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# Corporate social responsibility and forward default risk under firm and industry heterogeneity

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**ABSTRACT**

**Objective:** This study aims to evaluate the impact of corporate social responsibility on forward default risk (FDR) under the setting of firm and industry heterogeneity.

**Research Design & Methods:** This study evaluated the impact of corporate social responsibility (CSR) on FDR using the data of 497 companies from 2007-2021 in the S&P 500 index, taking into account firm and industry heterogeneity aspects. This study utilized instrumental variable regression using the generalized method of moments (IV-GMM) estimation technique which is robust for controlling the pertinent issue of endogeneity.

**Findings:** This study found a negative relationship between CSR and FDR in the full sample. From the firm size aspect, this study found that CSR is more effective in mitigating FDR in large-cap firms than in mid-cap firms. Firm age heterogeneity exhibited a distinct behaviour, as young and middle-aged firms had a stronger impact on FDR management in comparison to old firms. Industry heterogeneity showed that industries with higher customer interaction have a higher impact on corporate social responsibility to control FDR. Industries with lower customer interaction have a lower impact on corporate social responsibility and FDR.

**Implications & Recommendations:** We proposed some policy recommendations based on the findings in the context of firm and industry heterogeneity. Especially the management of mid-cap and young corporations should improve the CSR policy to enhance CSR performance which would lead to stabilized protection against FDR. Similarly, consumer-intensive industries should also focus on enhancing CSR initiatives to decrease FDR. Non-consumer-intensive industries should focus on enhancing CSR policy and at the same time pay particular attention to communicating CSR results to end consumers to reduce FDR.

**Contribution & Value Added:** This study is the first to explore CSR's impact on financial parameters under heterogeneity.

**Article type:** research article

**Keywords:** corporate social responsibility; forward default risk; heterogeneity effect; firm; industry

**JEL codes:** G3, G33, M14

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## INTRODUCTION

In recent decades, many businesses have spent a lot of money on corporate social responsibility (CSR) strategies, which involve working closely with various groups to integrate social, environmental, ethical, and human rights concerns into a company's day-to-day activities and long-term goals (European Commission, 2009). Academics have been studying the elements that influence CSR initiatives, because their use has increased (Petrenko *et al*., 2016; Ratajczak & Szutowski, 2016; Van Marrewijk, 2003; Vilanova *et al.*, 2008). Today's business leaders widely accept the CSR concept because of the widespread belief that it helps both the company and its stakeholders, as well as the community (Koh *et al*., 2023; Mochales & Blanch, 2022; Pfajfar *et al*., 2022; Risi *et al*., 2023; Yang & Basile, 2022).

This principle of enlightened self-interest affects a company's results, most notably in terms of income, creativity, efficiency, fair value, and the overall and idiosyncratic risks that the company faces (Fatemi *et al*., 2018; Jo & Na, 2012; Lins *et al*., 2017; Luo & Bhattacharya, 2009). The findings of the majority of such studies indicate that CSR activities add value to diverse components of a company's success by enabling increased goodwill and services, luring top talent, and enhancing access to important resources (Cheng *et al*., 2014; Greening & Turban, 2000). However, some empirical data reveal contradictory findings, and certain studies suggest that CSR activities are a waste of resources, lower profitability, and increase risk and shareholder value (Barnea & Rubin, 2010; Nguyen & Nguyen, 2021).

Although stakeholder engagement activities focus on a broad variety of interested parties other than simply customers and workers, they frequently appear under the umbrella concept of 'corporate social responsibility.' The environmental, social and governance (ESG) components of CSR and its constituent stakeholder groups can have opposing effects on the financial issues of a business, depending on how and to what extent they influence stakeholders' interests. This may result from externalities surrounding ESG engagement which influence default risk (Sun & Cui, 2014) or the managerial reaction to both internal and external stakeholders (Benabou & Tirole, 2010). The first effect refers to the influence on cash flow and the choices regarding investments, and the outcomes of financing decisions. If ESG activities lead to the inefficient use of an enterprise's resources, CSR can lower its value from an investment perspective (Hussaini *et al*., 2021). This could increase the likelihood of financial problems.

Conversely, CSR has the potential to contribute value if it results in positive externalities, such as an enhanced brand image, more dedicated staff, and happier consumers. Because of this, there may be a mitigating effect on future cash flows, which can reduce the likelihood of experiencing financial hardship. Credit ratings and the costs of financing improve via the implementation of responsible ESG practices and the subsequent improvement in CSR performance (Bannier *et al*., 2022). This might encourage enterprises to take on further debt, which would increase the likelihood that such businesses would fail financially. Thus, debt providers require data on CSR activity and stakeholder management to adequately measure default risks.

Moreover, in the literature, scholars discuss CSR and default risk under the assumption of firm symmetry and ignore the aspects of firm heterogeneity. It is important to address what firm heterogeneity means in this context. Under the assumptions of the neo-classical theory of firms, enterprises maximize profits. Profit maximization translates into increased levels of assets, stabilized cash flows, and a less risky situation for investors, which can be termed as a lower level of default risk. From the viewpoint of corporate finance theory, firms aim to maximize cash flow and business value (Damodaran, 1996; Tirole, 2010). This maximization is a consequence of stability and lower default risk, eventually benefitting firms in terms of lowered capital cost. We may explain stabilisation over the long-run period (assumption of long-run industry entry) as 'firms grow as they get old.' This leads to two aspects of firm heterogeneity, *i.e.* growing 'age' and 'stabilization.' However, not all firms stabilize at the same point in time, and at any given point in time *t*, the firms' ages will differ. This difference due to heterogeneity can cause different impacts of CSR on default risk.

Therefore, the contribution of this study to the literature concerns three aspects. Firstly, this study focused on the lag/lead dynamic relationship by testing the CSR effects on default risk in the 'future,' the so-called forward default risk (FDR). We proposed that CSR affects default risk in the subsequent period (*t+1*). Secondly, this study explored the difference between firm-specific effects on this relationship. This implies that as the temporal dimension varies, spending in CSR differs just like the level of default risk. Lastly, we tested the relationship in different industries, as industries which have lower consumer interaction also have a lower CSR level, and in turn, the effect on default risk differs.

The following section will discuss the relevant literature. Section three will elaborate on data and methods. Section four will present the and section five will provide a discussion and conclusions.

## LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Corporate social responsibility (CSR) is an organization's response to community needs and expectations (Brown & Dacin, 1997; Sen & Bhattacharya, 2001; Varadarajan & Menon, 1988). Generally speaking, it is 'the managerial obligation to take action to safeguard and advance both the welfare of society as a whole and the interest of organizations' (Davis & Blomstrom, 1975). In recent years, CSR has emerged as a key resource for businesses. According to studies, CSR plays a significant role in any successful organization (McWilliams *et al*., 2006).

Sun and Cui (2014) argued the relevance of CSR and default risk by raising the following four major points. (1) CSR has the potential to provide cash flow for a business, and cash flow stability directly influences a firm's inclination to default, because a healthy cash reserve facilitates daily operations and protects against financial trouble. (2) Cash flow volatility is more important than cash flow level in predicting default and CSR helps smooth out cash flows. (3) The worth of a company's assets will influence whether or not it goes into default, which is a predictable series of events. An asset that adds to the firm's worth may consequently contribute to risk mitigation. Activities involving CSR are examples of productive business efforts that create intangible benefits. (4) The firm's microenvironment might benefit from CSR initiatives if they foster goodwill.

Sun and Cui (2014) showed that CSR significantly impacts lowering default risk with a larger association existing between CSR and reduced default risk for enterprises operating in highly dynamic situations. Socially responsible businesses have superior credit ratings and reduced credit risk, both in terms of loan spreads and corporate bond spreads and in terms of distance to default (Hsu & Chen, 2015). Shahab *et al*. (2018) showed that improved environmental performance – which is supported by sound environmental policies – has a statistically significant impact on lowering the incidence and severity of business financial distress. Lin and Dong (2018) divided the accumulated social capital from CSR efforts into moral capital and exchange capital. Findings indicate that moral capital lessens the risk of insolvency when a company expands in size. However, exchange capital reduces the chance of bankruptcy for businesses that rely on intangible assets or that operate in a more litigious business climate.

Using regression analysis, Al-Hadi *et al*. (2019) demonstrated that CSR initiatives significantly ease company's financial stress. The CSR quality ratings greatly lessen the liquidity levels suffered among Chinese businesses. Moreover, some scientists have noticed that CSR is more effective at lowering distress levels in privately held Chinese companies than in state-owned ones (Shahab *et al*., 2019). According to Boubaker *et al*. (2020), firms with greater CSR levels have lower financial distress risk, indicating that good CSR performance improves a company's creditworthiness and its ability to gain access to finance. Kamalirezaei *et al*. (2020) showed that CSR has a negative correlation with insolvency risk. On the contrary, Dumitrescu *et al*. (2020) explained that the chance of future financial suffering rises because of social stakeholder activities.

