement could be seen as an outcome of stakeholder management. The reason is that CSR activities can improve a corporation's relationship with key stakeholders and enhance the image, which brings an intangible brand value (O'riordan & Fairbrass, 2008; Brown & Forster, 2013). However, all corporations have limited resources, and CSR engagement is costly. In order to meet the regulatory requirements of CSR engagement and in the meantime satisfy both investing and non-investing stakeholders, corporate managers have to make decisions on resources' allocation towards different operating and investing projects (Mason & Simons, 2014). In this case, CSR investments serve as a control mechanism to balance the interests of

multiple groups of stakeholders, and lead to more equal resource allocation (Mason & Simons, 2014). With corporations' efforts on CSR performance (i.e., interest-balancing and equally resource allocation), the contribution willingness of stakeholders will increase and investors will value corporations' brand images as well. Therefore, by increasing their investments and corporations, they will have more resources for management to run business. Also, corporate financial constraints decreases which lead to a lower corporate risk taking (Brown & Forster, 2013).

Second, from the perspective of risk management theory, firms with a high level of CSR performance indicate that they value their stakeholders more than other companies, thus in return, the close relationship between the corporation and stakeholders tends to generate moral capital since stakeholders will be more loyal to the company. According to Godfrey (2005) moral capital can provide firms with insurance-like protection when organizations have poor performance regarding operating, financing, or other aspects. Therefore, CSR leads to lower financial risk because stakeholders act less sensitive to negative news about the corporation (Sassen et al., 2016.). Thus, it is less likely for investing stakeholders to reduce investment and for non-investing stakeholders to give up the engagement with the company. Moreover, a high level of CSR performance leads to a lower level of corporate risk taking because CSR can strengthen employees' trust and faith of organizations and employees are less likely to resign under unsatisfied corporate operating performance or even worse, under financial distress (Godfrey, 2005).

Based on the two paragraphs above, we conclude that according to stakeholder theory and risk management theory, a better CSR performance leads to a lower corporate risk taking. However, shareholder theory is on the opposing side because shareholder theory requires managers to only focus on shareholders' needs and argues that corporations have only responsibility to shareholders (Friedman, 1962). From the perspective of shareholder theory, involving in CSR activities is a loss to shareholders because CSR engagement does not generate direct profits to them. Also, engaging in

CSR activities spend corporate resources (i.e., labor, time, and funds), and managers have fewer resources to invest in more risky and profitable projects. Thus, the disadvantages of CSR engagement is more than its benefits (Friedman, 1962).

As for the nature of the relationship between corporate risk taking and firm value, from the perspective of agency theory, due to the separation of corporate ownership and control rights, there always exists interest conflicts between agents and principles (Jensen & Meckling, 1976). Because agents run the business with spending principle's funds, so agents have more information than principles which it is called information asymmetry problem. In order to lower the risk, the agents make decisions on their own benefits rather than maximize shareholder wealth, principles usually spend too much funds in order to regulate and limit agents' behavior such as establishing internal monitoring department. Thus, it could bring agency costs to firms (Wiseman & Gomez-Mejia, 1998). Also, according to risk management theory, market imperfections make volatility costly. Furthermore, corporations engage in risk management activities to reduce risk and add value (Panaretou, 2014). Therefore, we conclude that risk is negatively related to firm value.

Previous papers widely studied the relationship between CSR and firm value, but the conclusions are inconclusive. However, only a few articles studied how CSR affected firm value, like under which circumstances or through which mechanisms. Porter & Kramer (2006) support a positive relationship between CSR and firm value. They argue that CSR engagement can reinforce corporate strategy. Specifically, it can mitigate harm from value chain activities and enhance competitive advantage. On the other hand, according to Sprinkle & Maines (2010), by involving into CSR activities, corporations may obtain contracting benefits like helping recruit, motivate, and retain employees, especially for the talents. Also, it can increase customers' purchasing desire and bring a price premium through brand value. As for those academic researchers who support a negative relationship between CSR and firm value (Orlitzky et al., 2003; Barnett, 2007), they represent an argument on the cost of CSR

because CSR activities consume corporations resources like working capital, available funds, operating time and manual work. And it may take a long time for firms to accumulate awards on its CSR efforts since public need time to perceive and understand the intangible value.

In our paper, based on the discussed theories above, we predict CSR has an indirect impact on firm value through the effect of corporate risk taking. Thus, our first hypothesis (H_1) is:

Hypothesis H_1*: CSR is positively related to firm value considering the negative impact of corporate risk-taking.*

3.2.2 CSR, Optimal Corporate Risk Taking, and Firm Value

In this section, we go one step further. Based on the study of Harjoto & Laksmana (2018), we consider that there is an optimal corporate risk taking. Instead of corporate risk taking, there are excessive corporate risk taking and insufficient corporate risk taking caused by managers' risk-seeking and risk aversion behavior (Wiseman & Gomez-Mejia, 1998). Also, we will use the theories in *section 3.1* to explain the relationship between CSR, optimal corporate risk taking, and firm value.

From the perspective of stakeholder theory, society is a part of the corporation's stakeholders. Thus, firms also need to consider their contribution to the public. In this case, corporations choose to involve in CSR activities to show their responsibility to society. According to O'riordan & Fairbrass (2008), CSR engagements can bring corporations many advantages regardless of its costs. With the benefits like building a close relationship between corporations and stakeholders, and bringing a better brand image, corporations can attract more investors and access to more resources controlled by their stakeholders which decreases the financial constraints and excessive risk (Brown & Forster, 2013). On the other hand, shareholders invest in corporations because they expect to receive returns, however, when managers intentionally reduce investments to lower risk and to secure their reputation,

shareholders may refuse to share more resources that controlled by them since managers are risk aversion (Wiseman and Gomez-Mejia, 1998). Which means, even if managers have more resources, they are still refuse to invest in more projects because they refuse to take more risk while risky projects may bring more profits. Therefore, excessive risk avoidance makes firms less attractive, and this limits the availability of funds (Harjoto and Laksmana, 2018). However, making CSR activities as a requirement, will force managers to balance different groups of stakeholders' interests and allocate resources more equally, and as a result, managers' decision-making will be more limited toward a certain risk-taking level so they will increase the risk taking level if they are risk averse and will decrease the risk taking level if they are risk seeker (O'riordan & Fairbrass, 2008). Therefore, CSR reduces both excessive risk taking and excessive risk avoidance.

