

# **TO WHAT EXTENT DOES ENVIRONMENTAL BEHAVIOR INFLUENCE FIRMS' ACCESS TO CAPITAL?**

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## **ABSTRACT**

This article analyzes the relationship between firms' environmental behavior (i.e. environmental performance and environmental disclosure) and their level of access to capital.

Here, environmental behavior was specifically isolated from financial, or economic performance and access to capital was measured by the KZ-index. This article also examines the interaction effect of financial performance on the relationship between environmental behavior and access to capital. An international panel data sample of 14,536 firm-year observations for the period of 2006-2016 was analyzed. The empirical evidence suggests that the two types of environmental behavior influence access to capital, but in different ways. Environmental performance only moderates the positive effect that financial performance has on access to capital, whereas environmental disclosure positively influences access to capital on itself, and through interacting with financial performance. These findings highlight the distinction between performance and disclosure, and the importance of environmental disclosure for a firm's financial position.

## INTRODUCTION

Nowadays, an exponentially growing amount of attention is directed at the conditions of our natural environment. Obviously, this growing awareness results from the pressing conditions of our world today. ‘Greenness’ is becoming increasingly important, and virtually impossible to ignore for existing firms. At the same time, new green businesses, directly aiming for a more sustainable world, are being set up in growing numbers (Eyraud, Clements & Wane, 2013). Naturally, both new green firms, and existing firms that try to become greener (hereafter, referred to as ‘green firms’ as both types show positive environmental performance) require some source of capital in order to launch their environmentally friendly business ideas, which is where funding becomes crucially important. One might say it lays the foundation for these firms to be able to start working on their goals, and is therefore, a vital ingredient for environmental value creation. Schaltegger and Wagner (2011) even defined the main goal of social entrepreneurship as ‘achieving a societal goal and securing funding to achieve this’, where funding obviously precedes achievement. As a result, it is particularly important to understand the factors that underly the constraints green firms experience when trying to access capital.

Nevertheless, current research has often neglected the difficulty underlying this process. Assumptions have been made on how green firms possess a beneficial position towards, for instance, the cost of capital (Ambec & Lanoie, 2008), resulting from their enhanced stock market position, and lower risk of public scrutiny. Furthermore, from a moral perspective, some have reasoned that some focus on environmentalism is the “right” thing to do, as the public expects managers to take responsibility (Marcus & Fremeth, 2009). Thus, investors can be expected to focus on environmental performance of investees as this is ethically justifiable, regardless of financial profitability (Marcus & Fremeth, 2009). However, at the same time, funding organizations are generally profit-seeking businesses that need financially viable projects to invest in, in order to stay alive. In this regard, due to green firms’ different product or service characteristics, core values, and strategies, they create value in unconventional ways, which might make them struggle more with getting access to capital (Bergset, 2015). Nowadays, there exists a growing body of research supporting the idea that being green pays off, or could potentially pay off (Hart & Ahuja, 1996; Ambec & Lanoie, 2008; King & Lenox, 2001), which contributes to a financial argument for funders to invest in green firms, or to the argument for how green firms can easily fund themselves. However, this would still come down to expected financial performance, resulting from environmental practices, instead of the

greenness itself that leads to access to capital. As a result of this paradox, this research looks at the two indicators, financial performance and environmental behavior (i.e. both disclosure and performance), separately in relation to access to capital in order to create a more sophisticated understanding of firms' financial constraints. In this way, this research aims to add value by focusing on the interplay of these two important, but sometimes conflicting, pillars of green firms. It investigates the effect of environmental behavior, both disentangled from, and in relation to financial performance, which corresponds with the following research question: "To what extent does environmental behavior influence access to capital?" Obviously, financial and environmental behavior will, within a green firm, always be interconnected, but the empirical distinction is made in order to investigate, in a more detailed way, how greenness on itself contributes to firms' financial constraints.

Information on this topic will be practically insightful both for firms that are, or would like to become more environmentally friendly, and would like to know how it affects their financial position, and for investors wanting to get an empirical understanding of the position that green firms are in. Moreover, this paper adds to existing research by providing an empirical understanding of the isolated effect of environmental behavior on access to capital.

In order to research the question stated above, a fixed effects regression analysis is conducted on a combination of economic, financial and environmental panel data<sup>1</sup>, collected from Thomson Reuter's Asset4, Bloomberg, and Compustat. The quantitative perspective was consciously taken, as there is a large base of often paradoxical theory on environmental behavior and financial performance already, and this research intends to show how these two pillars interplay in practice with respect to financial constraints. As medium- to large-sized firms generally provide documentation on their performance, and there exist constructs that indicate firms' access to capital, quantitative analysis of these data can assist in detecting relationships.

The rest of this paper is organized as follows. Firstly, the theory section provides the theoretical foundation of this research and the subsequent hypothesis development. Secondly, the methodology section clarifies the variables used and describes the statistics. Subsequently, the results section elaborates on the findings of the regression analysis and the robustness of the results. Finally, the concluding section discusses the results, gives some implications and limitations of this research, and highlights directions for further research.

<sup>1</sup> Panel data contains observations of multiple phenomena obtained over multiple time periods for the same firms or individuals.

## THEORY

As mentioned earlier, green projects, or entirely green firms, need a certain amount of funding to become successful. All funding opportunities together indicate to what extent a firm is financially constrained. Naturally, funding can be a direct result of firms' own operations (e.g. net profits, cash), but also, to a substantial size, it can be provided by external investors. In addition to financial support, investors can provide triple bottom line business advice and network support, and thereby be of crucial importance to sustainable businesses' success. Bocken (2015) researched the effect of sustainable venture capitalists on the success of sustainable businesses and found that the former can help prove the success of sustainable business formats, mitigate financial risk through co-investments, and exercise patience by balancing financial with social and environmental returns. Thus, investors can play a substantial role for sustainable, and more specifically, environmental businesses and as a result, it is essential to know what criteria investors find important when assessing a certain firm or project. A lot is known already about the mechanisms behind the financing of conventional firms (Reilly & Brown, 2011; Magni, 2010; Magni, 2011; Cohen, Zinbarg & Zeikel, 1967). For instance, previous work has named 'internal rate of return' (Magni, 2011), 'return on investment' (ROI) (Magni, 2010; Bachher & Guild, 1996), business opportunity and business identity (Feeney, Haines Jr. and Riding, 1999) as predictors for investment decisions. Therefore, it is particularly interesting to see what criteria are relevant when assessing green firms, and whether they divert from this. This paper seeks to understand whether 'greenness' of firms plays a significant role for firms' access to capital, and thus, whether it distinguishes green firms from so-called silent brown, or greenwashing firms (Delmas & Burbano, 2011). In this section, the relationship between environmental behavior and access to capital will first be discussed. Subsequently, the paper elaborates on the financial viability of financial institutions and on how green firm's financial performance might interact with their environmental performance in their distance to financial markets. From this theoretical discussion, four hypotheses are derived.

