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Identification and Examination of the Relationship between Determinants of Corporate Sustainability and Corporate Financial Performance – An Empirical Analysis –

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Identification and Examination of the Relationship between Determinants of Corporate Sustainability and Corporate Financial Performance – An Empirical Analysis

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Abstract

In this paper the relationship between corporate sustainability performance and corporate financial performance is researched. It is hypothesized that a better sustainability performance of firms leads to financial success in terms of increased EBIT and Market Capitalization. Furthermore 17 environmental activities and their assumed impact on financial benefits are analyzed for ten different industry sectors. The data sample for this research paper has been taken from Thomson Reuters Database ASSET4 and includes 3115 firms. The results show that there is a positive and non-linear link between the sustainability performance and the financial performance of firms, intending that financially more successful firms can gain greater benefits from being sustainable than less successful firms do. Furthermore sustainable environmental activities have been identified for different industry sectors, which indicate to lead to an increase of the financial performance.

JEL classification: M14, C19

Keywords:

Corporate Sustainability; ESG (environmental, social, governance); Environmental Performance; Corporate Financial Performance; Empirical Analysis; ASSET4

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ANOVA	Analysis Of Variance
B2C	Business-to-Consumer
CDP	Carbon Disclosure Project
CFP	Corporate Financial Performance
CO_2	Carbon Dioxide
CR	Corporate Responsibility
CSP	Corporate Social Performance
CSR	Corporate Social Responsibility
DAX	Deutscher Aktienindex
DJSI	Dow Jones Sustainability Index
DSI 400	Domini Social Index 400
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest and Taxes
ESG	Environmental, Social and Corporate Governance
EU	European Union
FTSE	Financial Times Stock Exchange
GRI	Global Reporting Initiative
ISO	International Standardization Organisation
KLD	Kinder, Lydenberg and Domini
KPI	Key Performance Indicator
Log	Logarithm (variables)
Market Cap	Market Capitalisation
MSCI	Morgan Stanley Capital International
MTB	Market value of equity over book value of equity
NAFTA	North American Free Trade Agreement
NGO	Non-governmental Organisation

NO_x	Nitrogen Oxides
ROA	Return on Assets
ROCE	Return on Capital Employed
ROE	Return on Equity
ROS	Return on Sales
S&P 500	Standard & Poor’s 500
SCM	Supply Chain Management
SO_x	Sulfur Oxides
VIF	Variance Inflation Factor
VOC	Volatile Organic Compound

1 Introduction

Since the late 20th century, there has been an increasing awareness about many environmental and social problems. On the one side, different groups of interest in terms of social, ethical and environmental issues and the decreasing raw material supply base on the other side, put pressure on firms and have forced them to adjust their strategies more towards these needs. In this context firms take certain activities to meet the demands of the different stakeholder groups (Dyckhoff, 2000). In recent years firms have increased their efforts towards sustainability by enhancing their CSR activities like emission reduction or the introduction of an environmental management system. CSR reports as an instrument of documentation and communication have become a common standard for nearly every firm of relevant size. Nevertheless, since introducing sustainable actions and processes towards the organization and its products, there has always been the question "if it pays to be green" (Ambec and Lanoie, 2008) or "how it pays to be green" (Pagell et al., 2004). Besides the environmental and social effects of a more sustainable production process or supply organization, firms also want to profit from their investments. This could result in an increase of different performance measures. The most obvious measures firms want to see improved as an effect of their investments are financial figures. While the neoclassical paradigm targets a firm's profit maximization, there are also approaches which assume that "in the long run, the more successful corporations will be those that can achieve both social responsiveness and good economic performance" (Ackerman, 1973). There has been broad research in this field, while the findings among studies show a wide variety of positive, negative and mixed results. Depending on the time horizon, as well as on the question if there is an effective relation between sustainability and financial success there is an ambiguous discussion about how to measure both sustainability and financial performance and how they are interrelated. Thus the questions mentioned above still remain unanswered. This paper tries to contribute to help answering these questions.

Therefore, the paper is structured as follows: Section two gives a literature review about the research that has been conducted in this field. Section three describes the data and the methodology, including a description of the data and further theoretical framework. The fourth section shows the results of the regression analysis and gives managerial implications. Section five provides a conclusion of the most important findings, limitations of this paper and gives an outlook on the future research in this field.