On the other hand, according to Amihud & Lev (1981), managers' have *employment risk* which includes losing job or professional reputation, and this risk cannot be diversified by their own portfolio since it cannot be traded on markets. Therefore, managers tend to lower firm risk to minimize their own risk, and this risk reduction behavior was tested by an empirical test which proves that it damage firm value (Amihud & Lev, 1981). Also, Smith & Stulz (1985) pointed out that part of the reasons why firms engage in hedging activities is due to managerial risk aversion which furthermore supported the argument that excessive risk avoidance does cause losses. In order to encourage managers to work diligently, various incentives and compensation contracts that aim to alleviate managers' insufficient risk taking, are generated and inversely, managers may over-motivated and act bolder on running the business (Wiseman & Gomez-Mejia, 1998). Also, according to Bhagat & Bolton (2014), executive compensation programs are not always effective because top managers sometimes are too confident and over-optimistic. Therefore, the incentives and compensation contracts may lead to induce risk preference, and managers act either excessively conservative or excessively aggressive which increases the monitoring costs and other costs (Hirshleifer & Suh, 1992).

In our paper, we measure the deviations from optimal corporate risk taking as the absolute value of error terms. Thus, we both include the excessive risk taking and excessive risk avoidance conditions, and we estimate the optimal point by using the model of Bargeron's , Lehn and Zutter (2010) model. Based on the theories discussed above, we expect that when the risk-taking level is above the optimal point, a better CSR performance will lead to a lower firm risk-taking while when it is below the optimal point, CSR forces managers to increase the risk-taking level. Therefore, our second hypothesis (H_2) is:

Hypothesis H2*: CSR is positively related to firm value through the negative impact of CSR on the deviations from the optimal corporate risk-taking.*

4. CSR Framework

As the purpose of our paper is to show the impact of CSR activities to corporate risk taking and how it affects firm value, so we measure firms' CSR performance by using the ESG data from Eikon database from Thomson Reuters as a proxy which is similar to some recent research studies (Sassen & Hinze, 2016; Garcia et al., 2017; Velte, 2017). One of the reasons that we choose this database is because it contains over 7,000 ESG rating data for different companies around the world, dating from 2002 (Thomson Reuters, 2019).

Thomson Reuters (2019) calculates more than 400 ESG indexes in each company and narrowed down to a subset of 178, which are the most comparable measures for corporate assessment. These indexes come from firms' CSR reports, annual reports, non-governmental organization, company websites, and other sources. Therefore, the measurements are grouped into ten different themes, such as emissions, resource use, human rights, workforce, management, etc. These ten categories are weighted proportionately, and create the three pillar of ESG score which are environmental, social and governance.

Furthermore, there are three ESG scores in this database where the first one is *ESG score* which measures company's ESG performance regarding the data reported and the second one is *ESG combined score* (ESGC) which combines the *ESG score with ESG controversies* score to provide a comprehensive evaluation of the companies regarding the sustainability. *ESG controversies* scores are based on 23 different media topics in which the companies can be involved, and can effect ESG rating (Thomson Reuters, 2019). As a result, in order to include all the most accurate ESG variable, we use ESG combined score (ESGC) in our paper.

As mentioned before, ESG scores are formed by three pillars, which are environmental, social, and governance score. The environmental pillar score (ENS) measures how the companies affect both natural living and non-living environment, including air, water, and land. Through different measures in three categories which

are resource use, emissions and innovation, Thomson Reuters (2019) represent the commitment of companies in developing eco-efficient products and services, reducing environmental emissions, and use the natural resources in the best way through their production process. Some of the indicators used to calculate environmental score are CO2 emissions, use of nuclear energy, amount of environmental R&D expenses, the total amount of waste, and many others.

The social pillar score (SOS), shows the capacity of the companies to create loyalty and trust within its employees and also with customers and society overall (Thomson Reuters, 2019) . This score includes four categories, which are the workforce, human rights, community, and product responsibility. The workforce which represents the highest weight of the SOS (16%), measures the quality of job conditions, including a healthy and a safe workplace. Human rights measure the commitment of companies to respect the fundamental human rights with their employees. Moreover, through community indices, Thomson Reuters (2019) treats issues of anticompetitive behavior, business ethics (corruption, political bribery), intellectual property (patents), public health (safety of third parties, industrial accidents), tax fraud (money laundering), and undemocratic countries that do not respect fundamental human rights. Lastly, product responsibility measures complaints, health, safety, and privacy of customers toward the products and services of the companies and reflect the commitment of management to produce quality goods and services.

The corporate governance pillar score (CGS), represents the ability of companies to ensure board members and executives who act in the best interests of the long-term shareholders. It consists of three categories, which are management, shareholder, and CSR strategy. Management indices measure the practices of corporate governance principles that are followed by companies. Shareholders measures show the company's effectiveness to treat shareholders equally and the use of antitakeover devices. Furthermore, CSR strategy measures capture the integration level of economic, social, and environmental dimensions into day-to-day decision-making processes (Thomson Reuters, 2019).

Overall, we think ESG combined score (ESGC) from Thomson Reuters database is a suitable proxy for corporate social responsibility performance. Moreover, because it may take a long time for firms to accumulate awards on its CSR efforts since public need time to perceive and understand this intangible value, so we use one year lagged EGSC score as our primary independent variable.

5. Empirical Method

In this section, the method of analyzing the relationship between CSR, managerial risk-taking and firm value is showed. We present two empirical models which are used to conduct the test of the hypothesis. First, we test whether CSR has a positive relationship with firm value through a negative impact of managerial risk-taking. Second, we use the regression model of Bargeron, Lehn, & Zutter (2010) and the technique of Harjoto & Laksmana (2018) to test our second hypothesis, whether CSR is positively related to firm value considering the deviations from the optimal managerial risk-taking level.

5.1 Testing for hypothesis 1

In order to test our first hypothesis, the regression equation (1) is structured:

$$TobinsQ_{i,t} = \beta_0 + \beta_1 ESGC_{i,t-1} + \beta_2 Risktaking + \beta_3 ESGC * Risktaking + \beta_4 Z_1 + \varepsilon_{i,t} \quad (1)$$

In this model, the dependent variable is the firm value measured by Tobin's Q which is calculated as the sum of Market Capital and Total Debt divided by Total Assets of the Firm. In addition, explanatory variables are ESGC, Risktaking, and ESGC*Risktaking. As it mentioned before, ESGC represents the ESG combined score which is the variable to measure CSR activities while Risktaking represents the variables that capture managerial risk-taking such as capital expenditure, research and development, investment, company cash holdings and stock returns volatility. Moreover, in this regression model we have included the interaction term, the multiplication of ESGC score with Risk taking variables, which is used to capture the indirect impact of CSR in firm value through corporate risk-taking. In addition, Z_1 is the vector of the control variables for firm value and risk-taking, which are included to make the model more accurate.

Furthermore, β_1 is the coefficient which shows the change in Tobin's Q by one unit change in ESGC score, while β_2 shows the change in Tobin's Q by one unit change in

risk taking variables. However, because we have included the interaction term, the coefficient β_3 shows by how much units the Tobin's Q changes when one unit changes in ESGC score and corporate risk-taking variables together. To elaborate, if risk taking has more impact on firm value than CSR in firm value, β_3 will be negative and vice versa. Therefore, β_3 represents the total impact of CSR considering risk-taking into firm value. Moreover, β_0 is the constant term which shows the intercept and ε is the error term that captures the margin of error in the model.