Gangi *et al*. (2020) showed that CSR activities and corporate governance procedures negatively impact a company's likelihood of experiencing financial trouble. Badayi *et al*. (2021) concluded that the likelihood of default lowers as enterprises in developing nations increase their investments in CSR initiatives. Default risk was found to be lower for companies during the United States quantitative easing (US QE) programme, an approach which could have unintended consequences by raising the risk premiums and volatility of equity and low-grade corporate bonds (Hsu & Chen, 2021). Kölbel and Busch (2021) showed that positive CSR ratings reduce exposure to risk in the marketplace. Saidane and Abdallah (2021) demonstrated the unidirectional nature of the link between business default risk and CSR and the environment dimension using bivariate PVAR estimations. Shih *et al*. (2021) proved that a company's environmental performance significantly affects its default risk.

From the perspective of the banking sector, Nguyen and Nguyen (2021) implied that CSR activities limit bank risk-taking, and this association is only present in the situation of financially restricted institutions. Conversely, unrestrained banks are more inclined to spend money on CSR which is not necessary, leading to lower performance and higher risk-taking. Neitzert and Petras (2022) confirmed that

CSR activities have a net risk-reducing effect on banks. A recent review of the literature confirmed the negative correlation between CSR and the likelihood of default (Mushafiq & Prusak, 2022).

Most of the above-mentioned literature has ignored the time aspect of the relationship between CSR and default risk. However, Chang *et al*. (2013) demonstrated that organizations with high-quality CSR have very low short-term default probability and forward default probability. Furthermore, Do (2022) discovered that CSR has a negative relationship with the likelihood of default and that this relationship is more pronounced over the long term than the short term. However, both these studies test the relationship considering the effect of CSR and default risk on the temporal level and not based on the lag/lead time horizon. Due to the existing gap, we hypothesised:

**H1:** CSR negatively impacts FDR.

**Firm Heterogeneity**

Firm size significantly influences CSR dedication; with larger enterprises being correlated with more resource-slack (Johnson & Greening, 1999). Due to limited or insufficient resources, CSR projects may be unfeasible for smaller businesses. The second characteristic of a large company is the degree to which it is organized. Due to their greater exposure to the outside world, businesses of a certain size may benefit from better-developed administrative processes (Donaldson, 2001). Because of this, they would have more sophisticated internal processes for handling issue management, which would make them more sensitive to social problems (Brammer & Millington, 2006).

When compared to a smaller organization, a larger one has several competitive advantages due to its scale. Large companies can sustain financial difficulties better than small firms, and as a result, they can afford to devote more resources to environmental, social, and governance initiatives. Investing in ESG allows businesses to earn the goodwill of their stakeholders and demonstrate their commitment to social responsibility through their participation in ethical ESG initiatives. Udayasankar (2008) claimed that compared to medium-sized businesses, large ones have more incentives to engage in CSR initiatives. According to legitimacy theory, a sizable company can influence the degree to which governments and environmental regulators clamp down on its operations (Watson *et al*., 2002).

The existing body of work clearly shows that firm size can affect firm risk, and when using firm size as a control variable, past research has discovered a negative influence of firm size on firm risk (Benlemlih *et al*., 2018; Chollet & Sandwidi, 2018). This is possible because huge businesses have access to more (in)tangible resources, that ultimately lead to greater financial success and establish them as market leaders. Financial stability helps companies win over their shareholders, which, in turn, calms markets. Similarly, a company's scale significantly impacts its environmental, social, and governance performance (Lerner & Fryxell, 1988).

Firms with better ESG performance have a level of protection similar to insurance, and they also improve their standing in the eyes of their stakeholders (Godfrey, 2005). Companies are better able to manage their volatility and crash risk when their reputation is strong (Albuquerque *et al*., 2019; Wu & Hu, 2019). Based on the literature, we can conclude that firm size is a key influencer for CSR, and this influence can cause differences in the relationship between CSR and default risk. Previous research (Al-Hadi *et al*., 2019; Boubaker *et al*., 2020; Habermann & Fischer, 2021) had accounted for firm size; however, only as a control variable without explaining the difference of discussed effects considering various firm sizes. Only the work of Lin and Dong (2018) explains the relationship between small and large firms. However, this study focuses mainly on medium and large firms as small firms might not have the resources available to perform CSR activities. Therefore, from the theoretical standpoint, it is important to explore the possible changes that might occur in the relationship between CSR and default risk in firms that have the resources to perform CSR activities. Thus, we hypothesised:

**H2:** The relationship between CSR and FDR differs in mid and large-cap firms.

Being one of the guiding references, Withisuphakorn and Jiraporn (2016) explained that engaging in CSR boosts a company's long-term reputation as a socially conscious business. Consumers and potential customers develop positive feelings towards businesses perceived as socially responsible. It increases the likelihood that customers will purchase from these enterprises. Advocates of CSR claim

that participating in CSR activities leads to higher revenues, greater profits, and better overall business performance. Established businesses are steadier and more reliable in terms of both performance and cash flow. Therefore, established businesses have greater financial resources to devote to CSR.

On the other hand, younger companies have less money to engage in CSR since their cash flows are more volatile, and they are expanding rapidly. According to this idea, established businesses put more resources into CSR initiatives than start-ups. For this reason, scholars perceive increased CSR spending as a natural consequence of a mature business, which Withisuphakorn and Jiraporn (2016) referred to as 'the resulting hypothesis.' Investment in CSR is consequently less crucial for established businesses that have had more time to build a solid reputation, which means, accordingly, they are more valuable to investors. This improved standing cancels out the potential benefits of CSR spending. However, younger businesses, that have yet to build a solid reputation, may benefit from CSR activities.

Çera *et al*. (2020) argued that this reasoning led to the conclusion that an organization's longevity increased the likelihood that it would adopt CSR strategies. Galbreath's (2010) research provides empirical support for this observation. According to Withisuphakorn and Jiraporn (2016), the effect of firm age on CSR varies depending on the type of CSR being measured. Waluyo (2017) confirms this finding. Similar to the size effect of a firm, the age of a firm can shape CSR and create an altering effect on default risk, and previously, Gangi *et al*. (2020) and Sun and Cui (2014) only included this as a control. Therefore, we hypothesised:

**H3:** The relationship between CSR and FDR differs depending on the company's age.

**Industry Heterogeneity**

When discussing who should take the lead on issues of social responsibility and sustainability, businesses are frequently given as examples (Fairbrass & Zueva-Owens, 2012). This is due to the fact that the actions of businesses significantly impact society's demand and supply patterns (Fairbrass, 2011). However, corporations do not make decisions in a vacuum. On a global scale, they are affected by policies enacted by countries and international organizations. As meso-level players, they are affected by the norms of their sector. McWilliams *et al*. (2006) state that CSR is still a developing field of study, despite decades of discussion and research. The field of CSR research is also often criticized for its lack of cohesion (Aguinis & Glavas, 2012). In particular, the connection between CSR practices and the sector of activity needs more inquiry in the field of CSR research (Beschorner *et al*., 2013).

Most researchers found that the industry in which a company operates heavily influences CSR actions. According to Hendry (2006), activists choose a problem and industry before singling out a company. Consequently, this emphasizes the value of business sectors for the CSR analysis. Many parties involved are common to businesses in the same field or industry (*e.g.* they compete for the same customers). Furthermore, legislators develop laws for specific activities, meaning that enterprises operating in the same industry have the same restraints (O'Connor & Shumate, 2010), such as environmental or labour regulations.

Roberts (1992) argued that the industry influences CSR actions. Useem (1988) added that businesses with high levels of public engagement, such as those in the financial sector, have a stronger need for a favourable image than sectors with a small concentration of interaction, such as mining or primary metals. Some industries are more susceptible to public perception than others, therefore, they resort to philanthropic donations to protect themselves from an unfavourable reputation (Amato & Amato, 2012). In a cross-sectional examination of corporate donating across several sectors, Amato and Amato (2006) found some interesting trends. Their findings point to significant industry impacts, with industry dummy variables accounting for almost one-fifth of the variance in philanthropic giving.