### **Environmental behavior and access to capital**

In order to investigate the relationship between firms' environmental behavior and access to capital, it makes sense to look at three streams that are dominant in current research and relevant concerning this topic. Firstly, one stream looks at the relationship between environmental performance and financial performance, as an explanation for how easily firms receive financing. Here, even though current literature displays ambiguous results, the field is

dominated by research arguing that it is profitable to firms to be environmentally friendly, and therefore, wise of investors to invest in firms that do so (Hart & Ahuja, 1996; Ambec & Lanoie, 2008; King & Lenox, 2001; Clemens, 2006). Secondly, some researchers have developed a more moral or stakeholder case for sustainability (Freeman, 1984; Marcus & Fremeth, 2009), arguing that valuing environmentally friendly behavior (e.g. of investors), is important regardless of financial profitability. Lastly, environmental firms are shown to disclose information more transparently, which has also been proved to positively affect access to capital (Flammer, 2013; Cheng, Ioannou & Serafeim, 2014). The three arguments will now, one by one, be explained into further detail.

***Environmental performance and financial performance.*** The relationship between environmental performance and financial performance is a well-documented relationship that has showed ambiguous results. It is relevant to understand how this relationship works in order to better understand investors' disposition towards green firms, under the assumption that investors value a positive ROI for investees (Magni, 2010). Different streams in research have tried to explain the, sometimes conflicting, results regarding this relationship. Firstly, the *traditionalist view* reasons that environmentalism can only potentially reduce negative externalities, but on itself hurts financial performance. In line with this, Wagner and Schaltegger (2003) argue that operating in polluting industries with strict environmental regulations results in overall higher legal costs to firms. These firms can decrease this industry-specific disadvantage by complying with environmental standards. If they do this better than others, they can decrease their competitive disadvantage. However, the bottom line remains, that there are no positive financial implications of environmentally friendly behavior on itself (Wagner and Schaltegger, 2003). Moreover, due to green firms' different product or service characteristics, core values and strategies, they create value in unconventional ways, which might make them financially volatile and worsen their chances of getting financed (Bergset, 2015). Alternatively, the *inverse U-shape view* argues that being green is predominantly beneficial in the 'low-hanging fruit' phase. Thus, in this phase, marginal effects of becoming greener on financial performance are the biggest. (Misani and Pogutz, 2015) Research has shown that financial performance of firms with an intermediate pollution level is the highest, suggesting both that possible positive effects of further lowering your pollution level can be marginalized, and, that substantially high pollution levels can also be harmful to firms. Lastly, the *neoclassical revisionist view*, currently the most dominant stream in research, states that environmental initiatives have the potential to create win-win situations, enhancing financial performance and environmental performance, simultaneously (Hart & Ahuja, 1996; Ambec &

Lanoie, 2008; King & Lenox, 2001; Clemens, 2006). For example, Ambec and Lanoie (2008) systematically discuss channels through which firms can either reduce costs, enhance revenues, or combine the two and basically, make a case for sustainability. In line with this, Porter and Kramer (2019) discuss the concept of ‘shared value’, which they claim can be created through enhancing shareholder value and social value at the same time. A review by Friede, Busch and Bassen (2015) of more than 2,000 studies reveals a nonnegative relationship for 90% of the studies, of which the majority show positive results, which will be the baseline viewpoint of this research. However, as this research looks at the effect of environmentalism on itself on access to capital, it will not investigate to what extent environmental behavior might have an effect through enhanced financial performance. This decision was consciously taken, to control as much as possible for the financial benefit of greenness as an argument for greater access to capital. However, there might be some associational effect of environmental behavior’s positive influence on financial performance left, when financial markets assess environmental behavior on its own, without looking at financial evidence. This leftover effect can, through environmental performance, still affect access to capital.

***Moral responsibility financial institutions.*** In addition to investors’ connotation of the financial profitability resulting from being green, one could also make a moral case for being sustainable as a firm. Firstly, stakeholder theory suggests that all stakeholders should be considered in corporate decision-making and not solely shareholders aiming for high dividends (Freeman, 1984). Naturally, stakeholders, here, include external parties like the government, NGOs, but even ‘the environment’ on itself. In line with this theory, Marcus and Fremeth (2009), make a moral case for sustainability by stating that green management matters regardless of whether it pays. In their opinion, managers have certain responsibilities, and people expect them to behave responsibly, which goes further than just looking at financial profitability. A similar argument can be made for financial institutions, when looking at the way they make their investment decisions which more often than not carry great importance and impact for the investees and thereby, for society. Therefore, it is expected to be able to find this relationship back in green firms’ access to capital.

***CSR and access to capital.*** As a final argument, we zoom into corporate social responsibility (CSR), of which environmental performance is an important component. Existing research has drawn attention to the so-called *CSR gap* (Tashman, Marano & Kostova, 2019; García-Sánchez, Hussain, Khan & Martínez-Ferrero, 2020); the distance between internal CSR performance and external CSR disclosure. When a firm is making external claims about its CSR policy, a lack of correspondence with actual behavior might enable the legitimization of

misconduct, resulting in a loss of legitimacy (MacLean & Behnam, 2010). Luo, Wang, Raithel and Zheng (2015) find support that financial analysts rather not recommend a stock with CSR risks to investors, even when this firm's economic performance is promising. This indicates that actual CSR performance is valued by investors, especially in relation to external CSR disclosure, which highlights the distinction between performance and disclosure. This distinction also exists for environmentalism and will be considered for this study as well. Environmental disclosure might be important to investors, as it helps capitalizing a firm's enhanced image and decrease or avoid political risks, as was investigated by Gamerschlag, Möller & Verbeeten (2011). Moreover, there is a consensus that high quality information disclosure results in low cost of capital and low financial constraints to firms (Flammer, 2013; Cheng et al., 2014), as it reduces forecast errors, information asymmetries and noise associated with stock performance information. It offers a better understanding to investors and creditors of the economic risk of investing in a certain firm. Firms that have a high CSR performance, have shown to score higher on CSR disclosure extensiveness and credibility (Flammer, 2013; Cheng et al., 2014) which, again, implies that both firms that perform well and firms that disclose much might have more access to financial resources than non-sustainable firms. This theory is mainly focusing on CSR as a broad concept, while this paper is specifically focusing on environmentalism. As environmental practices make a crucial component of CSR, similar effects can be expected.

To summarize, on top of the positive connotation investors might have regarding financial performance when assessing green firms, and how they might behave morally responsible through their investments, green firms generally disclose information more transparently, granting them greater access to financial markets. Together, these arguments provide a solid background to derive the following hypotheses:

*Hypothesis 1a. Environmental performance positively affects firms' access to capital.*

*Hypothesis 1b. Environmental disclosure positively affects firms' access to capital.*

### **Financial viability of financial institutions**

Besides the argument that can be made for environmental behavior on itself as a predictor for access to capital, investors look at other criteria. Obviously, investors aim to invest in financially viable projects, as they are basically businesses themselves, that need to stay alive and solvent in order to invest in the first place. When looking at the more conventional criteria that are important to investors, it becomes evident that financial performance plays a role. For

instance, Bachher and Guild (1996) showed that investors of early stage technology-based companies value a certain expected ROI from potential investees, and Feeney and colleagues (1999) found that business opportunity, combined with business identity are main criteria for investors. Moreover, research by Adhikari (2016) showed that profitable firms rely less on CSR to create a certain reputation and to be attractive to financial analysts and investors, indicating how financial profits can overrule the need for ethical practices. Moss, Neubaum and Meyskens (2015) find that microenterprises which signal autonomy, competitive aggressiveness, and risk-taking, are more likely to receive funding, and to receive it more quickly. This, again, indicates that innovativeness and aims for high business outcomes can already, in the signaling phase, positively influence investors. Reasoning from this perspective, one might expect an interplay between financial performance and environmental behavior in investors' assessment of possible investments. Therefore, the following hypotheses are proposed:

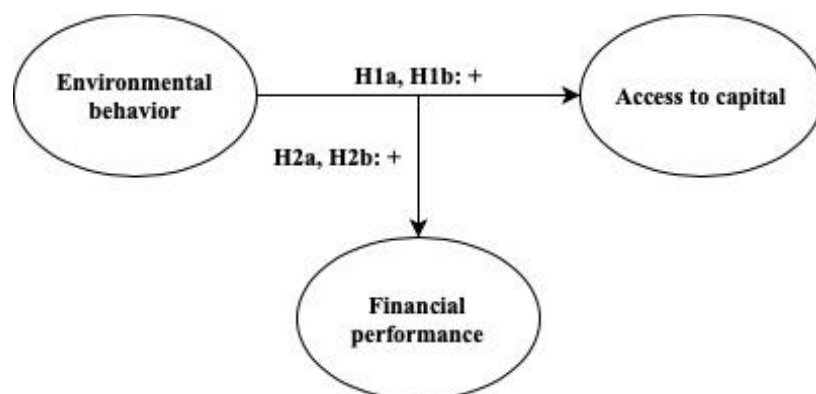
**Hypothesis 2a.** *Financial performance strengthens the relationship between environmental performance and access to capital.*

**Hypothesis 2b.** *Financial performance strengthens the relationship between environmental disclosure and access to capital.*

All hypotheses were visualized in Figure 1.

Figure 1

*Conceptual framework*





## METHODS

### Data

For this study, data were collected from the year 2006 until the year 2015. This specific period was chosen for the sake of data availability. The final dataset originated from three databases. The Thomson Reuter's ASSET4, Compustat and Bloomberg databases all possess data from medium to large-sized publicly traded companies originating from a variety of countries and industries. Firstly, economic and financial data were sourced from the Thomas Reuter's ASSET database and the Compustat database. Secondly, the Thomson Reuter's ASSET4 database was consulted in order to connect environmental performance data to the economic and financial data. Lastly, environmental disclosure data was collected from the Bloomberg database. After matching these data from the above-mentioned sources, all values below the normal probability of 1% and above 99% were removed from the dataset, in order to prevent highly unexplainable outliers from influencing the results. This was done for the dataset at whole, before taking a subsample that only selected all observations without missing values for the important variables. Thus, in this phase, the dataset was still substantially large (much larger than the final sample), making it interesting to look at the percentage of deletion. For each variable, this percentage was between one and two percent of all observations. Subsequently, all missing values of the control variables (except for the dummy for financial loss) were imputed with industry-year means<sup>2</sup> in order to have more complete observations to run regressions with. On average, for each variable, this resulted in an increase in observations of 25 percent with respect to original number. Before doing this, a Little's test (Little, 1988), following Li (2013), was conducted to check whether the missing values were missing completely at random<sup>3</sup> (MCAR). This condition was satisfied for the relevant variables and covariates. Lastly, all observations that were missing (MCAR) any of the required information<sup>4</sup> were deleted, resulting in the final sample. The final sample used to test the hypotheses at interest consisted of 14,536 firm-year observations<sup>5</sup> spanning 11 years (2006-2016) and originating from 2,159 firms.

<sup>2</sup> The mean of a certain variable, in a certain year, for a certain industry.

<sup>3</sup> MCAR stands for no relationship between the missingness of the data and any values, observed or missing.

<sup>4</sup> Required information concerned the independent and dependent variables, as displayed in Table 1.

<sup>5</sup> Firm-year observations are calculated by multiplying the number of firms with the years of data available for each firm.

## Variables Measurement

**Environmental performance.** The independent variable, environmental performance, was drawn from the Thomson Reuter's Asset4 database. This database offers specific data on firms' ESG score, which is a score that consists of environmental, social, and corporate governance performance, and is often used in academic research (Friede et al., 2015). It is built up out of 70+ key performance indicators (KPI's) and more than 400 datapoints, focusing on ten main categories. This specific research is only looking at the environmental component of the ESG score and therefore, only at three environmental categories: resource use, emissions and innovation. Firms receive a score for each KPI from 0 to 1. Here, a score of 0 represents a low performance, whereas a score of 1 represents an excellent performance. The scores are relative, so they represent values that are based on an industry benchmark, instead of absolute values. Values for environmental performance range between 0.1 and 100, where 0.1 indicates a low and 100 a high level of performance.

**Environmental disclosure.** Environmental disclosure was collected from the Bloomberg database, which annually compiles ESG data on thousands of companies from published disclosures and new items and turns it into a number: a disclosure score. Just like for Asset4's environmental performance, this variable only contains the environmental part of Bloomberg's ESG score. Other than with environmental performance, this score displays environmental performance as a measure of transparency. The more transparent a firm is about environmental practices, the higher the environmental disclosure score. This score is relative to the specific industry in which a firm operates. Values range from 0.1 till 100, where 0.1 indicates a low and 100 a high level of transparency.

**Financial constraints.** In order to measure access to capital, the KZ-index was employed (Kaplan & Zingales, 1997). In line with García-Sánchez and colleagues (2020) who also use this measure as an indicator of access to capital, this study uses Kaplan and Zingales' (1997) regression coefficients to construct the index for every firm, for each year. Here, the linear combination of five ratios is being looked at: cash flow to total capital, market to book, debt to total capital, dividends to total capital, and cash holding to total capital. In line with Cheng and colleagues (2014), the calculations were done as follows:

$$\text{KZ index} = -1.002 \frac{\text{CF}_{it}}{\text{A}_{it-1}} - 39.638 \frac{\text{DIV}_{it}}{\text{A}_{it-1}} - 1.315 \frac{\text{C}_{it}}{\text{A}_{it-1}} + 3.139 \text{LEV}_{it} + 0.283 \text{Q}_{it}$$

Here, CF stands for cash flow; A for total assets; DIV for cash dividends; C for cash balances; LEV for debt to total capital; and Q for the market-to-book ratio. In sum, higher values of the KZ index indicate that the firm experiences more financial constraints. The intuition behind

this is that firms with higher cash balances and cash flows have more funds available to use for new projects (Baker, Stein & Wurgler, 2003). Also, firms that have high dividend pay-outs and a low market-to-book value have fewer options for growth, and thereby, do not necessarily need much financing (Lamont, Polk & Saaá-Requejo, 2001). These two components tell something about the “need” for financing, which shows to be low when firms’ are paying high dividends, lowering cash, or when market-to-book values are low, indicating that markets consider a firm to have few growth opportunities<sup>6</sup>. The intuition here is that, when there are few opportunities for growth, there are also fewer constraints on growth. Lastly, highly levered firms are less capable of obtaining of receiving more debt financing as their chances of default are already high, and thus, the cost of financing is high as well (Baker et al., 2003).