5.2 Testing for hypothesis 2

In order to test the second hypothesis, we used the Harjoto & Laksmana (2018) technique which estimates the optimal managerial risk-taking in order to find the impact of CSR engagements in firm value through the deviation from the optimal managerial risk-taking. The following equation (2), similar to Bargeron, Lehn, & Zutter (2010), presents the regression model:

$$\begin{aligned} \text{RiskTaking}_{i,t} = {} & \alpha_0 + \alpha_1 \text{Re}\,turnIndex_{i,t-1} + \alpha_2 GDPGROWTH_{i.t} \\ & + \alpha_3 EBIT_{i,t-1} + \alpha_4 MTB_{i,t-1} + \alpha_5 Leverage_{i,t-1} + u_{i,t} \end{aligned} \quad (2)$$

We have omitted the variable of Sarbanes-Oxley Act from our model because the whole period of our study is after 2002 when the Sarbanes-Oxley Act has been presented and is based in Europe. As a result, the explanatory variables are $ReturnIndex$ which represent the FTSE Europe return index, GDP growth of Europe, EBIT which represent earnings before interest divided by average total assets and taxes, MTB refers to market-to-book value and Leverage calculated as the ratio of long-term debt to total assets. As can be seen from the equation (2) $ReturnIndex$, *EBIT*, *MTB*, and $Leverage$ are lagged by one year because these variables need more than one year to show the impact on risk-taking. Furthermore, the dependent variables are CAPEX, R&D, INVEST, CASH, and STD which represent capital expenditure, research and development expenses, total investment in capital and research, cash and short-term investment, and stock return volatility, respectively.

We obtained the error terms from the model (2) which represent the margin of errors of the model and refers to the deviations from the regression line. Therefore the error term consists of all the variables that capture managerial risk-taking because by including the market variables that affect the corporate risk-taking in the model, all the market influence in risk-taking is excluded from the error term. Therefore, we calculated the absolute value of the estimated residuals |û|, in order to capture the deviation from the optimal level of managerial risk-taking, similar to Harjoto & Laksmana (2018).

The regression equation (3) is constructed:

$$TobinsQ = \gamma_0 + \gamma_1 ESGC_{i,t-1} + \gamma_2 |\hat{u}|_{i,t} + \gamma_3 ESGC * |\hat{u}|_{i,t} + \gamma_4 Z_{i,t} + \varepsilon_{i,t} \quad (3)$$

In the model (3), same as in model (1), Tobin's Q is used as a measure of firm value and is the main dependent variable. The main explanatory variables are ESGC score, the absolute value of error terms from the model (2) and the interaction term between the ESG combined score and the absolute value of the estimated residual from the model (2). Furthermore, γ_1 is the coefficient which shows the change in Tobin's Q by one unit change in ESGC score, while γ_2 shows the change in Tobin's Q by one unit change in the optimal risk-taking variables. In addition, the coefficient γ_3 shows by how much units the Tobin's Q change when one unit of ESGC score and one unit of optimal corporate risk-taking variables change. To clarify, if the deviation of risk taking is huge then will have more impact on firm value than CSR, so γ_3 will be negative, and vice versa. Therefore, γ_3 represent the total impact of CSR considering optimal risk-taking into firm value. Lastly, γ_0 is the constant term which shows the intercept and ε is the error term that captures the margin of error in the model.

6. Data Analysis

6.1 Sample Construction

Our sample consists of all European public listed companies within the period from 2014 to 2018. However, due to the reason that financial institutions and some industries are regulated differently (e.g.banks, insurance, real estate, utilities, etc.), we removed them from our sample. First, we collected all the ESGC data from Eikon database from Thomson Reuters which has better coverage of European companies compared to other databases. After that, limited by the availability of ESGC data, we found that some countries have less than five public listed companies in the sample so we excluded them from our sample. Then, using International Securities Identification Number (ISIN), we merge the ESGC data with other financial data from Datastream and with data of governance's characteristics from MSCI database. As a result, our final sample includes public listed firms across 17 European countries from 2014 to 2018.

6.2 Variable Definition and Descriptive Statistics

6.2.1 Dependent Variable

In our paper, we use Tobin's Q as a proxy for firm value. It's calculated as the sum of market capital and total debt divided by total assets of the firm. Also, we use Tobin's Q as our main dependent variable to investigate the impact of CSR on firm value through risk taking. This method has been widely accepted and is in line with previous research studies (Velte, 2017; Lo & Sheu, 2007; Harjoto & Laksmana, 2018). We collect the date from the Datastream database. According to Lo & Sheu (2007) Tobin's Q includes price information and is defined as a ratio of market value to the replacement value of assets. Also, using Tobin's Q facilitates comparison among firms because it is no need for risk adjustment (Lang & Stulz, 1994). *Table 1* represents the descriptive statistics. As we can see, the total observation number of Tobin's Q is 3940, the minimum value is 8.074E-05 and the maximum value is 3.53 with an average value of 0.26. Also, the standard deviation is 0.21. For the minimum value, it

cannot be 0, but because Stata only represents two decimals, it is shown as 0 in the table.

6.2.2 Corporate Risk Taking

Based on previous studies (Harjoto & Laksmana, 2018; Bargeron, Lehn and Zutter, 2010; Acharya et al., 2011, Faccio et al., 2011; John et al., 2008), we use five variables to proxy corporate risk taking which are CAPEX, R&D, INVEST, CASH, and STD and we collect them from Datastream database. CAPEX is defined as capital expenditures divided by average total assets, while R&D shows the expenses for research and development divided by average total assets, and INVEST represents the total investment as the sum of capital expenditures and research and development expenses divided by average total assets. Moreover, CASH represents the cash holdings of the company, which includes cash and short-term investments divided by average total assets. All these variables provide direct measures of management decisions on corporate risk taking. Following Bargeron et al. (2010), STD represents the volatility of stock returns and is calculated manually as the standard deviation of daily stock returns.

In *Table 1*, the total number of observations for those five corporate risk taking variables are 3057, 3781, 3057, 3060, and 3071 respectively. Because all those variables except STD are scaled by average total assets, thus, the mean values are expressed as a ration as 0.04 for CAPEX, 0.03 for R&D, 0.08 for INVEST, 0.08 for CASH, and 7.46 for STD. Compared to others, the stock returns volatility has the largest standard deviation of 15.67 which illustrates that the data of STD has the most dispersive distribution. The minimum value for the former four variables are the same as 0, while the minimum value of STD is 0.01. As for the maximum value, for the former variables, they are 0.19, 3.02, 3.09, 0.37, respectively, while for STD, the maximum value is 96.83.