All companies within an industry are susceptible to reputational issues due to industry impacts attributed to product characteristics or other market qualities. The positive impacts of charity donations can vary widely between sectors, as demonstrated by Brammer and Millington (2005). The results of Dabic *et al*. (2016) reveal that CSR studies are widely dispersed across industries and that the topics and methodologies addressed differ considerably. While exploring the effect of CSR on default risk, Habermann and Fischer (2021) utilized the industry effect as a fixed effect rather than a firm-level effect. However, there still exists a gap in explaining the relationship between CSR and default risk,

whether it differs in different industries or whether there is any difference between the industry's CSR impact on default risk or not. Based on the discussion, we hypothesised:

**H4:** The industry type affects the relationship between CSR and FDR.

## RESEARCH METHODOLOGY

This study utilized data from 497 companies constituting the Standard and Poor's 500 (the S&P 500)[1] index, to explain the relationship between CSR and FDR in the context of firm and industry heterogeneity. Previous research supports our choice of index-based data sampling (Cohen, 2022; Meles *et al*., 2023; Nguyen *et al*., 2023). Table 1 presents the variables of the study with the relevant proxies. We measured FDR using the proxy of FDR for a period of one year from the Credit Risk Institute (CRI) (CRI, 2009). The CRI corporate default prediction system utilizes the forward intensity model developed by Duan *et al.* (2012) to calculate the probability of default (PD), which is a fundamental credit measure. This model incorporates two distinct doubly stochastic Poisson processes that operate on forward time rather than spot time. By employing this forward-looking approach, the model generates PD-term structures for public firms that adapt dynamically to macro financial and firm-specific data, allowing for dynamic learning and analysis. The choice of the main variables of interest was based on two things: accessibility and acceptability of measures. Both the main variables are widely accepted in the literature and calculated based on several points (Berg *et al*., 2022; Do, 2022). We measured CSR using the environmental, social, and governance scores calculated by Eikon. Refinitiv ESG Scores evaluate the ESG performance of companies by analysing reported data available in the public domain. These scores are based on three key pillars and cover 10 different ESG topics. To create these scores, Refinitiv considers a wide range of over 630 company-level ESG measures. For the overall company assessment and scoring process, we selected a subset of the most relevant and comparable 186 data points. We based this selection on factors such as materiality, data availability, and industry relevance. The resulting ESG combined score provided a comprehensive evaluation of a company's ESG performance, incorporating information from the ESG pillars, as well as ESG controversies gathered from global media sources. The control variables included in this study were working capital, efficiency, leverage, and liquidity, which we chose based on the literature (Altman & Sabato, 2007; Habermann & Fischer, 2021; Lin & Dong, 2018; Nguyen & Nguyen, 2021).

Following the discussion in section 2, we based the choice of fixed-effect regression on the assumption that unobserved firm heterogeneity is relevant for the independent and control variables. However, as we tested the model under several settings, this study takes from the Hausman test for the choice between fixed and random effects. In this study, we used the STATA software.

$$d_{it+1} = \alpha_i + \upsilon_1 c_{it} + \varphi_1 w_{it} + \varphi_2 a_{it} + \varphi_3 lq_{it} + \varphi_4 lv_{it} + \varepsilon_{it} \quad (1)$$

in which $d$ is the FDR, $c$ is the ESG score, $w$ is working capital, $a$ is the asset turnover ratio, $lq$ is liquidity, $lv$ is leverage, $\alpha$ is the constant term, $\varepsilon$ is the robust error term, *i* represents the observation firm and *t* represents the observation year. This study tested equation (1) under different settings of firm heterogeneity and industry effects. After testing the relationship using the Ordinary Least Squares (OLS) regression, we tested the model using the instrumental variable regression with generalized method of moments estimator (IV-GMM) regression, which helped to address the endogeneity issue. Endogeneity arises in empirical models if an explanatory (independent) variable is connected with the residuals (also known as 'error term' or 'disturbance term') (Lu *et al*., 2018). The IV-GMM regression is a statistical method designed to tackle endogeneity in regression models by incorporating instrumental variables. It leverages the GMM framework to estimate the causal relationships between variables. By utilizing instrumental variables, the IV-GMM regression provides consistent estimates, addresses endogeneity bias, and offers robustness against misspecification. Compared to OLS regression, scholars consider IV-GMM regression more effective in handling endogeneity-related issues. In terms of firm size, firm heterogeneity is expressed in equations (2) and (3):

[1] We obtained the data for the study from the Eikon database, based on the agreement between the LSEG and the University of Gdansk. We accessed them on 9 November 2022. We based the number of firms on the S&P 500 index with regard to time and data availability.

$$Mid_t \equiv \{i \in N : 2 \leq m_{it} \leq 10\} \quad (2)$$

$$Large_t \equiv \{i \in N : m_{it} > 10\} \quad (3)$$

in which *t* = 1,2,...T and *m* is market capitalization in USD billions.

**Table 1. Variables' description**

| Variable | Symbols | Proxy | Description | Source | Period |
|---|---|---|---|---|---|
| **Default Risk** | *d* | Forward one-year probability of default risk | Probability of Default over one year. | CRI | 2007-2021 |
| **CSR** | *c* | Environmental, social, and governance scores | Evaluation of measurement of how well a company handles issues related to the environment, society, and governance (ESG). | Eikon Refinitiv | 2007-2021 |
| **Working Capital** | *w* | Current assets – current liabilities | Measuring the short-term liquidity. Calculated as $Working\ Capital = Current\ Assets - Current\ Liabilities$ | Eikon Refinitiv | 2007-2021 |
| **Efficiency** | *a* | Asset turnover ratio | Measuring companies' efficiency in generating sales using their assets. Calculated as $Asset\ Turnover = \frac{Net\ Sales}{Average\ Total\ Assets}$ | Eikon Refinitiv | 2007-2021 |
| **Leverage** | *lv* | Debt-to-equity ratio | Measuring firm's leverage. Calculated as $Debt\ to\ Equity\ Ratio = \frac{Total\ Debt}{Total\ Shareholders\ Equity}$ | Eikon Refinitiv | 2007-2021 |
| **Liquidity** | *lq* | Current ratio | Measuring the overall liquidity of firm. Calculated as $Current\ Ratio = \frac{Current\ Assets}{Current\ Liabilities}$ | Eikon Refinitiv | 2007-2021 |
| **Firm Size** | *m* | Market cap | Total market capital of the firm. | Companies Market Cap | 2011-2021 |
| **Firm Age** | *ag* | Current year – founding year | Number of years to incorporation of firms. | Eikon Refinitiv | 2007-2021 |

Source: own study.

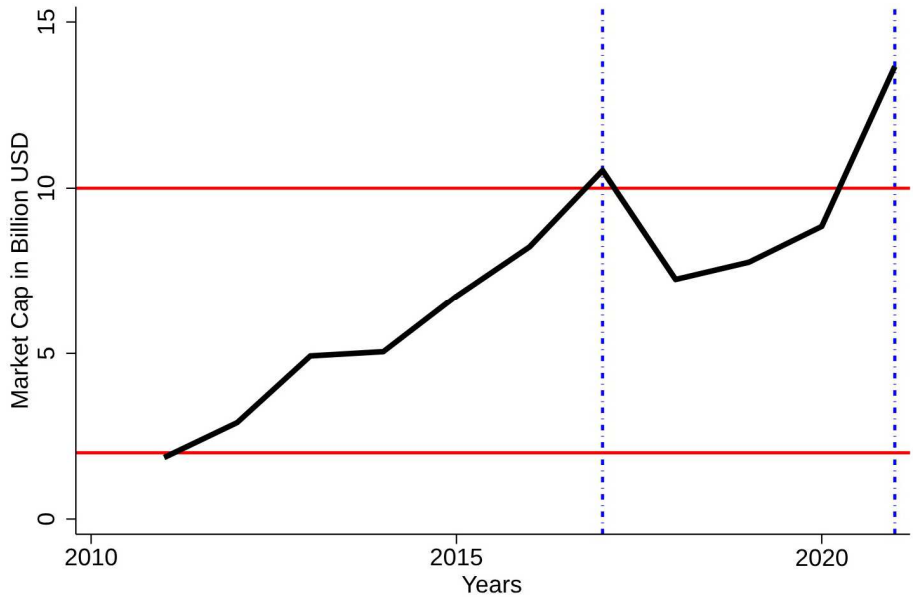


**Figure 1. Observation based on division into firm size**

Source: own elaboration.

The subset created based on $m$ is the market capitalization of firms, N is the total number of observations. We chose market capitalization instead of other measures, such as the number of employees, assets or turnover, because the firms in the sample are public and come from the S&P 500. Hence, we can refer to them as large. However, market capitalization allowed us to divide them according to

mid and large-cap firms and test the difference of effect in different firm sizes. Investment funds adopt the following thresholds: 'mid-cap' is the term given to companies with a market capitalization between USD 2 billion and USD 10 billion, large-cap is the term given to companies with a market capitalization above USD 10 billion (Ross, 2021). Firms' capitalization changes over time. Therefore, according to above mentioned criteria, some of the firm-observations in the S&P 500 are mid or large-cap firms in certain periods which can explain the effect of CSR and FDR in firm-size heterogeneity. As an example, we present the case of A.O. Smith corporation in Figure 1. Throughout the years, A.O. Smith corporation has been in the mid-cap sample. However, in the 2017-2021 period, it belonged to the large-cap firm sample creating a clear and concise division of mid and large-cap sample.[2] Equation (2) depicts testing equation (1) for the subset of firm-observations that have a market capitalization between USD 2 billion and USD 10 billion and these firms are termed mid-cap firms.