**Financial performance.** “ROA” represents the return-on-assets percentage (Cormier & Magnan, 2014). This variable represents a firm’s financial profitability, or performance, relative to its size<sup>7</sup>. As explained in the previous section, investors need financially viable projects invest in, and are therefore, likely to value financial performance. More profitable firms have been argued to be more attractive to financial markets and to rely less on CSR to create a certain reputation (Adhikari, 2016). As a result, a more positive ROA value is expected to result in a more favorable position towards financial markets. This variable will be used both as a covariate, enabling the isolation of the effect of environmental behavior on access to capital, and as a component of the interaction effects.

**Control variables.** Next to the above-mentioned dependent and independent variables, a set of control variables was added to the analysis to account for imaginable other explanations and to prevent the results from being biased. The control variables were selected in accordance with previous research on environmental performance, CSR performance, and access to capital. They are primarily in line with García-Sánchez, Hussain, Khan, and Martínez-Ferrero (2020), who investigated the effect of the CSR gap on access to finance. Firstly, firm size was chosen as a control variable, which is indicated by the natural logarithm of total assets. The logarithmic

<sup>6</sup> The market-to-book ratio indicates whether a firm is under- or overvalued. When the market value (share price multiplied by the number of shares outstanding) is higher than the book value (the book, or balance sheet value per share multiplied by the number of shares outstanding), this generally indicates that markets believe that a company has growth potential beyond its current balance sheet. Logically, the opposite is true when a firm’s market price is smaller than its book value.

<sup>7</sup> Total assets represent a firm’s total balance sheet, summing up both non-current assets such as property, plant and equipment (PP&E), intangible assets (e.g. goodwill), and long-term investments, to current assets such as cash and equivalents, inventory, and prepaid expenses. Although capital intensive firms are likely to have more capital assets, lowering their ROA, the Fixed Effects model automatically controls for time-invariant firm characteristics that can be correlated with the independent variables (i.e. industry, capital intensity). In addition, the control variable ‘Assets in Place’ controls for fluctuating PP&E levels, indicating capital intensity.

transformation was done to normalize this variable<sup>8</sup>. Current research suggests that often, larger firms have more resources available to invest in CSR and on top of that, are often estimated in a more favorable way by financial analysts (Dhaliwal, Radhakrishnan, Tsang & Yang, 2012; Simpson, 2010; García-Sánchez et al., 2020). Secondly, ‘Loss’ is a dichotomous variable that refers to whether a firm made a loss (1) or not (0) in the previous year. Negative earnings may reduce a firm’s likelihood to be able to invest in environmental activities, which makes it a relevant measure to control for (Dhaliwal et al, 2012; García-Sánchez et al., 2020). Including this variable helps preventing the KZ-index from approximating the level of financial distress, instead of financial constraints. Furthermore, long-term debt divided by common equity was added to control for the portion of debt compared to firms’ portion of equity<sup>9</sup>. Debt is often considered risky and thereby, expected to worsen access to capital (Dhaliwal et al, 2012; Simpson, 2010; García-Sánchez et al., 2020). Market concentration, representing the market-to-book percentage<sup>10</sup>, was added to control for the popularity of a firm’s stocks compared to their book value (Simpson, 2010; García-Sánchez et al., 2020), where higher values are expected to increase financial constraints. As firms with popular stocks generally have more growth opportunities, they are also more likely to feel constrained when achieving this growth. Moreover, ownership concentration, measured as the percentage of shares that is “strategically” held, was added in order to control for how a higher ownership concentration can make a firm less dynamic and resultedly, more financially constrained (Simpson, 2010; García-Sánchez et al., 2020). Here, a strategic shareholder has an interest of at least 5% in the firm. Assets in place, measured as the ratio of tangible fixed assets over total assets, was added to control for how firms that put their money towards fixed assets<sup>11</sup>, cannot easily convert this money into cash, or put it to other causes (Simpson, 2010; García-Sánchez et al., 2020). R&D expenditures (in millions), indicating the expenditures on research and development was added, as they reduce firms’ cash balances (Harjoto & Jo, 2015; García-Sánchez et al., 2020). Cashflow volatility (in millions), measured as the standard deviation of the operational cashflow, was added to control for inconsistent income flows that expectedly result in a worse capital position (Timbate & Park, 2018; García-Sánchez et al., 2020); Lastly, sales, measured as the natural logarithm of total sales in millions, (García-Sánchez et al., 2020), and sales growth, measured as the

<sup>8</sup> ‘Total assets’ is skewed to the right as outliers primarily exist on that side of its distribution. Taking the natural logarithm helps normalizing its values, while preserving the possibility to interpret the results.

<sup>9</sup> ‘Equity’ stands for the shareholders’ stake in a firm.

<sup>10</sup> The market value of equity (in mlns) as a percentage of common equity (book, or balance sheet value of equity).

<sup>11</sup> ‘Fixed assets’ are also known as property, plant and equipment (PP&E) and indicate the value of assets and property that cannot easily be converted into cash.

percentage change between sales in t1 and sales in t2 divided by sales in t2 (Simpson, 2010; García-Sánchez et al., 2020), were added in order to control for the size of a firm's practices and its growth, both benefiting access to capital.

The models used to test the previously mentioned hypotheses include different sets of these variables. All variables are listed in Table 1.

Table 1  
*Dependent, independent and control variables*

Category	Measure	Definition/specification	Source
<b>Dependent</b>			
Financial constraints	KZ-index*	Financial constraints	Asset4, Compustat
<b>Independent</b>			
Environmental performance	EP	E(SG)-score	Asset4
Environmental disclosure	ED	E(SG)-score	Bloomberg
Financial performance	ROA	Return on assets (%)	Asset4
Interaction effect EP & ROA	ROA_EP	ROA*EP	-
Interaction effect ED & ROA	ROA_ED	ROA*ED	-
<b>Control</b>			
Firm size	Firm size	Natural logarithm of total assets (mlns)	Asset4
Loss	Loss	Company loss (1) or not (0)	Asset4
LTD over CE	LTD_CE	Long-term debt divided by common equity	Asset4
Market concentration	Market con.	Market-to-book (%)	Asset4
Ownership concentration	Ownership con.	Percentage of shares that is held strategically (%)	Asset4
Assets in place	Assets in place	Ratio of tangible fixed assets over total assets	Asset4
R&D expenditures	R&D exp.	Total R&D expenditures (mlns)	Asset4
Cashflow volatility	CF volatility	Standard deviation of the cashflow of operations (mlns)	Asset4
Sales	Sales	Natural logarithm of total sales (mlns)	Asset4
Sales growth	Sales growth	Growth in sales from t1 to t2 (%)	Asset4

\*Appendix I can be consulted for detailed calculations

## RESULTS

### Descriptive statistics

Table 2 displays the descriptive statistics of the sample used for the analysis. Panel A provides the descriptive statistics for the measures used to capture to what extent firms are financially constrained. All variables were cut off at four decimals. Panel B displays the distribution of observations across years, whereas Panel C shows the distribution across countries. Sales was omitted from the final analysis as a control variable due to multicollinearity issues in relation to total assets. In sum, the data originated from 52 different countries across the world, from 11 years of data (2006-2016), and from 2,159 different firms. On average, each firm contained 6.7 years of observations, with a minimum of 1, and a maximum of 11 years. Firstly, when looking

at Panel A, it becomes evident that, despite the omission of outliers, there remain some extreme minimum and maximum datapoints in the dataset. This can be explained by the size of the dataset and the variety of firms included. It might be more insightful to look at the values at the p25 and p75 level, to get a more complete picture of variable distributions. The KZ-index lies for 50 per cent of the firms between 1.7578 and 6.5213. Further, environmental disclosure starts at 0, whereas environmental performance starts as 9.22, indicating that all firms, at least, score some points at being environmentally friendly, but not all of them show something to the public. Moreover, it is interesting to point out how the dummy variable for a financial loss in the previous year still shows a '0' for the 3<sup>rd</sup> quartile, showing that only the minority of firms showed this financial inconvenience. With respect to the years of data, the observations are more or less equally divided over time, but slightly increasing with every subsequent year. Furthermore, Japan is the country with the largest number of observations, followed by Great-Britain and Australia. In total, the data originates from fifty-two countries around the globe.