6.2.3 CSR Performance and the Main Independent Variable

As we mentioned before we used one year lagged ESGC score ranged from 0 to 100 from Eikon database as a proxy for corporate CSR performance. Also, we use ESGC score as our main independent variable to analyze its impact on firm value through corporate risk taking.

In *Table 1*, the total number of observations of CSR variable (ESGC) is 3241 with a standard deviation of 16.22. The minimum value of ESGC score is 7.69 which equals to grade D, while the maximum value is 93.54 which equals to grade A+ and the average ESGC score is 52.98 which equals to grade B- according to Thomson Reuters (2019). Furthermore, we count the number of firms which have a higher ESGC score than average, the result is 2892, and which means that there are 349 companies that performed worse in environmental, social and governance responsibility than average level.

Furthermore, *Graph 1* illustrates the development of companies' CSR investments during the period 2014-2018. We can see that on average, it decreased first then increased during the period 2015-2017 and then decreased again. However, the changes are significantly small, from the highest value at 53.85 in the year 2014 to the lowest value at 52.48 at year 2015.

6.2.4 Other Control Variables

Control variables of estimating optimal corporate risk taking regressions include Index Return, GDP growth, EBIT, MTB and Leverage. The Index Return is based on FTSE Europe return index gained from FTSE Rusell, and GDP data is collected from the Eurostat database which is calculated the Europe GDP growth for each year manually. Also, EBIT is computed as earnings before interest and taxes divided by average total assets. MTB represents the ratio of market-to-book value, and Leverage is the ratio of total long term debt to total assets. We use those five variables as control variables in the regressions of estimating optimal risk taking. Also, as already mentioned before, the control variables other than Return Index are lagged one year.

Furthermore, we also include Director Age, Director Gender, CEO tenure, CEO bonus, Size, and Sales growth as control variables when testing our hypotheses. For director gender, we defined it as a dummy variable that equals to 1 if the Director is a female and 0 if it is a man. For CEO tenure, it is the number of years of current CEO's tenure which equals 0 if it's less than 1 year. CEO bonus shows the bonus in Euro currency. The Size variable is measured as the natural logarithm of total assets. Lastly, sales growth is the annual growth rate of sales. In different regressions and for different purposes, we use different control variables.

In *Table 1*, for Index Return and EU GDP growth, the mean values are 9.96 and 2.21, respectively. The minimum values of EBIT and MTB are negative. Some companies have no debt because the smallest value of Leverage is 0. The age of director in our sample varied between 27 and 101 years old. We count the number of director gender and found that 483 companies have a female director that is 12.66% of the sample. Moreover, the CEO who has the longest time in a company is 53 years. For CEO bonus, the currency is euro and the average bonus is 2.17e+05. The company size is proxied by the total assets with the average value of 1.23E+08. Lastly, the sales growth has a minimum value of -7.19 while the largest value is 239.75 with a mean value of 0.19.

7. Empirical Results

7.1 Pre-Estimation

To make our model more stable and regression results more reliable, we run several diagnostic tests. Since we use five risk taking variables (CAPEX, R&D, INVEST, CASH, and STD) there are five regression for each regression model. Due to the reason that for each regression model the control variables are the same, thus we only test one of the five regressions in different models. And we perform Hausman test to choose the model between random effects and fixed effects. As the results showed in *Appendix 3*, all the P values are significantly larger than 0.05, thus we cannot reject the null hypothesis which holds for random effects model. Therefore, we use random effects model in our paper.

7.1.1 Winsorizing

In order to reduce the effect of extreme values, variables other than Index Return, GDP growth, and Director Gender are winsorized at the 1% and 99% levels. Usually, winsorized estimators are more robust to outliers.

7.1.2 Correlation Coefficients

In *table 2*, the correlation coefficients matrix is represented. There are three values above 0.5 while all the others are significantly small. The highest correlation is 0.75 and is between CAPEX and INVEST. The possible reason is that INVEST is the sum of CAPEX and R&D. Thus, they're highly correlated. Then, the correlation between Index Return and GDP Growth is 0.66 while the correlation between MB and EBIT is 0.52. All the values are less than 0.8 which shows there is no multicollinearity issue. However, in order to ensure there is no multicollinearity problem, we run the VIF test which is in the next section below.

7.1.3 Multicollinearity

According to Disatnik & Sivan (2016), when two or more independent variables are highly correlated, the multicollinearity problem occurs. Also, this problem increases the variances on the estimation of coefficients of the variables in the model, and lead

to incorrect regression results since the variables cannot be separated. Thus it is more difficult to identify the individual effects of the variables (Studenmund, 2014, p. 266). Correlation coefficients and VIF test are the most common ways to detect multicollinearity problems. If the absolute value of the correlation coefficients is less than 0.8, then the possibility of multicollinearity is low (Studenmund, 2014, p. 271). However, it is not entirely reliable. For this reason, many researchers use VIF test for further detection. VIF test (Variance Inflation factor) shows the separate VIF value for each independent variable, so it allows users to understand clearly how much variances caused by multicollinearity of the estimated coefficients. If the VIF test has a value less than 5, then there is no multicollinearity issue (Studenmund, 2014, p. 274).

In our paper, we include interaction terms to analyze the indirect impact of CSR on firm value, but interaction terms may lead to a multicollinearity problem. Therefore, we subtract the corresponding average value from each variable and then multiply them to generate the mean-adjusted interaction terms. After that, we run the VIF test (See *table 3-1*). Since all the VIF values are below 5, we conclude that there is no multicollinearity issue in our models.

7.1.4 Homoscedasticity

In a regression model, if the error terms have the same variances, it is called homoscedasticity. On the contrary, if the error terms have different variances, then is called heteroscedasticity. If a model exhibits heteroscedasticity problem, then the estimation of the coefficients is not efficient enough (Newbold et al., 2013, p. 557). To test this problem, we conduct White Test, which is proposed by Halbert White (1980).

In *table 3-2*, since all the P values are larger than 0.05, thus we cannot refuse the null hypothesis which holds for homoscedasticity on the 95% significance level. Therefore, we conclude that there is no heteroscedasticity problem in our regression models.

7.1.5 Endogenous

In regressions, if one or more independent variables are correlated with the error term, then there is an endogenous problem in the model. The endogenous problem may lead to inconsistency and biased estimations of the coefficients, and it is usually generated by omitted variables or measurement errors. One way to solve this problem is by replacing the endogenous variable with an instrumental variable (Wright, 1928). As no instrumental variable is included in the explanatory equation, and because it has to be highly correlated with the endogenous variable while not related to the error term. In order to detect whether there is an endogenous problem in our models, we run Ovtest after regression. The null hypothesis of Ovtest holds for all the explanatory variables are strictly exogenous. In *table 3-3*, we can see that all the P values are larger than 0.05, thus we conclude that at the 95% significance level, there is no endogenous problem in our model.