Equation (3) shows testing equation (1) for firm-observations with a market capitalization greater than USD 10 billion, termed as large-cap firms.

$$\{AgeCluster_t \equiv \{i \in N : k_{it} = n\} \quad (4)$$

in which $t = \{1,2, \dots T\}, n = \{1,2,3\}$.

The second part of firm heterogeneity is based on age. We. created the subsets of age $k$based on K-means clustering of firm age, and *N* is the total number of observations. K-means clustering is an efficient method for creating clusters when there is no known outcome variable. In this study, age has not been very well defined in the literature as previous mentions focused on small and medium enterprises, which are different in terms of the demographic characteristics of larger corporations in indexes like the S&P 500. Previous studies on SMEs reported an average of 10 years as a young firm (Messersmith & Wales, 2013; Steffens *et al*., 2013). Therefore, using K-means clustering was the most suitable method. Results of our centroid of cluster k1 in panel B of Table 2 show that the average age of young firms was 11 years, k2 (middle-aged firms) had an average age of 37 years and the cluster for old firms had an average age of 94 years. The classification was similar to that of Shrivastava and Tamvada (2019). Equation (4) tests equation (1) in 3 different settings of firm age, *i.e.* 1) young firms, 2) middle-aged firms, and 3) old firms.

$$\{Industry_t \equiv \{i \in N \mid id_{it} = n\} \quad (5)$$

Finally, the model presented in equation (1) is tested in different industries (equation 5), in which $t = \{1,2, \dots, T\}, n = \{e, m, ind, cd, cs, hc, fin, it, tel, ut\}$, in which $e$ is energy, $m$ is materials, $ind$ is industrials, $cd$ is consumer discretionary, $cs$ is consumer staples, $hc$ is healthcare, $fin$ is financials, $it$ is information technology, $tel$ is telecommunications and $ut$ is utilities. We based the classification of industries on global industry classification standard (GICS) codes.

One of the major assumptions to obtain unbiased results is the normality of data. To test if the variables were close to a normal distribution, we plotted the kernel density of variables as shown in Figure 2. Almost all of the variables were not normally distributed, therefore, we performed log transformation. The variables apart from the ESG score were closer to the bell curve shape. The ESG score was more in normal distribution without the log distribution. Based on the visual appearance of the data, this study used the log-transformed variables of FDR, working capital, efficiency, leverage, and liquidity.

## RESULTS AND DISCUSSION

### Preliminary analysis

Table 2 shows the descriptive statistics of the variables in their original form. In the full sample, the mean probability of default was at 0.2% with a standard deviation of 1.2 p.p., while the mean of the ESG scores was 54.068 with a standard deviation of 19.496, which lands the full sample in the third quantile as per the Eikon measures, with a relatively good performance in CSR aspects. On average,

[2] Along with the detailed division, the data might be very well explained, there is one issue pertinent regarding the time frame of the study. Due to the availability of market capital data limited only from 2011 to 2021, the results for firm size heterogeneity are explained for 11 years instead of 15 years.

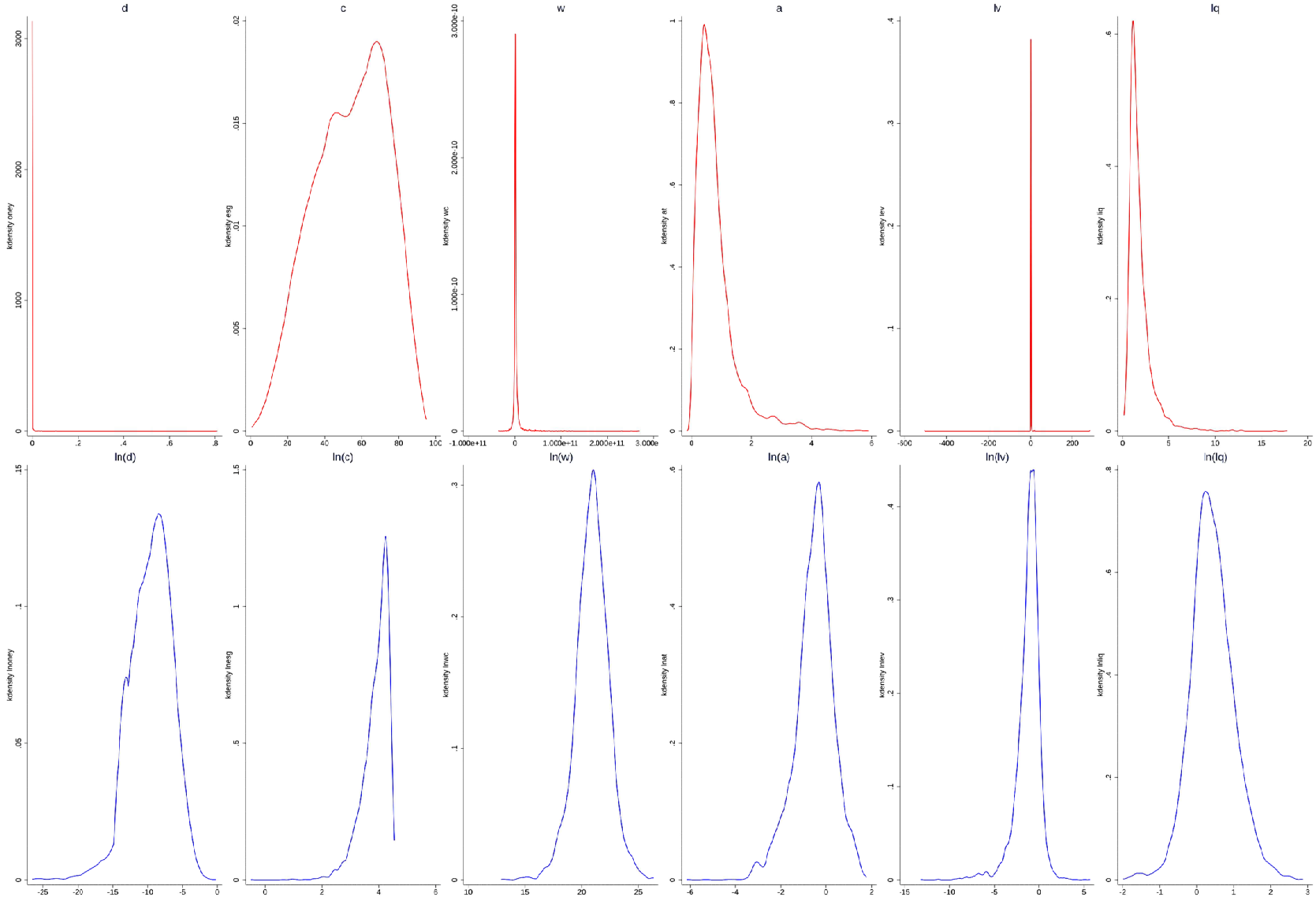


**Figure 2. Variable distribution and log transformation**

Source: own elaboration.

the working capital for the S&P 500 firms was USD 2.4 billion. The mean efficiency, leverage, and liquidity of firms in the full sample were 80.9%, 0.391, and 1.819, respectively. Firm size heterogeneity led to two subsamples of mid and large-cap firms. The mean FDR in the large-cap was lower when compared to the mid-cap and full sample. However, the deviation from the mean was greater than the mid-cap and full sample. The ESG score was higher for the large-cap in comparison to the mid-cap and full sample. Mid-cap firms belonged to the second quantile of Eikon, in which the ESG performance was satisfactory but could still be improved. Firm age heterogeneity had three subsamples, which we termed as young, middle-aged, and old firms. Young firms had higher FDR when compared the two other subsamples and higher standard deviation than the full sample. Middle-aged and old firms had the same average and standard deviation in FDR. Mean ESG scores increased with the firm age and alongside this, the deviation between the firms lowered as the age increased. Ten industries were part of the full sample, taken to test the effect of industry heterogeneity. The mean FDR was the lowest for the consumer staples industry and the highest for consumer discretionary. The lowest mean ESG scores belonged to the telecommunications services industry and the second quantile of the Eikon scale. The consumer staples industry had the highest mean ESG scores, more than any other subsample and the full sample. It was only nine points short of the fourth quantile.

The panel C of Table 2 presents the full sample pairwise correlation between the variables. The FDR negatively correlated with all the variables except leverage. The ESG scores negatively correlated with FDR, efficiency, and liquidity. Working capital positively correlated with the ESG scores and liquidity, whereas efficiency positively correlated only with liquidity. Leverage negatively correlated with the other control variables. Liquidity negatively correlated with FDR, the ESG scores, and leverage.