Table 2.  
*Descriptive statistics*

Panel A.						
<i>Summary Statistics</i>						
VARIABLES	(1) mean	(2) std	(3) min	(4) p(25)	(5) p(75)	(6) max
KZ-index	5.0309	5.2284	-9.2324	1.7578	6.5213	42.2211
Environ. disclosure	22.1876	18.1316	0	4.6500	37.2100	62.0200
Environ. performance	58.5124	30.4181	9.2200	27.8550	88.5700	95.8700
Return on assets (%)	6.0673	8.2449	-65.7400	2.7525	9.5300	35.8400
Firm size	17.1676	2.7568	9.6130	15.0941	19.3610	23.7491
Loss	0.1137	0.3174	0	0	0	1
LTD over CE	0.5737	0.7976	-2.2944	0.0836	0.7237	9.2345
Market concentration (%)	0.2702	0.2729	-0.5063	0.1128	0.3236	2.6076
Ownership concentration (%)	30.4042	24.7861	0	7.0000	51.0000	95.0000
Assets in place	0.3212	0.2252	0.0002	0.1361	0.4710	0.9467
R&D expenditures (in mlns)	6.6614	19.4341	0	0.0733	4.6963	193.9805
Cashflow volatility (in mlns)	23.8862	88.0387	0.0034	0.1535	10.6575	1012.9030
Sales growth (%)	7.4971	23.7665	-64.1644	-2.0693	13.2675	387.8545
Number of observations	14,536					
Number of firms	2,159					

TO WHAT EXTENT DOES ENVIRONMENTAL BEHAVIOR INFLUENCE ACCESS TO CAPITAL?

Panel B.

*Sample distribution across years*

Year	N
2006	618
2007	775
2008	920
2009	1,056
2010	1,373
2011	1,089
2012	1,547
2013	1,616
2014	1,729
2015	1,885
2016	1,928
<b>Total</b>	<b>14,536</b>

Panel C.

*Sample distribution across countries*

Country	N	Country	N
Argentina	4	Kuwait	9
Australia	1,467	Luxembourg	17
Austria	88	Malaysia	242
Belgium	122	Morocco	7
Brazil	281	Mexico	125
Canada	2	Netherlands	157
Chile	98	New-Zealand	101
China	237	Norway	164
Colombia	37	Oman	3
Czech Republic	24	Peru	2
Denmark	180	Philippines	24
Egypt	6	Poland	82
Finland	175	Portugal	50
France	673	Qatar	14
Germany	561	Russia	188
Great-Britain	1,675	Saudi-Arabia	30
Greece	78	Singapore	253
Hong-Kong	847	South-Africa	416
Hungary	8	Spain	245
India	426	Sri Lanka	6
Indonesia	163	Sweden	278
Ireland	51	Switzerland	314
Israel	54	Taiwan	645
Italy	178	Turkey	87
Japan	2,900	United Arab Emirates	28
Croatia	442	United States	168
<b>Total</b>	<b>14,536</b>		

Table 3 reports the correlation matrix of the studied variables. As mentioned before, due to a high correlation of sales and firm size, sales was omitted as a variable. After this measure, no signs of multicollinearity, indicated by the benchmark of a correlation of 0.8 or higher, could be detected from the table. Nevertheless, some values are higher than others, and therefore, require some further explanation. For example, environmental performance and environmental disclosure display a high correlation (0.69), which can be explained by how they are both related to environmental behavior. For instance, firms that perform well environmentally, might sooner disclose this information to the public. As the correlation value does not yet exceed the 0.8 benchmark, but is relatively high, these two variables were both looked at individually, in separate models, and together, in the same model. The latter was done in order to find out effect of environmental performance on access to capital, when keeping environmental disclosure constant. Further, there is a high correlation between the KZ-index and long-term debt over common equity, which can be explained by how the KZ-index consists of a leverage component, which of course, relates to the relative share of long-term debt. However, since this correlation concerns the dependent and an independent variable, this will not be problematic. Lastly, Variance Inflation Factors (VIF) results showed a rather low mean of 1.34 for the relevant variables, with no individual variables exceeding the benchmark of 4 which again indicates no problems here.

Table 3.  
*Correlations matrix*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. KZ-index	1.00												
2. Env. performance	0.14	1.00											
3. Env. disclosure	0.10	0.69	1.00										
4. ROA	-0.16	-0.06	-0.04	1.00									
5. Firm size	0.10	0.29	0.27	-0.04	1.00								
6. Loss	0.10	-0.02	-0.01	-0.35	-0.12	1.00							
7. LTD over CE	0.77	0.10	0.09	-0.12	0.05	0.10	1.00						
8. Market concentration	0.09	-0.13	-0.10	0.40	-0.24	-0.10	0.06	1.00					
9. Ownership con.	-0.01	-0.15	-0.11	0.10	-0.04	-0.03	0.00	0.08	1.00				
10. Assets in place	0.02	0.03	0.06	-0.12	0.11	0.10	0.21	-0.13	0.09	1.00			
11. R&D expenditures	-0.02	0.20	0.15	-0.05	0.37	-0.01	-0.04	-0.09	-0.10	-0.02	1.00		
12. CF volatility	0.03	0.10	0.07	-0.00	0.39	-0.01	0.01	-0.06	0.04	0.08	0.24	1.00	
13. Sales growth	-0.05	-0.16	-0.12	0.02	-0.11	0.04	-0.03	0.16	0.04	-0.01	-0.05	-0.01	1.00
<b>N</b>	<b>14,536</b>												



### 3. Regression results

Table 4 displays the regression results for KZ-index as the dependent variable. A fixed effects model was chosen based upon regular and robust Hausman (1978) specification test results. This econometric model, developed for panel data, allows to only investigate the effects of variables that vary over time, which takes away the risk of omitting time-invariant variables (e.g. industry, country). In a fixed effects model, subjects (i.e. firms) serve as their own time-invariant controls, as firm-specific observations are clustered.