7.2 Empirical Analysis

7.2.1 The ESGC score, Risk-Taking, and Firm Value

Table 4 shows the results of the random effects multiple regression models which aims to test our first hypothesis (H_1) that CSR performance has a positive relationship with firm value considering the negative relation of managerial risk-taking. In order to investigate the indirect impact of CSR in firm value, an interaction variable is used. In the case of interaction variables of CAPEX, R&D, and INVEST with ESGC score, the coefficients have positive signs which show a positive indirect relationship between CSR activities with firm value measured by Tobin's Q. On the other hand, the interaction variables of CASH and STD with ESGC score, the coefficients are negative, meaning a negative relation between CSR and firm value. In addition, when transforming the coefficient by multiplying them with 100, a change of one unit in the interaction variable of ESGC score with capital expenditures, research and development, and investments, increase the firm value by 0.43%, 0.000004%, 0.28% and the indirect impact of ESGC score in firm value through company cash holdings,

and stock return volatility, reduce the firm value by 0.021%, and 0.0004%, respectively.

Furthermore, only the coefficient of interaction variables between CAPEX, INVEST, STD and ESGC score, are statistically significant with firm value on 10%, 10 %, and 1% significance level. Besides this, the economic significance is low. Therefore, it can be stated that CSR activities have a small impact on firm value considering managerial risk-taking since CSR performance and risk taking variables are not the only indicators which influence firm value. Also, as it can be seen from *Table 4*, we can conclude that the results are in line with our hypothesis H_1 since most of the results prove that CSR activities have a positive indirect impact on firm value considering the negative impact of managerial risk-taking.

7.2.2 The ESGC score, Optimal Risk-Taking, and Firm Value

In Table 5, the results from the regression analysis which aims to measure optimal managerial risk-taking are presented. As we mentioned in (5.2), the regression model of Bargeron et al. (2010) is used to estimate the optimal risk-taking. As can be seen, most of the explanatory variables, which are controlled by the market, have a statistical significance relationship with managerial risk-taking. There are relationships on the 10% significance level such as EUGDPGrowth with INVEST, EBIT with CASH and MTB with STD. Also, the relationships of ReturnIndex with R&D, INVEST, CASH and also the relationships between EUGDPGrowth and CAPEX, and R&D, are positive in 5% significance level. Similarly, the impact of EBIT in CAPEX is positive and have a strong statistically significance. Furthermore, some relationships such as ReturnIndex with CAPEX and EU GDPGrowth with STD are weakly significant statistically. Moreover, according to *Table 5*, there is a non-significant relationship between corporate leverage and managerial risk-taking. The explanatory variables have positive relationships with the risk-taking variables except for stock return volatility which means that European market increases the risk for firms by increasing the volatility in stock returns. However, from this model, we use the error terms which include all the risk taking variables controlled by managements

of companies. For this reason, R square is expected to be very low because the risk is caused mostly by the management incentives than by the market.

Furthermore, we used the error terms from each regression of *Table 5* as the dependent variable for the regressions which are presented in *Table 6*. The purpose of this model is to answer our second hypothesis (H_2) whether CSR activities have a positive indirect relationship with firm value because of the negative relationship with the deviation of the optimal managerial risk-taking. In order to investigate the impact of CSR activities in firm value considering optimal risk-taking, an interaction variable is used between ESGC score and absolute values of error terms from the multivariate regression in *Table 5*. In the case of interaction variables of error terms from CAPEX, R&D, and INVEST regressions with ESGC score, the coefficients have positive signs which show a positive indirect relationship between CSR activities with the firm value measured by Tobin's Q. On the contrary, the coefficients of the interaction variables of error terms from CASH and STD regressions with ESGC score are negative, meaning a negative relation between CSR and firm value through optimal managerial risk-taking. To elaborate, the negative impact is because company cash holding and stock returns volatility have a higher impact on firm value than CSR activities. Also, a change of one unit in interactive variable of ESGC score with ECAPEX, ER&D, EINVEST, increase the firm value by 0.143%, 0.0071%, 0.0776%, and the indirect impact of ESGC score through ECASH, and ESTD, reduce the firm value by 0.0372% and 0.0021%, respectively.

However, the coefficients of interaction variables are not statistically significant with firm value, and also the magnitude is low. Therefore, CSR activities have small indirect impact on firm value considering the optimal managerial risk-taking. Moreover, as it can be seen from *Table 6*, we can conclude that the results are in line with our hypothesis H_2 since most of the results prove that CSR activities have a positive indirect impact on firm value considering the negative impact of corporate risk-taking.

7.3 Robustness Tests

In our paper, we used two different methods to estimate the indirect effect of corporate social responsibility performance on firm value through corporate risk taking. The regression results of the two methods are similar, with the same signs. Therefore, we argue that this is one way of doing robustness tests by comparing different regression models. For the comparison table between two methods, see *Appendix 1 Panel A*.

On the other hand, we add a control variable (SalesGrowth) in each model to see if the signs, magnitudes and significant levels of estimated coefficients changed a lot. For the comparison of before and after adding control variables, see *Appendix 1 Panel B*. Since adding control variable didn't affect the regression results a lot, therefore, the models are robust.

8. Conclusions and Recommendations

The purpose of this study was to analyze and explain whether CSR activities are associated with management decisions on corporate risk-taking and firm value. To fulfill the purpose, the relationships between ESG ratings, managerial risk-taking, and firm value were examined in an extensive panel data sample of European firms between the years 2014 and 2018. The variables used for measuring CSR performance was ESG combined score, while risk-taking was proxied by capital expenditure, research and development, investment, cash holdings, and stock return volatility. Also, firm value was measured by Tobin's Q since it is the most accurate and used variable. Furthermore, in order to study the relationship between CSR and corporate risk-taking, we used two methods (standard and optimal). The standard method showed the direct impact of CSR on corporate risk-taking while the optimal method showed the direct effect of CSR on the deviation from optimal risk-taking. Moreover, we performed random effects regressions with robust standard errors and also used a broad set of control variables to find the empirical results to test our hypothesis.

Since we argued that getting involved in CSR activities help to limit the excessive risk-taking and excessive risk avoidance, it is expected that a negative relationship between ESG combined score and corporate risk-taking will impact the impact of CSR engagements on firm value. Using both methods, the empirical results showed that the relationship of CSR associated with risk taking was more statistically significant in the first regression model than in the second regression method. Moreover, both methods stated that CSR activities did not have a high impact on firm value, which can be explained by the other control variables that can affect the firm value and because of the impact of risk taking in firm value. Furthermore, we tested our second hypothesis on whether CSR has an indirect impact on firm value through optimal corporate risk-taking. The empirical results were more statistically significant when we tested the ESGC score with risk-taking than when we tested the ESGC score

with optimal risk-taking. However, in both methods, the magnitude of the relationship between CSR, risk-taking, and the firm value was very low. Lastly, we can conclude that involving in CSR activities reduce the deviation from the optimal risk-taking and for this reason, the firm value is increased.