**The CSR-FDR nexus**

We initially assessed the relationship between CSR and FDR using the random and fixed-effect regression model with robust standard errors controlling for heteroskedasticity and autocorrelation. To choose between fixed and random effects, we ran equation (1) without robust standard errors, in both fixed effect and random effect settings. After acquiring both estimates, we performed the Hausman test as depicted in Tables 3 and 4. These results could have been biased due to the endogeneity problem. Therefore, we tested the models using an instrumental variables estimator implemented through IV-GMM with return on asset and return on equity as exogenous excluded variables. The significance of the test for endogeneity (GMM C statistic) showed that the OLS results did have the problem of endogeneity and results obtained from IV-GMM were robust. Tables 5 and 6 present robust IV-GMM results of the CSR-FDR relationship. Results show that in the full sample and all subsamples, the relationship between CSR and FDR was negative except for the energy and financial industry, in which the relationship between CSR and FDR was positive. Results of the full sample showed that as the ESG score increased by 1 point, FDR decreased by 0.577,[3] a 1% increase in efficiency and liquidity decreased FDR by 0.94% and 9.14%, respectively and a positive percent change in leverage increased FDR by 0.90%. For models m1 and m2 of firm size heterogeneity, mid-cap and large-cap subsamples, we noted that a one-point increase in the ESG scores decreased FDR by 0.133% and 0.498%, respectively. Thus, as a firm's size increased, the controlling power over FDR possessed by CSR increased as well. As discussed in the literature, the spending power and resources allocated on CSR might be higher for large capital firms in contrast to the limited resources possessed by mid-cap firms. Therefore, this allocation and availability of resources can cause higher levels of spending by larger firms and eventually protect them against default.

[3] Our explanation uses point-percentage as the relationship between the ESG scores and forward probability of default was in semi-log form. However, we provided. the explanation for the control variables in percentage-percentage as the relationship was in double-log form.

**Table 2. Descriptive statistics**

| Varibles | | *d* | *c* | *w** | *a* | *lv* | *lq* |
|---|---|---|---|---|---|---|---|
| *s&p* | $\mu$ | 0.002 | 54.068 | 24.400 | 0.809 | 0.391 | 1.819 |
| | $\sigma$ | 0.012 | 19.496 | 107.000 | 0.696 | 9.457 | 1.298 |
| *m1* | $\mu$ | 0.002 | 41.490 | 6.470 | 0.841 | 0.197 | 2.009 |
| | $\sigma$ | 0.009 | 16.985 | 15.200 | 0.666 | 12.400 | 1.448 |
| *m2* | $\mu$ | 0.001 | 59.052 | 32.900 | 0.783 | 0.364 | 1.703 |
| | $\sigma$ | 0.013 | 18.103 | 128.000 | 0.702 | 6.711 | 1.172 |
| *k1* | $\mu$ | 0.002 | 49.479 | 22.200 | 0.776 | 0.349 | 1.942 |
| | $\sigma$ | 0.016 | 20.030 | 80.600 | 0.706 | 13.149 | 1.382 |
| *k2* | $\mu$ | 0.001 | 56.328 | 19.200 | 0.842 | 0.431 | 1.758 |
| | $\sigma$ | 0.006 | 17.663 | 73.100 | 0.746 | 1.828 | 1.357 |
| *k3* | $\mu$ | 0.001 | 63.492 | 41.000 | 0.854 | 0.445 | 1.561 |
| | $\sigma$ | 0.006 | 17.305 | 195.000 | 0.533 | 0.394 | 0.770 |
| *e* | $\mu$ | 0.003 | 56.708 | 22.700 | 0.785 | 0.378 | 1.348 |
| | $\sigma$ | 0.010 | 19.688 | 49.200 | 0.802 | 0.278 | 0.545 |
| *m* | $\mu$ | 0.002 | 57.594 | 17.600 | 0.791 | 0.508 | 1.987 |
| | $\sigma$ | 0.005 | 18.087 | 23.200 | 0.376 | 0.379 | 0.785 |
| *ind* | $\mu$ | 0.001 | 53.467 | 28.100 | 0.974 | 0.262 | 1.782 |
| | $\sigma$ | 0.005 | 19.051 | 184.000 | 0.645 | 6.140 | 1.159 |
| *cd* | $\mu$ | 0.003 | 49.544 | 16.400 | 1.225 | 0.618 | 1.538 |
| | $\sigma$ | 0.030 | 20.971 | 66.800 | 0.740 | 1.526 | 0.796 |
| *cs* | $\mu$ | 0.000 | 66.134 | 2.260 | 1.268 | 0.637 | 1.275 |
| | $\sigma$ | 0.002 | 15.245 | 37.900 | 0.899 | 0.590 | 0.679 |
| *hc* | $\mu$ | 0.001 | 53.662 | 34.500 | 0.924 | 0.154 | 2.552 |
| | $\sigma$ | 0.002 | 20.924 | 61.100 | 0.961 | 23.366 | 1.742 |
| *fin* | $\mu$ | 0.001 | 52.549 | 5.200 | 0.260 | 0.449 | 1.415 |
| | $\sigma$ | 0.007 | 18.314 | 9.350 | 0.277 | 0.592 | 0.670 |
| *it* | $\mu$ | 0.001 | 53.661 | 48.600 | 0.689 | 0.341 | 2.326 |
| | $\sigma$ | 0.004 | 20.154 | 120.000 | 0.328 | 2.929 | 1.652 |
| *tel* | $\mu$ | 0.002 | 47.303 | -10.600 | 0.382 | -3.891 | 1.056 |
| | $\sigma$ | 0.007 | 20.257 | 101.000 | 0.261 | 42.536 | 0.559 |
| *ut* | $\mu$ | 0.001 | 58.861 | -8.830 | 0.299 | 0.624 | 0.872 |
| | $\sigma$ | 0.006 | 15.046 | 24.400 | 0.160 | 0.229 | 0.334 |
| **Panel B. Descriptive statistics of classifiers 'market capital' and 'firm age'** | | | | | | | |
| | Obs | Mean | Std Dev | Min | Max | | |
| *m1** | 2 043 | 6.018 | 2.252 | 2.010 | 9.997 | | |
| *m2** | 4 747 | 57.216 | 119.329 | 10.001 | 2913.300 | | |
| *k1* | 4 003 | 11 | 8 | 0 | 23 | | |
| *k2* | 2 391 | 37 | 11 | 24 | 65 | | |
| k3 | 1 061 | 94 | 18 | 66 | 168 | | |
| **Panel C. Correlation matrix** | | | | | | | |
| | *d* | *c* | *w* | *a* | *lv* | *lq* | |
| *d* | 1 | | | | | | |
| *c* | -0.0210 | 1 | | | | | |
| *w* | -0.0263 | 0.3921 | 1 | | | | |
| *a* | -0.0485 | -0.0024 | -0.0139 | 1 | | | |
| *lv* | 0.0645 | 0.0901 | -0.0638 | -0.1778 | 1 | | |
| *lq* | -0.1796 | -0.1521 | 0.2795 | 0.1567 | -0.2299 | 1 | |

Note: *in billion dollars.
Source: own study.

**Table 3. Baseline Regression results of CSR-FDR relationship for the full sample and firm heterogeneity**

| Variables | *s&p* | *m1* | *m2* | *k1* | *k2* | *k3* |
|---|---|---|---|---|---|---|
| ***c*** | -0.0331*** | -0.0394*** | -0.0146*** | -0.0319*** | -0.0239*** | -0.0309*** |
| | (0.0042) | (0.0081) | (0.0056) | (0.0067) | (0.0074) | (0.0100) |
| ***w*** | -0.0293 | 0.0937 | 0.0959 | -0.1494 | 0.133 | 0.4064*** |
| | (0.0754) | (0.1414) | (0.0926) | (0.1143) | (0.1388) | (0.1291) |
| ***a*** | -1.4302*** | -1.3167*** | -1.3096*** | -0.7699** | -2.3033*** | -0.9437*** |
| | (0.2359) | (0.4693) | (0.2811) | (0.3222) | (0.4198) | (0.3369) |
| ***lv*** | 0.1189* | 0.1812** | 0.0963 | 0.1255 | 0.1336 | 0.5372** |
| | (0.0684) | (0.0870) | (0.1004) | (0.0973) | (0.1063) | (0.2278) |
| ***lq*** | -0.7161*** | -0.7574* | -0.8268*** | -0.4466 | -0.8828** | -1.6874*** |
| | (0.2383) | (0.4012) | (0.2994) | (0.3540) | (0.4257) | (0.5181) |
| ***cons*** | -7.2087*** | -9.0052*** | -11.0827*** | -4.6346** | -11.2628*** | -15.8437*** |
| | (1.4815) | (2.6566) | (1.8826) | (2.2393) | (2.7369) | (2.3699) |
| ***N*** | 3486 | 1013 | 2440 | 1772 | 1130 | 584 |
| ***r2_w*** | 0.049 | 0.059 | 0.025 | 0.034 | 0.068 | 0.051 |
| ***r2_b*** | 0.054 | 0.036 | 0.09 | 0.059 | 0.043 | 0.146 |
| ***r2_o*** | 0.025 | 0.041 | 0.026 | 0.037 | 0.013 | 0.111 |
| ***rmse*** | 2.147 | 1.716 | 2.088 | 2.165 | 1.989 | 2.14 |
| ***N_g*** | 377 | 228 | 357 | 239 | 163 | 67 |
| ***F*** | 23.25 | 7.58 | 7.62 | 7.76 | 9.71 | - |
| ***Hausman Chi2*** | 57.23 | 77.66 | 27.33 | 22.35 | 32.15 | 8.26 |
| ***Hausman p*** | 0.000*** | 0.000*** | 0.000*** | 0.0004*** | 0.000*** | 0.1426 |

Note: standard errors in parentheses. *p<0.10, **p<0.05, *** p<0.01.
Source: own study.