As can be seen from Table 4, regressions were run for different models. When looking at the main model, Model 1, one can see that environmental performance is not significantly influencing the KZ-index, which leads to a rejection of Hypothesis 1a. Further, ROA, firm size and sales growth have a significant and negative effect on the KZ-index, indicating that, the higher financial performance, firm size and sales growth, the fewer capital constrains firms experience. As firm size is calculated as the natural logarithm of total assets, a one percent increase in total assets, decreases the KZ-index by  $0.2390/100=0.0023$ . In line with the expectations, A financial loss in the previous year, long-term debt over common equity and market concentration have a positive and significant effect on the KZ-index. Long-term debt over common equity has the largest coefficient size (4.6020). This coefficient indicates that a 50/50 distribution of long-term debt and common equity (LTD over CE = 1) results in an a KZ-index margin that is  $(1*)4.6020$  times higher than when long-term debt is absent (LTD over CE = 0). A financial loss in the previous year increases the KZ-index by 0.4240. Quite unexpectedly, ownership concentration, assets in place and R&D expenditures do not significantly influence the KZ-index. When looking at Model 2, focusing on environmental disclosure, one can see how this variable has a highly significant ( $p<1\%$ ) and negative influence on the KZ-index. Thus, the higher the level of disclosure, the lower the financial constraints and the greater access to capital. The coefficient of -0.0096 indicates that, for a 1-point increase in environmental disclosure, the KZ-index decreases with 0.0096. Margins can help illustrating this effect. For instance, for an environmental disclosure value of 0, the KZ-index margin at a 95% confidence interval is 5.244. Alternatively, for a score of 20, which is more or less average, this margin is 5.052, which is slightly lower. Although the effect is small, this evidence strongly supports Hypothesis 1b. Model 3 displays both environmental behavior variables in one model. It shows how environmental disclosure maintains significant, even when environmental performance is kept constant. This proves that the transparency of firms towards the outside world, apart from its logical implicit link with performance, is a significant predictor for financial constraints. Excluding the independent variables (Model 4) does not change the

Table 4.  
Regression results KZ-index

	(1) Env. perf.	(2) Env. discl.	(3) 1 and 2 combined	(3) Only controls	(4) Only IV's	(5) Int. effect 1	(6) Int. effect 2
Environmental performance (EP)	-0.0022 (0.0017)		0.0004 (0.0018)		-0.0011 (0.0032)	0.0022 (0.0022)	
Environmental disclosure (ED)		-0.0096*** (0.0018)	-0.0098*** (0.0019)		-0.0038 (0.0038)		-0.0061** (0.0024)
Return on assets (ROA)	-0.0450*** (0.0052)	-0.0457*** (0.0053)	-0.0456*** (0.0052)		-0.0883*** (0.0073)	-0.0148* (0.0085)	-0.0367*** (0.0071)
Firm size $\diamond$	-0.2390** (0.1100)	-0.2250** (0.1090)	-0.2270** (0.1100)	-0.2400** (0.1080)		-0.2370** (0.1100)	-0.2280** (0.1090)
Loss	0.4240*** (0.0921)	0.4330*** (0.0923)	0.4320*** (0.0921)	0.5230*** (0.0965)		0.3970*** (0.0920)	0.4210*** (0.0917)
Long-term debt over common equity	4.6020*** (0.1090)	4.6090*** (0.1080)	4.6090*** (0.1080)	4.6860*** (0.1080)		4.5830*** (0.1080)	4.6000*** (0.1080)
Market concentration	1.5290*** (0.2680)	1.5050*** (0.2680)	1.5070*** (0.2680)	1.1870*** (0.2540)		1.5450*** (0.2680)	1.5150*** (0.2680)
Ownership concentration	-0.0005 (0.0027)	-0.0003 (0.0027)	-0.0003 (0.0027)	0.0003 (0.0027)		-0.0006 (0.0027)	-0.0003 (0.0027)
Assets in place	-0.1980 (0.4770)	-0.2330 (0.4770)	-0.2300 (0.4770)	0.0562 (0.4870)		-0.2160 (0.4770)	-0.2620 (0.4770)
R&D expenditures	-0.0031 (0.0020)	-0.0029 (0.0019)	-0.0029 (0.0019)	-0.0030 (0.0020)		-0.0029 (0.0020)	-0.0028 (0.0019)
Cashflow volatility	-2.7100 (2.0440)	-2.6790 (2.0550)	-2.6720 (2.0500)	-2.5560 (2.0100)		-2.7120 (2.0320)	-2.7130 (2.0500)
Sales growth	-0.0022* (0.0011)	-0.0022** (0.0011)	-0.0022* (0.0011)	-0.0020* (0.0011)		-0.0020* (0.0011)	-0.0022* (0.0011)
Interaction effect ROA*EP						-0.0006*** (0.0001)	
Interaction effect ROA*ED							-0.0006** (0.0002)
Constant	71.2864 (48.8168)	70.4107 (49.0787)	70.2468 (48.9709)	67.1342 (48.0141)	5.7208*** (0.1739)	71.1076 (48.5336)	71.2044 (48.9726)
Observations	14,536	14,536	14,536	14,536	14,536	14,536	14,536
Adjusted R-squared	0.5944	0.5955	0.5955	0.5863	0.0338	0.5963	0.5963
F-test p-value	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Number of firms	2,159	2,159	2,159	2,159	2,159	2,159	2,159

Robust standard errors in parentheses, all values were cut off at four decimals

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

$\diamond$  denotes a transformed variable (natural logarithm)

significance or signs of any variables but worsens the Adjusted R-squared<sup>12</sup> slightly, indicating that the model gets worse at predicting the data. Exclusion of the control variables (Model 5) worsens the model fit even more, proving their importance for the correct estimation of the KZ-index.

Furthermore, when looking at Models 5 and 6, which include the interaction terms of ROA, environmental performance and environmental disclosure, one can see both terms are significant in their negative influence on the KZ-index. Yet, both coefficients are very weak, which can partly be explained by how they represent of a product of two variables<sup>13</sup>. Nevertheless, the interplay of environmental behavior and financial performance plays at least some role for firms' access to capital. When comparing Model 5 to Model 1, the Adjusted R-squared increases by the inclusion of the interaction term, indicating that the model gets better at predicting the KZ-index. Environmental performance stays insignificant as an individual predictor, whereas ROA stays significant, but decreases in effect size. Thus, when environmental performance equals zero, ROA still has an individual effect, but when environmental performance is different from zero, ROA is better explained in relation to this variable. Alternatively, although environmental performance has no significant effect on access to capital when ROA equals zero (which is highly uncommon), it does interact with ROA. When comparing Model 6 to Model 2, both environmental disclosure and return on assets stay significant on themselves as predictors. This indicates that both main effects still significantly influence the KZ-index in their own way, if the other equals zero. Also, the Adjusted R-squared improves by adding the interaction term, which underlines its explanatory power.

In order to make valuable claims about whether the results support Hypotheses 2a and 2b, Figure 2 and Figure 3 give a more detailed understanding of the interaction effects as, for each of them, they visualize the interplay of the two components. Firstly, Figure 2 visualizes that a low environmental performance, combined with a high ROA leads to the lowest values of the KZ-index, indicating the greatest access to capital. This indicates a negative relationship between environmental performance and access to capital, which is the opposite of the expectations (H1a). ROA counteracts this relationship, as it exerts a positive influence on access to capital. In other words, high values for ROA and low values for environmental performance

<sup>12</sup> The regular R-squared indicates to what extent the variance in the dependent variable can be explained by the independent variables and control variables included in a certain model. The Adjusted R-squared goes a step further by adjusting for the number of predictors in a model, as the regular R-squared tends to increase unfairly when predictors are added.