There are also some limitations in our study because there were not possible to be implemented. First, in this thesis, the population and sample are based in European countries due to the fact that Europe is less examined and based in Ho et al. (2012) European companies are leaders in CSR. However, no analysis has been made to study whether a difference between countries exists because of the different regulatory environments. In addition, we used the GDP growth of Europe instead of GDP growth of each country which may affect the result. Secondly, we used the Thomson Reuters Eikon database to collect the ESGC scores to measure CSR. According to Thomson Reuters (2019) , the database consists of 150 experienced analysts to verify the data, so we have sufficient trust in the quality of the data but the different database and measure of CSR activities can provide more data, and with a bigger data sample the result becomes more accurate.

Furthermore, we provided evidence that CSR is one of the determinants of risk-taking and firm value, but additional research is worth pursuing in future research. Firstly, future researches can be extended internationally using a global sample and provide findings on how the relationship between CSR, risk-taking, and firm value differs among countries. Secondly, future case studies can investigate this relationship in developing countries and developed countries with a global sample to contribute to the literature and to compare whether the impact of CSR in risk-taking and firm value can change between the two types of countries. Lastly, it would be worth that future research studies examine the relationship between CSR performance, overall enterprise risk management (ERM), and firm value.

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Tables

Table 1 Descriptive Statistics

Variables	Obs.	Mean	SD	Min	Max
Tobin's Q	3940	0.26	0.21	0.00	3.53
CAPEX	3057	0.04	0.04	0.00	0.19
R&D	3781	0.03	0.22	0.00	3.02
INVEST	3057	0.08	0.24	0.00	3.09
CASH	3060	0.08	0.07	0.00	0.37
STD	3071	7.46	15.67	0.01	96.83
ESG	3241	52.98	16.22	7.69	93.54
ReturnIndex	3753	9.96	5.22	4.1	19.3
EUGDPGrowth	3115	2.11	0.25	1.87	2.5
EBIT	3741	0.07	0.09	-0.2	0.38
MB	3752	2.75	3.44	-5.33	21.68
Leverage	3787	0.2	0.16	0.00	0.67
DirectorAge	3503	62.57	10.93	27	101
DirectorGender	3815	0.13	0.33	0.00	1.00
CEOTenure	3767	7.58	7.05	0.00	53
CEOBonus	3594	2.17e+05	8.53e+05	0.00	2.00e+07
Size	3879	1.23e+08	8.68e+08	35778.50	1.95e+10
SalesGrowth	3768	0.19	5.1	-7.19	239.75

Table 2 Correlation Coefficients

No	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	ESGC	1.00																	
2	CAPEX	-0.03	1.00																
3	R&D	-0.06	0.00	1.00															
4	INVEST	0.02	0.75	0.18	1.00														
5	CASH	0.00	-0.07	0.04	0.06	1.00													
6	STD	-0.03	0.07	-0.02	0.05	-0.03	1.00												
7	ReturnIndex	-0.01	0.00	-0.01	-0.01	-0.02	-0.01	1.00											
8	GDPGrowth	-0.02	-0.03	0.00	-0.03	0.02	-0.01	0.66	1.00										
9	EBIT	0.04	0.02	0.02	0.03	0.14	0.06	0.03	-0.01	1.00									
10	MB	0.01	0.00	-0.03	-0.01	0.11	0.00	-0.02	-0.04	0.52	1.00								
11	Leverage	-0.02	0.12	-0.06	0.02	-0.15	-0.01	0.02	-0.01	-0.05	-0.03	1.00							
12	DirAge	0.00	0.01	0.02	0.02	-0.01	0.04	0.04	0.03	-0.02	-0.03	0.01	1.00						
13	DirGender	0.04	0.01	0.02	0.01	0.02	0.00	-0.08	-0.01	0.00	-0.04	-0.02	-0.13	1.00					
14	CEOTenure	0.04	0.01	-0.02	0.01	0.02	0.00	0.02	-0.02	0.01	0.01	-0.03	0.00	0.02	1.00				
15	CEOBonus	0.03	0.07	-0.01	0.04	-0.04	0.02	0.00	-0.01	0.00	-0.01	0.00	0.02	-0.02	0.09	1.00			
16	Size	-0.04	0.08	0.09	0.07	0.02	-0.05	0.00	-0.01	0.03	0.04	-0.06	-0.02	0.01	-0.05	-0.06	1.00		
17	SalesGrowth	-0.03	0.00	0.00	-0.01	0.03	-0.01	0.00	-0.03	0.02	0.00	-0.03	0.02	-0.01	-0.02	0.00	-0.02	1.00	
18	Tobin's Q	0.03	0.03	-0.02	0.06	0.04	-0.05	-0.01	-0.01	0.01	0.04	-0.01	-0.01	-0.01	0.01	0.02	0.05	0.00	1.00

Table 3 Diagnostic Tests

No	Objective	Test	Method	Results		Conclusion
1	Multicollinearity Test	VIF Test	If the VIF value < 5, then there is no multicollinearity problem.	CAPEX CAPEXESG ESG EUGDPGrowth ReturnIndex MB EBIT Lverage DirGender DirAge CEOBonus CEOTenure Size	VIF:1.02 VIF:1.03 VIF:1.01 VIF:3.05 VIF:3.05 VIF:1.00 VIF:1.00 VIF:1.00 VIF:1.02 VIF:1.02 VIF:1.01 VIF:1.01 VIF:1.01	All the VIF values are smaller than 5, so there is no multicollinearity problem in our models.
2	Homoskedasticity Test	White Test	Null Hypothesis (Ho): homoskedasticity	Regression Equation (1) Regression Equation (2) Regression Equation (3)	P value:1.00 P value:0.05 P value:0.08	All the P values are larger than 0.05 which means we cannot reject the null hypothesis, so there is no heteroskedasticity problem in our models.
3	Endogenous Test	Ovtest	Null Hypthesis (Ho): model has no omitted variables which holds for no endogenous issue	Regression Equation (1) Regression Equation (2) Regression Equation (3)	P value:0.49 P value:0.20 P value:0.11	All the P values are larger than 0.05 which means we cannot reject the null hypothesis, so there is no endogenous problem in our models.