We may explain it by the fact that firms which are growing in capitalization are better at using CSR as insurance against default, while mid-cap firms or medium-sized firms are prone to create a better-developed relationship with society in general, and consumers in particular, following customer connection as a strategy to growth (Wayland & Cole, 1998). Thus, where large-cap firms have better tangible assets to fulfil social responsibility, mid-cap firms have intangible ones, and this connection in society can create a shield against the future possibility of default. Efficiency and liquidity negatively impact FDR and leverage increases FDR similarly to the full sample model.

In the subsamples of firm age heterogeneity, k1, k2, and k3, representing young, middle, and old-aged firms, a 1-point increase in the ESG score pertains to a decrease in FDR by 0.667%, 0.577%, and 0.289%, respectively. Young firms have a higher impact than any other subsample in firm age heterogeneity, while in middle-aged firms, the impact of CSR on FDR lowers and finally, for old-aged firms, the impact of CSR on FDR decreases as compared to young and middle-aged firms. In all three samples all the control variables affected FDR positively by working capital and leverage, and negatively by both efficiency and liquidity. Moreover, CSR can have a varying impact on FDR for different firms, with the effects being influenced by the firm's age. For older firms, the impact of CSR on FDR may be lower due to their established reputation. These firms may already have a solid customer base and a strong brand presence in the market, which could make them less sensitive to fluctuations in their FDR stemming from CSR actions. Furthermore, older firms may have legacy issues related to their operations that cannot be easily resolved through CSR initiatives. For instance, a company with a history of environmental pollution may face greater challenges in improving its FDR through CSR actions than a younger firm that has yet to encounter such problems. Moreover, older firms may be subject to more stringent regulations and standards than younger ones, which may restrict the influence of CSR activities on their FDR. These companies may already be meeting the mandatory bare minimum CSR requirements, leaving less room for additional improvement. Lastly, younger firms may be more focused on building their reputation and

**Table 4. Baseline regression results of CSR-FDR relationship for industry heterogeneity**

| *Varables* | *e* | *m* | *and* | *cd* | *cs* | *hc* | *fin* | *it* | *tel* | *ut* |
|---|---|---|---|---|---|---|---|---|---|---|
| ***c*** | 0.0203** | -0.0404*** | -0.0218** | -0.0264** | -0.0815*** | -0.0300** | -0.0818*** | -0.0556*** | -0.0415* | -0.0274* |
| | (0.0102) | (0.0071) | (0.0090) | (0.0122) | (0.0227) | (0.0114) | (0.0257) | (0.0096) | (0.0223) | (0.0152) |
| ***w*** | -0.2979 | 0.6859*** | -0.3879* | -0.2352 | 0.0592 | 0.0312 | -0.1785 | -0.0615 | 0.2736 | 0.6923*** |
| | (0.2094) | (0.2231) | (0.2250) | (0.1851) | (0.3894) | (0.3121) | (0.2766) | (0.1575) | (0.2582) | (0.2174) |
| ***a*** | 0.4214 | -1.4582*** | -1.8573** | -3.2789*** | -1.8157 | -1.8350*** | 0.8245 | -1.4831*** | 2.5509*** | 0.629 |
| | (0.2875) | (0.3964) | (0.8146) | (0.6575) | (1.2969) | (0.5673) | (0.9249) | (0.4086) | (0.7723) | (0.5537) |
| ***lv*** | 1.5727*** | -0.1229 | 0.2518** | -0.1063 | 0.766 | 0.2439* | 0.4 | -0.0207 | -0.7494 | 1.8142*** |
| | (0.3056) | (0.1770) | (0.1176) | (0.1072) | (0.5342) | (0.1300) | (0.7407) | (0.1248) | (0.9034) | (0.6524) |
| ***lq*** | 0.0095 | -2.2862*** | 0.4849 | -0.7162 | -0.0909 | -0.543 | -1.3578 | -0.9267** | -0.2606 | -0.0597 |
| | (0.7588) | (0.6163) | (0.9182) | (0.6429) | (1.1564) | (0.5730) | (1.4668) | (0.3879) | (2.7344) | (1.1199) |
| ***cons*** | -0.5787 | -20.0267*** | -0.8704 | -2.0086 | -6.1471 | -9.744 | -0.7357 | -5.6565* | -9.5215** | -19.6360*** |
| | (3.8029) | (4.3579) | (4.4283) | (3.5272) | (8.5585) | (5.9395) | (4.5524) | (3.2390) | (4.1317) | (4.7322) |
| ***N*** | 193 | 278 | 626 | 502 | 198 | 511 | 126 | 663 | 30 | 103 |
| ***r2_w*** | 0.119 | 0.07 | 0.032 | 0.143 | 0.111 | 0.07 | 0.197 | 0.11 | 0.014 | 0.109 |
| ***r2_b*** | 0.561 | 0.187 | 0.019 | 0.26 | 0.006 | 0.009 | 0.284 | 0.052 | 0.959 | 0.499 |
| ***r2_o*** | 0.207 | 0.102 | 0.006 | 0.126 | 0.001 | 0.002 | 0.005 | 0.056 | 0.476 | 0.255 |
| ***rmse*** | 2.094 | 2.129 | 2.219 | 1.955 | 2.217 | 2.174 | 2.215 | 2.135 | 2.406 | 2.048 |
| ***N_g*** | 17 | 21 | 63 | 50 | 28 | 47 | 12 | 65 | 6 | 22 |
| ***F*** | – | – | 2.68 | 6.65 | 3.27 | 6.78 | 20.3 | 12.31 | – | – |
| ***Hausman Chi2*** | 2.2 | 6.68 | 15.19 | 23.92 | 19.24 | 27.26 | 21.85 | 19.63 | 3.47 | 4.5 |
| ***Hausman p*** | 0.8206 | 0.2457 | 0.0096*** | 0.0002*** | 0.0017*** | 0.0001*** | 0.0006*** | 0.0015*** | 0.6273 | 0.48 |

Note: standard errors in parentheses. *p<0.10, **p<0.05, *** p<0.01.

Source: own elaboration.

establishing themselves in the market, making them more inclined to invest in CSR initiatives which can enhance their activities to lower FDR. In contrast, older firms may have already made some investments in CSR activities and may not receive the same benefits from additional investments.

Subsamples for industry heterogeneity *e*, *m*, *ind*, *cd*, *cs*, *hc*, *fin*, *it*, *tel*, and *ut* represent the following industries: energy, materials, industrials, consumer discretionary, consumer staples, healthcare, financials, information technology, telecommunications services and utilities. The energy industry is different from all the other industries and samples as it is the only industry in which growth in the ESG score increased FDR. However, the growth was not statistically significant. Similarly, the financial industry showed growth in FDR as the ESG scores increased. The utilities industry showed a negative impact but it was not significant. In the rest of the industries, a 1-point increase in ESG decreases FDR by 0.358%, 0.133%, 0.519%, 0.212%, 0.728%, and 0.129%, respective to the order of industries mentioned at the start of the paragraph. In the results, we noticed a pattern that the impact of CSR on FDR was greater in those industries which directly interacted with the end user, *e.g*. consumer staples, consumer discretionary, healthcare, and information technology. On the contrary, the industry which was less consumer-intensive displayed a lower impact of CSR on FDR.