<sup>13</sup> The multiplication of two variables, which is how the interaction variables were calculated, will automatically result in relatively larger values. Intuitively, the coefficient becomes smaller.

combined, result in the greatest access to capital. As the basic relationship that was expected for environmental performance and the KZ-index is insignificant and shows the reversed sign as a component of the interaction effect, ROA cannot strengthen this relationship, and Hypothesis 2a was rejected. In fact, ROA moderates the relationship between environmental performance and the KZ-index. Secondly, Figure 3 displays that a high environmental disclosure, combined with a high ROA results in the lowest values of the KZ-index, indicating greater access to capital. Therefore, it can be concluded that ROA strengthens the positive relationship between environmental disclosure and access to capital, which supports Hypothesis 2b. For both interaction effects, the marginality of the influence of environmental behavior becomes evident when looking at the interaction plots. In both cases, ROA shows to have the larger stake in the determination of the KZ-index.

Throughout the different models, the signs and significance levels of the control variables do not change.

Figure 2.

*Interaction plot EP and ROA*

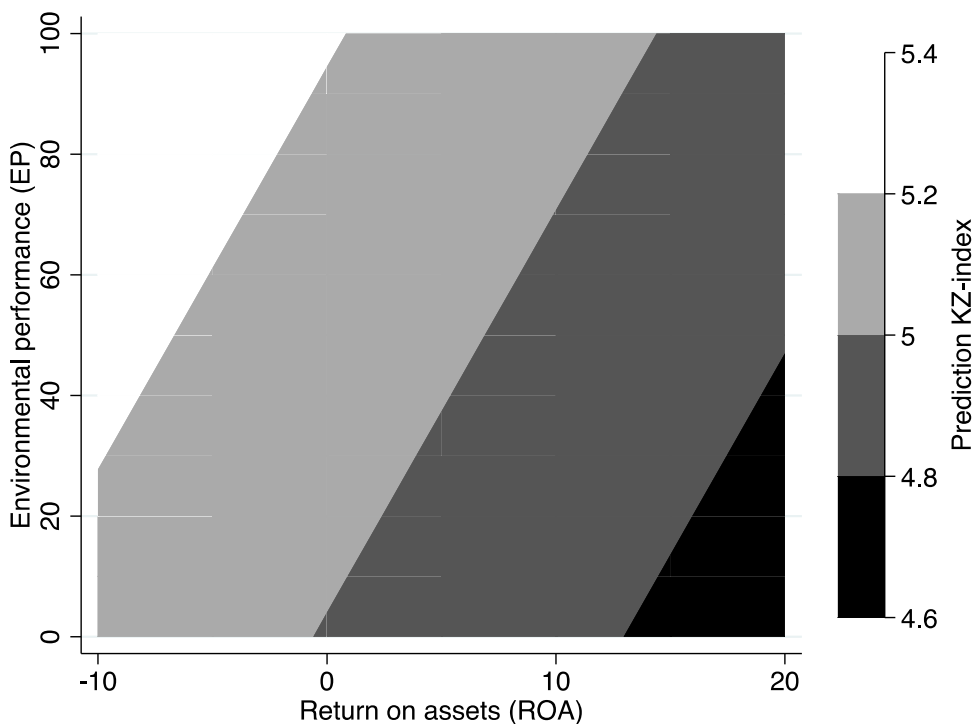
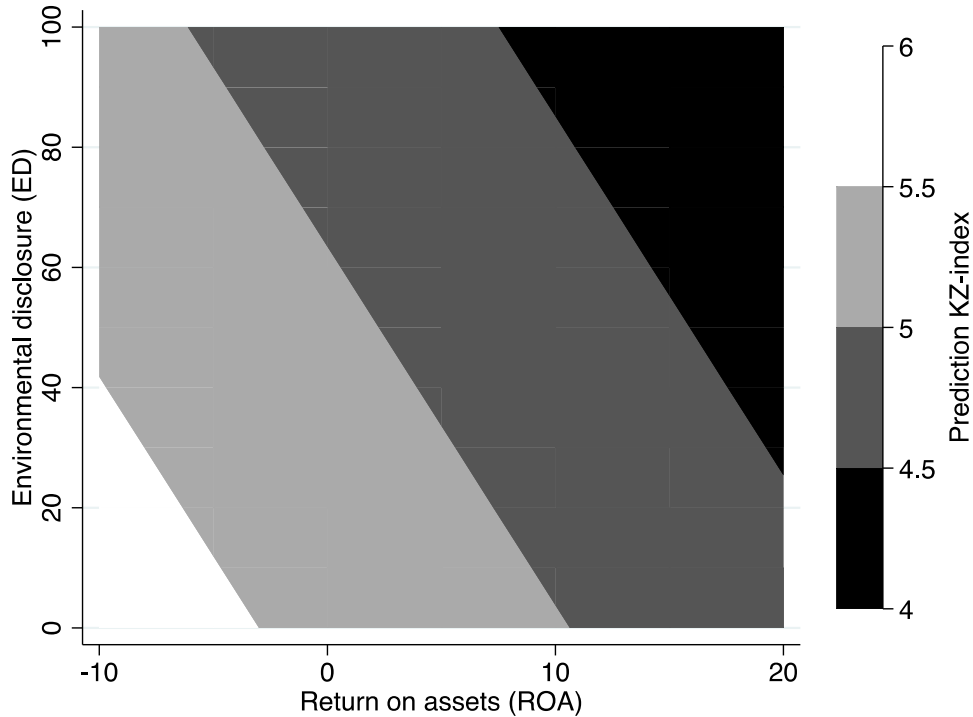


Figure 3.

*Interaction plot ED and ROA*



**Robustness**

In order to guarantee the robustness of the results, several tests were conducted for all models visualized in Table 4. Firstly, as can be read from Table 4, all F-tests were highly significant, indicating that all coefficients in the researched models were different from zero. Furthermore, a modified Wald-test for groupwise heteroskedasticity was conducted for all regression models, indicating that the data was not homoskedastic. In addition, a Woolridge test for serial correlation<sup>14</sup>, or autocorrelation, showed significant results. In order to guarantee these two inconveniences did not affect the quality of the results, clustered standard errors were used throughout all regression models.

<sup>14</sup> Serial- or autocorrelation is the relationship between a variable and the lagged version of itself over various time intervals.

## CONCLUSIONS AND DISCUSSION

This research intended to answer to the question: “*To what extent does environmental behavior influence firms’ access to capital?*” Here, environmental behavior was split up in environmental performance and environmental disclosure, since these indicate different processes that are both informative when investigating firms’ environmentalism. Although similar effects were expected for the two concepts, they were approached separately, as they are different in nature and constitute different conclusions. Also, both measures were isolated from financial performance.

Following the regression results that were displayed in the previous section, it becomes evident that environmental performance individually does not significantly influence access to capital. In relation to return on assets, environmental performance does influence access to capital, but not in a positive sense. It turns out that, given a firm’s financial performance, higher values of environmental performance only result in slightly lower access to capital. Apparently, the moral argument and the leftover connotation between environmental performance and financial performance do not result in a positive influence of environmental performance. This might be explained by how, despite its potential profitable outcomes, environmental practices are, to an even larger extent, associated with high initial investment costs. Alternatively, it might be that financial markets are still convinced that green values cannot go hand in hand with creating economic value, and that firms would primarily do it to comply (Wagner and Schaltegger, 2003). As mentioned before, green firms create value in unconventional ways due to their different product or service characteristics, core values, and strategies (Bergset, 2015), which might make them look more risky or volatile.