Table 4 Regression Equation (1)

VARIABLES	Model 1 Tobin's Q	Model 2 Tobin's Q	Model 3 Tobin's Q	Model 4 Tobin's Q	Model 5 Tobin's Q
CAPEX*ESGC	0.00432*				
	(0.00244)				
CAPEX	-0.175				
	(0.154)				
RD*ESGC		4.04e-08			
		(7.18e-08)			
RD		-2.34e-06			
		(3.18e-06)			
INVEST*ESGC			0.00283*		
			(0.00165)		
INVEST			-0.0848		
			(0.0923)		
CASH*ESGC				-0.000208	
				(0.00129)	
CASH				0.0213	
				(0.0719)	
STD*ESGC					-4.80e-06**
					(1.98e-06)
STD					0.000193***
					(6.25e-05)
ESGC	-0.000157	7.45e-05	-0.000116	5.33e-05	9.23e-05
	(0.000166)	(0.000124)	(0.000155)	(0.000159)	(0.000119)
DirectorAge	-7.21e-05	-6.14e-05	-5.19e-05	-5.15e-05	-5.10e-05
	(0.000141)	(0.000146)	(0.000141)	(0.000142)	(0.000140)
CEOTenure	4.37e-06	2.62e-05	2.04e-05	3.57e-05	1.98e-05
	(0.000189)	(0.000196)	(0.000188)	(0.000188)	(0.000187)
CEOBonus	-0.000320	1.51e-05	-0.000377	-0.000209	-0.000195
	(0.00123)	(0.00103)	(0.00124)	(0.00124)	(0.00124)
Constant	0.273***	0.264***	0.269***	0.263***	0.262***
	(0.0169)	(0.0139)	(0.0154)	(0.0152)	(0.0136)
Observations	2,624	2,484	2,653	2,657	2,668
Number of Firms	610	592	617	616	618

The Sample includes all European public listed companies from the period 2014 to 2018. However, financial institutions and other industries regulated differently are removed from our sample (e.g.banks, insurance, real estate, utilities,etc.,). We also excluded those companies which are less than five within one country. The dependent variable in this table is Tobin's Q, which is a common proxy for firm value. We also include a mean-adjusted interaction term in each regression model by multiplying ESGC score and CAPEX, R&D, INVEST, CASH, and STD respectively to analyze the impact of ESGC on firm value through risk taking. The ESGC scores are lagged one year. For CEOBonus, we use the natural logarithmic of the total bonus. ***, **, and * denote statistical significance at 1%, 5%, and 10% level respectively.

Table 5 Regression Equation (2)

VARIABLES	Model 1 CAPEX	Model 2 R&D	Model 3 INVEST	Model 4 CASH	Model 5 STD
ReturnIndex	0.000343***	0.000483**	0.000363**	-0.000548**	-0.228***
	(0.000125)	(0.000246)	(0.000145)	(0.000240)	(0.0342)
EUGDPGrowth	0.00391**	0.00766**	0.00378*	-0.00482	-4.767***
	(0.00193)	(0.00319)	(0.00229)	(0.00402)	(0.620)
EBIT	0.0160**	-0.00732	0.0156*	0.0276	1.144
	(0.00791)	(0.00879)	(0.00945)	(0.0170)	(1.806)
MB	0.000116	-5.29e-05	0.000125	-0.000171	-0.0453*
	(0.000104)	(7.62e-05)	(0.000122)	(0.000326)	(0.0259)
DEBT	0.0112	-0.00890	0.0133	0.0148	0.280
	(0.00775)	(0.0104)	(0.00922)	(0.0157)	(1.029)
Constant	0.0284***	0.0176*	0.0409***	0.0903***	19.97***
	(0.00517)	(0.00924)	(0.00616)	(0.0108)	(1.647)
Observations	2,960	3,017	2,992	2,996	3,007
R-squared	0.010	0.002	0.008	0.005	0.035
Number of Firms	607	615	614	614	615

The Sample includes all European public listed companies from the period 2014 to 2018. However, financial institutions and other industries regulated differently are removed from our sample (e.g.banks, insurance, real estate, utilities,etc.,). We also excluded those companies which are less than five within one country. Dependent variables in this table are CAPEX, R&D, INVEST, CASH, and STD, respectively. Those five dependent variables and DEBT for the year are divided by average assets. Return index is the return on the PTSE index for European firms and GDP growth is the Europe GDP Growth from the Eurostat database. Variables other than ReturnIndex and GDPGrowth are winsorized at the 1% and 99% levels, and control variables except ReturnIndex and GDPGrowth are lagged one year. ***, **, and * denote statistical significance at 1%, 5%, and 10% level respectively.

Table 6 Regression Equation (3)

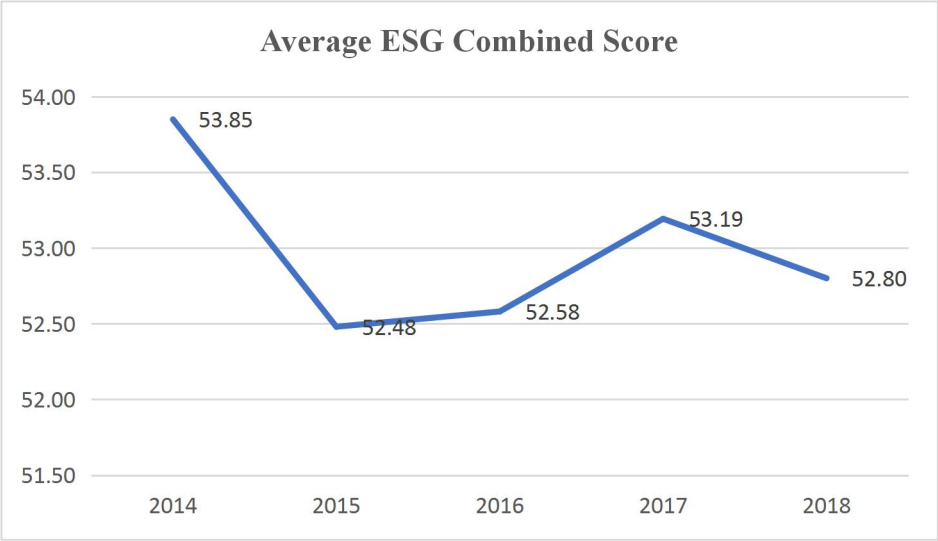
VARIABLES	Model 1 Tobin's Q	Model 2 Tobin's Q	Model 3 Tobin's Q	Model 4 Tobin's Q	Model 5 Tobin's Q
ECAPEX*ESGC	0.00143				
	(0.00444)				
ECAPEX	-0.0713				
	(0.234)				
ERD*ESGC		7.12e-05			
		(0.000939)			
ERD		-0.0134			
		(0.0518)			
EINVEST*ESGC			0.000776		
			(0.00384)		
EINVEST			-0.0202		
			(0.185)		
ECASH*ESGC				-0.000372	
				(0.00219)	
ECASH				-0.00252	
				(0.120)	
ESTD*ESGC					-2.12e-05
					(1.90e-05)
ESTD					0.000422
					(0.00105)
ESGC	5.70e-05	0.000791***	5.28e-05	9.09e-05	0.00101***
	(0.000196)	(0.000277)	(0.000194)	(0.000176)	(0.000328)
CEOBonus	-0.000107	0.00496	-0.000149	-0.000146	0.00478
	(0.00126)	(0.00456)	(0.00125)	(0.00124)	(0.00455)
CEOTenure	-1.70e-05	-0.000206	-4.75e-08	1.26e-05	-0.000245
	(0.000192)	(0.000614)	(0.000191)	(0.000193)	(0.000615)
DirAge	-8.68e-05	-9.99e-05	-6.18e-05	-6.00e-05	-5.90e-05
	(0.000154)	(0.000394)	(0.000155)	(0.000155)	(0.000394)
DirGender	0.00371	-0.00568	0.00366	0.00354	-0.00433
	(0.00346)	(0.0129)	(0.00344)	(0.00344)	(0.0129)
Size	0.00422	0.00388**	0.00408	0.00405	0.00379**
	(0.00343)	(0.00190)	(0.00339)	(0.00339)	(0.00191)
Constant	0.196***	0.168***	0.197***	0.197***	0.161***
	(0.0575)	(0.0430)	(0.0567)	(0.0578)	(0.0437)
Observations	2,473	2,523	2,501	2,504	2,516
Number of Code	591	599	598	597	599