Amato and Amato (2012) and Useem (1988) provide an explanation of this fact as they mention that industries with more public engagement invest more in CSR. Higher investment in CSR is a driving force for relationships in these industries to better protect them against FDR. More investments in CSR lead to better relationships

**Table 5. Robust regression results of CSR-FDR relationship for the full sample and firm heterogeneity**

| Variables | *s&p* | *m1*[ψ,ς] | *m2* | *k1* | *k2* | *k3* |
|---|---|---|---|---|---|---|
| ***c*** | -0.5777*** | -0.1325* | -0.4980*** | -0.6674*** | -0.5769*** | -0.2887*** |
| | (0.0960) | (0.0753) | (0.1134) | (0.2577) | (0.1611) | (0.0512) |
| ***w*** | 4.3038*** | 1.8049*** | 2.9678*** | 5.2073** | 3.8827*** | 1.8492*** |
| | (0.7068) | (0.4484) | (0.6097) | (2.0582) | (0.9949) | (0.3062) |
| ***a*** | -0.9411*** | -0.9912** | -0.8320*** | -1.1451** | -0.1718 | -2.2708*** |
| | (0.2750) | (0.3959) | (0.2784) | (0.5160) | (0.4006) | (0.5312) |
| ***lv*** | 0.9003*** | 0.1291 | 0.8971*** | 0.8060*** | 0.7444** | 1.8852*** |
| | (0.1828) | (0.1383) | (0.2230) | (0.3103) | (0.2931) | (0.3859) |
| ***lq*** | -9.1431*** | -3.7205*** | -7.0916*** | -10.1344*** | -8.4560*** | -5.3187*** |
| | (1.3695) | (0.7450) | (1.2618) | (3.6066) | (1.9792) | (0.8620) |
| ***cons*** | -62.9472*** | -38.1136*** | -39.2599*** | -78.0486*** | -53.8671*** | -27.5980*** |
| | (8.9783) | (5.8358) | (5.9791) | (27.8636) | (11.2563) | (3.8550) |
| ***N*** | 3482 | 400 | 2436 | 1770 | 1130 | 582 |
| ***rmse*** | 9.837 | 3.279 | 8.444 | 11.706 | 9.456 | 4.557 |
| ***df_m*** | 5 | 5 | 5 | 5 | 5 | 5 |
| ***GMM C Statistic*** | 212.120*** | 3.987** | 17.546*** | 7.404*** | 88.715*** | 64.107*** |
| ***First Stage Fstat*** | 18.647*** | 2.789** | 81.813*** | 6.649*** | 10.773*** | 23.757*** |

Note: Standard errors in parentheses. *p<0.10, ** p<0.05, *** p<0.01. [ψ]Excluded exogenous variables in logarithmic form. [ς]Additional excluded exogenous variable (stock return) was included to tackle the issue of weak instrument bias due to a lower number of observations in the sub-sample.
Source: own study.

## CONCLUSIONS

In this study, we explored the relationship between CSR and FDR in 497 firms of the S&P 500 index from the firm and industry heterogeneity perspective. We found that CSR negatively impacts FDR. Thus, we accepted the first hypothesis proposed in this study. Moreover, by testing in different settings of firm heterogeneity, we conclude that CSR's impact on FDR varies according to both firm size and age. Figure 3 shows the different effects in the subsamples of firm size. In the context of the full sample, large-cap firms tend to have a great impact on CSR and FDR, and this impact is much lower in mid-cap firms. Figure 4 shows a declining pattern of CSR's impact on the FDR. This is inherent because of the mechanisms explained above.

**Table 6. Robust IV-GMM results of CSR-FDR relationship for industry heterogeneity**

| Variables | *e* | *m* | *and* | *cd* | *cs* | *hc* | *fin* | *it* | *tel*[ψ] | *ut* |
|---|---|---|---|---|---|---|---|---|---|---|
| ***c*** | 0.3117 | -0.3576* | -0.1329** | -0.5049** | -0.5189*** | -0.2122*** | 0.1351* | -0.7282** | -0.1290*** | -0.0380 |
| | (0.2556) | (0.2094) | (0.0630) | (0.2084) | (0.1981) | (0.0347) | (0.0755) | (0.2989) | (0.0411) | (0.0246) |
| ***w*** | -2.934 | 4.1190* | 1.3393*** | 3.3795** | 2.9550*** | 1.8724*** | -1.0174* | 5.0942** | 1.0874* | 0.7131*** |
| | (2.4718) | (2.1133) | (0.4600) | (1.4435) | (0.9485) | (0.3444) | (0.6161) | (2.1976) | (0.6081) | (0.2366) |
| ***a*** | 1.2607 | -6.1110** | -1.6114*** | 0.4233 | -0.6148 | -0.9648*** | -1.2770* | 5.6561** | 3.5035*** | 0.8238** |
| | (0.9766) | (2.9953) | (0.3652) | (1.1924) | (0.9342) | (0.3276) | (0.7376) | (2.7776) | (1.2326) | (0.4168) |
| ***lv*** | 0.4848 | 0.7446 | -0.0303 | 0.7634** | 1.1124 | 0.3909*** | -0.5752 | 0.8736** | -1.2272 | 1.9607*** |
| | (1.3609) | (0.6220) | (0.1050) | (0.3851) | (1.0435) | (0.1365) | (0.3559) | (0.4292) | (0.8676) | (0.3933) |
| ***lq*** | 4.7395 | -8.7644* | -3.3490** | -12.3467*** | -13.3966*** | -4.4486*** | 0.8293 | -6.5337** | -5.0763 | -0.5825 |
| | (4.6717) | (4.5665) | (1.3041) | (4.6057) | (4.1251) | (0.6882) | (1.7287) | (2.5609) | (3.0956) | (1.3649) |
| ***cons*** | 36.006 | -70.3105** | -29.7574*** | -47.6746*** | -34.6682*** | -35.5630*** | 0.435 | -69.1872** | -20.3524** | -19.1797*** |
| | (35.6254) | (30.1638) | (5.8916) | (18.2748) | (10.9368) | (5.2593) | (7.8511) | (27.2272) | (9.9658) | (4.1950) |
| ***N*** | 191 | 278 | 626 | 502 | 198 | 511 | 126 | 663 | 23 | 101 |
| ***rmse*** | 4.908 | 5.116 | 3.435 | 9.503 | 7.448 | 3.568 | 3.541 | 11.681 | 2.581 | 2.099 |
| ***df_m*** | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| ***GMM C Statistic*** | 10.078*** | 1.303 | 5.545** | 7.068*** | 31.380*** | 21.255*** | 3.707** | 29.648*** | 5.683** | 0.060 |
| ***First Stage Fstat*** | 0.672 | 1.178 | 10.269*** | 14.011*** | 3.106** | 18.084*** | 7.125*** | 4.603** | 7.096*** | 4.026** |

Note: Standard errors in parentheses. * p<0.10, **p<0.05, ***p<0.01. [ψ]Excluded exogenous variables in logarithmic form.
Source: own elaboration.

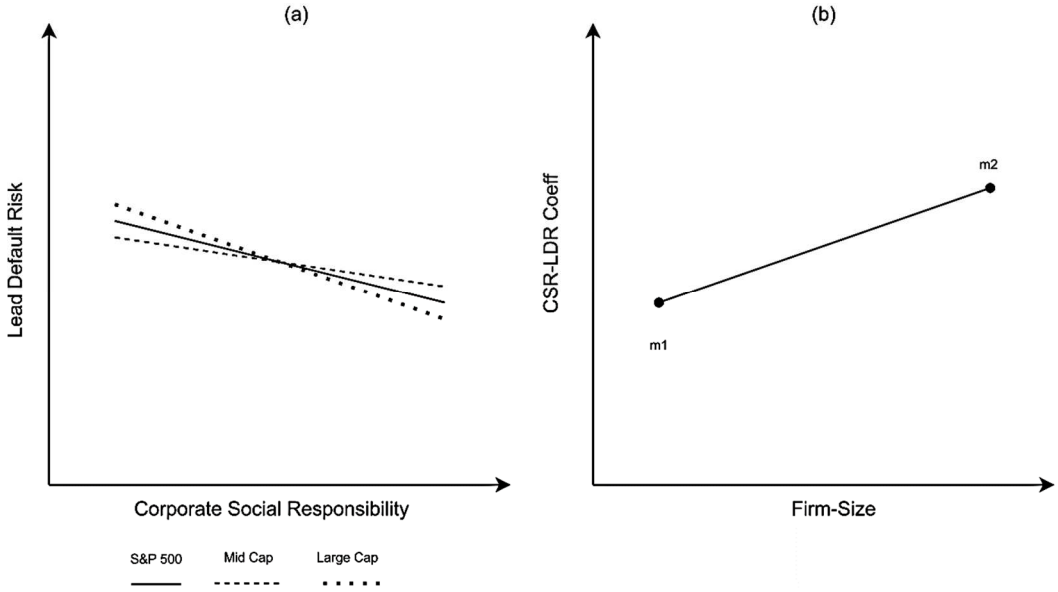


**Figure 3. Firms' heterogeneous (size) effect on the relationship between CSR and FDR**
Source: own elaboration.

Interestingly, although firm size and age have often been linked, this study suggests that the two are not necessarily co-dependent. We found that as the age of a firm increases, the effect of CSR on FDR diminishes. While we may see older firms as more established and therefore larger, younger firms may also exhibit larger sizes due to a variety of factors. Innovation is one such factor. Younger firms may be more disruptive and innovative, leading to rapid expansion. In contrast, older firms may be more risk-averse and focused on maintaining profitability, which can limit their growth potential.