When looking at environmental disclosure, however, the results show that this practice on itself slightly improves access to capital. These results hold, even when controlled for environmental performance and financial performance and thereby taking out the implicit connection between environmental performance and environmental disclosure and environmental disclosure and financial performance, indicating that publicity and firms’ external transparency is crucial on its own; on top of what is happening behind the scenes. Furthermore, besides the small individual effect that environmental disclosure has on access to capital, higher levels of financial performance strengthen this relationship and result in an additional positive effect. Thus, more profitable firms experience an even stronger positive effect of environmental disclosure, or, more transparent firms experience an even stronger positive effect of financial performance. The positive effect of disclosure on access to capital is in line with Flammer

(2013) and Cheng and colleagues (2014), who state that high quality information disclosure results in low cost of capital and low financial constraints to firms. Also, it might be explained by how the public only perceives a firm to be environmentally friendly when this becomes a widely spread fact, which is where frequent disclosure plays an important role. Lastly, the results for the second interaction effect are in line with the expectations, as financial markets were expected to value economic value creation, in combination with environmental value creation. Lacey (2007) emphasized how both the economic pillar and the environmental pillar are important for strong relationship commitment and trust, which is confirmed by the significant interplay between ROA and environmental disclosure in their effect on access to capital.

To summarize the results, the two types of environmental behavior both influence access to capital, but in different ways. Thus, the findings underline the distinction between environmental performance and disclosure; how they might both be categorized under 'environmental behavior' but have different impacts on firms' access to capital. Environmental performance only seems to moderate the positive effect that financial performance has on access to capital (considering the positive influence that it presumably directly has on financial performance). At the same time, environmental disclosure positively influences access to capital on itself, and through interacting with financial performance. Both environmental predictors' effects remain relatively weak.

At the same time, despite their opposite effects on firms' financial market position, environmental performance and environmental disclosure cannot be separated completely, as they are inherently connected. In line with this, Clarkson, Richardson and Vasvari (2008) found a positive relationship between environmental performance and discretionary environmental disclosure for the five most polluting industries in the US. Furthermore, environmental disclosure without the precedence of environmental performance has often been defined as greenwashing, which carries the costly risk of public scrutiny and loss of legitimacy (MacLean & Behnam, 2010; Luo et al., 2015). Financial analysts rather not recommend a stock with this kind of risk to investors (Luo and colleagues, 2015). Also, it has shown to lower market value (Hawn & Ioannou, 2016). Therefore, firms will aim to keep the gap between performance and disclosure only as big as 'they can get away with', meaning that disclosure will, in certain a way, always go hand in hand with performance. By being transparent about environmentalism, firms can basically 'reap' the benefits of environmental practices and offset the negative relationship between environmental performance and access to capital. Additionally, although potential greenwashing, resulting from an incentive to disclose without performing

simultaneously, does not directly benefit the natural environment, as long as it remains undetected, competitors will potentially try to catch up environmentally. Thus, greenwashing might result in green spillovers.

This research makes a couple of important contributions to both theory and practice. First of all, with regard to theory, the results highlight how environmental performance and environmental disclosure, despite their interconnectedness, differently influence firms' access to capital. It provides a more deductive, quantitative understanding of what these relationships entail in practice. Also, it emphasizes the importance of environmental disclosure for gaining an advantageous financial market position, which is likely due to its importance for the capitalization of a firm's environmental image. Lastly, it suggests how this disclosure is implicitly might be linked with environmental performance. In other words, environmental disclosure is suggested to often follows performance, and if this is not the case (i.e. undetected greenwashing) it might still have the potential to incentivize competitors to become greener. Furthermore, this research adds to practice by giving insights into what type of environmental behavior is essential for gaining access to capital; environmental disclosure. Firms that are, or would like to become environmentally friendly, should take this into consideration. Although actual environmental performance, in combination with financial performance, might slightly worsen their position, they can potentially offset this by frequently being transparent about it. Nowadays, on average, firms undertake more internal than external actions, while jointly, these practices could help accumulate intangible firm resources (Hawn & Ioannou, 2016). Also, for investors wanting to get a better understanding of the difficulties green firms are facing and subsequently, helping them, it might be wise to consult firms about the benefits of environmental disclosure, following environmental performance.

Naturally, like any other research, this research comes with some limitations. First of all, as a result of data availability constraints, the analysis was only done for medium- to large-sized publicly traded firms. Although this sample provided interesting results, it might not be automatically applicable on green start-ups or smaller enterprises. In line with Hockerts and Wüstenhagen (2010), relatively large-sized firms ("Goliaths") are prone to only engage in incremental, rather than disruptive technologies, as smaller firms ("David's") do. This full commitment might, however, be necessary in order to create shared value (Porter & Kramer, 2019). Secondly, the indicator that was used to indicate access to capital, the KZ-index, is a research-born construct that was developed to approach a practical circumstance; access to



capital. Although its calculations are based on a logical rationale, the KZ-index, does not offer information on what certain levels of the KZ-index look like in practice, and how they are perceived by firms. In order to give more body to a construct that measures access to capital, it might be interesting to know, for instance, whether a firm has acquired capital, yes or no. Such a measure would provide more quality towards what is valued by investors, whereas the KZ-index indicates, based on bookkeeping techniques, the ease of attaining capital.

Some interesting future research directions would be, firstly, investigating different time-lags of the KZ-index, responding to environmental performance. Access to capital might require some time to respond to changed environmental performance. Furthermore, future research could focus on different constructs that indicate access to capital, possibly for smaller firms. An example of how this could be done is by conducting a quantitative case study at a financial institution (e.g. a bank), by use of data on their funding processes. Also, future research could particularly focus on the gap between environmental performance and disclosure, indicating the risk of public scrutiny, and on how this gap, either positive (when performing better than disclosed) or negative (when greenwashing), drives investment decisions. Alternatively, it would be interesting to enrich the findings of this study with qualitative research, exploring the reasons why environmental disclosure is positively influencing access to capital and why environmental performance is not.

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**APPENDIX I**

**Calculation and specific sources of the KZ-index**

$$\text{KZ index} = -1.002 \frac{\text{CF}_{it}}{\text{A}_{it-1}} - 39.638 \frac{\text{DIV}_{it}}{\text{A}_{it-1}} - 1.315 \frac{\text{C}_{it}}{\text{A}_{it-1}} + 3.139 \text{LEV}_{it} + 0.283 \text{Q}_{it}$$

Here,

$\text{CF}_{it}$  = net income before extraordinary items (Asset4, WC01551) + depreciation, depletion and amortization (Asset4, WC01151)

$\text{A}_{it-1}$  = total assets (Asset4, WC02999) , lagged by one year

$\text{DIV}_{it}$  = cash dividends (Compustat Global and Compustat US)

$\text{C}_{it}$  = cash equivalents generic (Asset4, WC02005)

$\text{LEV}_{it}$  = [long-term debt (Asset4, WC03251) + short term debt and current portion of long-term debt (Asset4, WC03051) + current liabilities total (Asset4, WC03101)] / common equity (WC03501)

$\text{Q}_{it}$  = [market value company (Asset4, MVC) + total assets (Asset4, WC02999) – common equity (WC03501)] / total assets (Asset4, WC02999)