Random Effects model, robust standard error clustered by firms.

The Sample includes all European public listed companies from the period 2014 to 2018. However, financial institutions and other industries regulated differently are removed from our sample (e.g.banks, insurance, real estate, utilities,etc.,). We also excluded those companies which are less than five within one country. The dependent variable in this table is Tobin's Q, which is a widely used proxy for firm value. We also include the mean-adjusted interaction term by multiplying the ESGC score and the absolute value of the residuals from the regressions in *Table 5*, respectively. The ESGC scores are lagged one year. For CEOBonus and firm Size, we use the natural logarithmic of the total bonus and total assets. For Director Gender, we set it as a dummy variable that equals 1 if the director is a female and 0 otherwise. ***, **, and * denote statistical significance at 1%, 5%, and 10% level respectively.

Figures

Figure 1 Average ESG Combined score



Appendices

Appendix 1 Robustness Tests

Panel A. The Comparison between the First Hypothesis and The Second Hypothesis

The First Hypothesis	0,00432	4.04e-08	0,00283	-0.000208	-4,80E-06
	(0.00244)	(7.18e-08)	(0.00165)	(0.00129)	(1.98e-06)
The Second Hypothesis	0.00143	7.12e-05	0.000776	-0.000372	-2.12e-05
	(0.00444)	(0.000939)	(0.00384)	(0.00219)	(1.90e-05)

Panel B. Adding control variables

The First Hypothesis	0,00432	4.04e-08	0,00283	-0.000208	-4,80E-06
	(0.00244)	(7.18e-08)	(0.00165)	(0.00129)	(1.98e-06)
Adding control variables	0.00352	4.09e-08	0.00296	-0.000879	-4.92e-06
	(0.00298)	(9.79e-08)	(0.00262)	(0.00168)	(2.99e-06)
The Second Hypothesis	0.00143	7.12e-05	0.000776	-0.000372	-2.12e-05
	(0.00444)	(0.000939)	(0.00384)	(0.00219)	(1.90e-05)
Adding control variables	0.00120	6.41e-05	0.000594	-0.000683	-2.13e-05
	(0.00464)	(0.000941)	(0.00400)	(0.00262)	(1.91e-05)

Appendix 2 Variable definitions

Risk Taking Variables	
CAPEX	Capital Expenditures/Average Assets
RD	Research and Development Expenditures/Average Total Assets
INVEST	The sum of CAPEX and RD
CASH	Cash Holding/Average Total Assets
STD	The standards deviations of the daily stock returns
ECAPEX	Absolute Value of estimated residual for CAPEX based on the estimating optimal risk taking regression
ERD	Absolute Value of estimated residual for RD based on the estimating optimal risk taking regression
EINVEST	Absolute Value of estimated residual for INVEST based on the estimating optimal risk taking regression
ECASH	Absolute Value of estimated residual for CASH based on the estimating optimal risk taking regression
ESTD	Absolute Value of estimated residual for STD based on the estimating optimal risk taking regression
Main Independent Variable	
ESGC	Thomson Reuters ESG combined score (ESGC score)
Other Control Variables	
ReturnIndex	FTSE Europe return index from FTSE Rusell
GDPGrowth	Europe GDP Growth from Eurostat database
EBIT	Earnings before interest and taxes, as ratios to the average assets
MB	The ratio of the market-to-book value of assets
DEBT	Total Debt/Average Assets
DirAge	Director's Age
DirGender	A dummy variable that equals to 1 if the Director is a female, 0 otherwise
CEOBonus	the natural logarithmic of the anual bonus received by the CEO
CEOTenure	The number of years of current CEO's tenure
Size	Firm size measured by the natural logarithmic of total assets
SalesGrowth	The annual growth rate of sales
Firm Value Variable	
TobinsQ	the sum of Market Capital and Total Debt/ Total Assets of Firm

Appendix 3 Hausman Test

Regression Equation （1）

	Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
ESGC	4.43E-03	0.0043163	1.16E-04	4.79E-04
ReturnIndex	-0.1926572	-0.174623	-0.0180342	3.09E-02
GDPGrowth	-0.000179	-0.0001569	-2.21E-05	3.42E-05
EBIT	-0.0000744	-7.21E-05	-2.29E-06	0.0000121
MB	1.36E-05	4.37E-06	9.21E-06	1.95E-05
DEBT	-0.000434	-0.0003198	-1.14E-04	0.0001832

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 1.70

Prob>chi2 = 0.9452

Regression Equation （2）

	Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
ReturnIndex	0.0003427	0.0003393	3.42E-06	4.90E-06
EUGDPGrowth	0.0039058	0.0038511	0.0000547	0.0000968
EBIT	0.0159552	0.016068	-0.0001128	0.0021478
MB	0.000116	8.87E-06	0.0001071	0.0000623
DEBT	0.0111935	0.0098989	0.0012945	0.003168

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 4.18

Prob>chi2 = 0.5236

Regression Equation （3）

	Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
ECAPEX*ESGC	0.0016375	0.0014251	2.12E-04	6.51E-04
ECAPEX	-0.0889835	-0.0712877	-0.0176957	0.0414289
ESGC	3.04E-06	0.000057	-5.40E-05	3.54E-05
CEOBonus	-2.44E-04	-1.07E-04	-0.000137	0.0001737

CEOTenure	-0.0000118	-0.000017	5.17E-06	0.0000197
DirAge	-0.0000854	-0.0000868	1.42E-06	0.0000126
DirGender	0.0040053	0.0037081	0.0002972	0.0004186
Size	0.001259	0.00422	-0.002961	0.0059543

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 4.77

Prob>chi2 = 0.7817