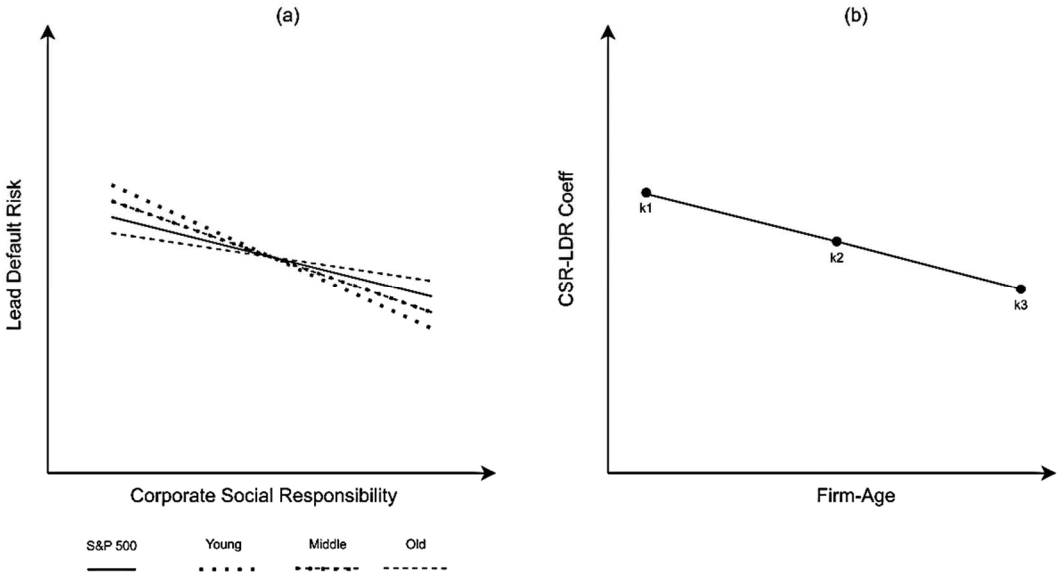


**Figure 4. Firm's heterogeneous (age) effect on the relationship between CSR and FDR**
Source: own elaboration.

Market conditions also play a critical role in determining firms' size, regardless of their age. Younger firms may enter a growing market and capture a large share of the market, while older firms may operate in a mature or declining market with limited growth opportunities. Resource constraints also contribute to differences in firm size. Older firms may have limited resources to invest in growth, particularly if they prioritize profitability over expansion. In contrast, younger firms may have greater access to funding or be

more willing to take on risks to invest for growth. Firm's organizational structure can impact its size and growth potential. Older firms may be more bureaucratic and hierarchical, hindering innovation and growth. Younger firms may have a more flexible and decentralized structure that allows for faster decision-making and innovation. Subsequently, this leads to the acceptance of the second and third hypotheses.

Finally, we found that industry heterogeneity impacts the relationship between CSR and FDR. Thus, we accepted the fourth hypothesis. Figure 5 shows this relationship from the context of industry heterogeneity, where industries with an intensive level of consumer interaction have a strong impact of CSR on FDR as compared to those firms which have less consumer interaction. Numerous mechanisms could account for this behaviour. Firstly, customer loyalty is critical to the success of businesses in industries that involve high consumer interaction, such as retail and hospitality. Companies in these sectors may face higher FDR if they fail to participate in CSR activities, as consumers are more likely to support businesses with a positive reputation for CSR, such as ethical labour practices and sustainable sourcing. As a result, firms may face higher FDR as consumers switch to competitors with a better CSR track record. Moreover, companies in high-consumer interaction industries may be more susceptible to negative publicity and reputational damage if they do not participate in CSR activities. Online platforms, including social media, make it easier for consumers to share information about firms, and unfavourable information can spread rapidly. Conversely, firms in sectors with less consumer interaction may be able to avoid negative publicity.

Companies in industries with high consumer interaction may face greater regulatory pressure to engage in CSR activities. Government agencies and consumer advocacy groups may be more inclined to investigate and punish businesses in sectors where customers are more vulnerable or at risk. Lastly, industries with high consumer interaction may have more opportunities to participate in CSR activities that can directly benefit their customers. For instance, a restaurant chain that sources local and organic ingredients may be able to charge a premium for its products and draw more customers. In contrast, firms in sectors with less customer interaction may not have as many opportunities to engage with their customers through CSR activities.

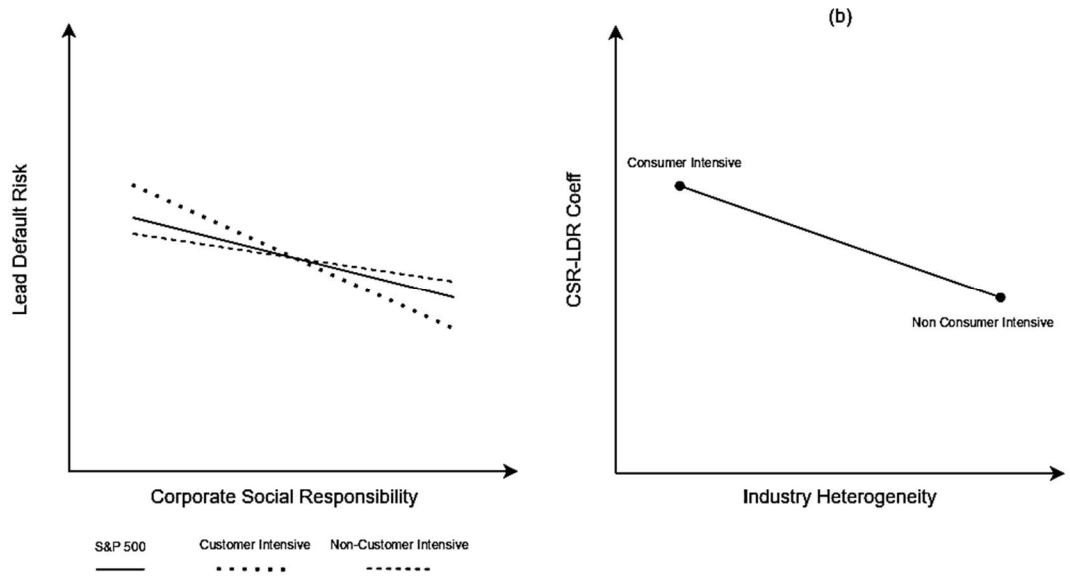


**Figure 5. Heterogeneous effect of industry on the relationship of CSR and FDR**
Source: own elaboration.

This study suggests two major policy implications. Firstly, from the firm heterogeneity perspective, even though CSR is a better shield for FDR in young firms, their total ESG scores prove to be in the second quantile of ESG performance. Therefore, mid-cap and young firms should introduce CSR policy to enhance their ESG performance but also guard them against FDR. Secondly, based on the findings which demonstrate that higher CSR lowers FDR in customer-oriented industries, this study strongly recommends that corporations operating in these industries enhance their CSR policies.

This will allow them to maximize CSR's positive impact on FDR. Conversely, for corporations in non-consumer-intensive industries, this study suggests emphasizing and effectively communicating their CSR performance to end consumers. This strategic approach is likely to create a stronger and more profound connection between CSR initiatives and FDR in the future. For instance, the energy and industrial industries have very limited customer interaction as they work specifically on chemicals or refineries of fuels. As this study found, in consequence, their non-customer-intensive nature does not allow them to better utilize the CSR effect, which might further protect them from default. Obviously, CSR is not just a vacuum practice; instead, it creates a connection or rather a pathway of enlightened self-interest-based exchange. Therefore, even industries with lower consumer interaction should create a channel of communication by educating their end consumer about efforts made by them to use, innovate, and improvise environmentally friendly business methods.

To some extent, this study was limited. Due to the availability of data, we studied only on the S&P 500 sample. Future research can focus on a comprehensive understanding of the financial implications of CSR by comparing its impact on various financial parameters, such as profitability, stock performance, or cost of capital, across firm and industry heterogeneity. To gain insights into the sustainability and persistence of the relationship between CSR engagement and FDR, conducting longitudinal studies that examine the long-term effects on financial indicators would be crucial. A deeper understanding of the underlying mechanisms can be achieved by exploring potential mediating or moderating factors, such as firm goodwill, financial performance, governance mechanisms, or industry competitiveness, that influence the relationship between CSR and FDR. Broadening the scope of research to different countries and regions will contribute to a broader understanding of the impact of CSR on FDR, taking into account variations in legal, cultural, and institutional contexts.

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## Conflict of Interest

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