2 Literature Review

2.1 Research methods of measuring sustainability and financial performance

Doing research in the field of corporate sustainability is complex. In recent years various definitions for corporate sustainability have been developed. Terms like corporate responsibility (CR), corporate social performance (CSP) and corporate social responsibility (CSR) prevail in the literature. Often these terms are used interchangeably for sustainability in empirical studies (Margolis et al., 2009). In this paper, corporate sustainability is seen as "a business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to a firm's societal relationships" (Wood, 1991), thus going "beyond compliance" (Dhaliwal et al., 2011) and covering the economic, environmental, social and corporate governance dimensions.[1]

As indicated by the wide scope of definitions about corporate sustainability, there is also a difficulty in measuring it. This is due to two main reasons. First, firms have various methods to measure the diverse results of sustainability-related activities. Depending on the business environment and the organizational structure, firms use environmental management information systems, which capture measured data by applying specific operational or management oriented indicators (Chien and Shih, 2007). Operational indicators cover production-related outcomes like emissions, waste, pollution, used energy and water (Bogaschewsky (1995); Epstein and Roy, 2001). Management oriented indicators are more related to the firm's policies regarding preventive activities to avoid emissions and waste or to use renewable energy (Chava, 2010).

Building up on the measuring process, most of the studies use different indices like KLD, DSI 400 and DJSI or ratings, where information about corporate sustainability are taken from different sources and aggregated for further research (Griffin and Mahon, 1997; Waddock and Graves, 1997; McWilliams and Siegel, 2000; Barnea and Rubin, 2010). Others use specific criteria like environmental activities (González-Benito and González-Benito, 2005; Montabon et al., 2007; Jacobs et al., 2010) or information about emissions and waste (King and Lenox, 2001; Wagner et al., 2002; Al-Tuwaijri et al., 2004; Iwata and Okada, 2011).

[1] For a collection of further definitions see: Hasna (2012).

2.2 Corporate sustainability and corporate financial performance

In recent years, there has been a strong growth publications on the relationship between corporate sustainability and corporate financial performance, which state a positive relationship between these two factors. Russo and Fouts (1997) analyzed environmental ratings as an indicator of environmental performance. They concluded that ROA as an economic figure is positively related to the ratings. Weber et al. (2008) found a link between GRI indicators and EBITDA, ROE and ROA. Renner (2011) analyzed firm data of the CDP Global 500 Reports and the EBIT of these firms from eight different industry sectors. The results show a positive relationship between environmental and economic performance. Eccles et al. (2012) focused the adoption of sustainable activities by firms using the ASSET4 database of Thomson Reuters. The findings reveal that sustainable firms outperform less sustainable firms in terms of ROA, ROE and MTB. These results especially hold for resource-intensive B2C sectors with a competitive environment. Further positive findings have been published by Wood (1991), Hart and Ahuja (1996), Klassen and McLaughlin (1996), Carter et al. (2000), Simpson and Kohers (2002), Al-Tuwaijri et al. (2004), Chien and Shih (2007) and Guenster et al. (2011).

When taking the neoclassical view, there are findings for a negative relationship between sustainable and financial performance. Focusing on the chemical industry, Griffin and Mahon (1997) showed that the KLD score is negatively related to ROS, ROE and ROA. Wagner et al. (2002) analyzed the impact of various emissions on ROS, ROE and ROCE in the European paper industry and found evidence for a mainly negative relationship between economic and ecological performance. Barnea and Rubin (2010) also found negative results between investments in CSR and the financial figures, while an increase of non-monetary value has been observed. These mixed results are leading to a conflict between shareholders.

There are also studies, which show mixed results or no relationship. Analyzing the link between CSR and ROA, McGuire et al. (1988) found no difference between sustainable and less sustainable firms. King and Lenox (2001) found evidence that there is a link between pollution reduction and financial benefits, but they weren’t able to define the direction of causality. Furthermore, the results are depending on specific factors like the business environment or the market situation. Therefore markets react differently in evaluating the announcements of environmental activities (Jacobs et al., 2010).

Fourth, besides the single studies on this topic, there are also various reviews of the existing literature. The results of different meta-analyses show that there is a positive link between CSP and CFP (Orlitzky et al., 2003; van Beurden and Gössling, 2008; Margolis et al., 2009) respectively CSP, CFP and firm size (Wu, 2006). Another finding of analyzing the literature is, that the divergence of the results strongly depends on the research method and on the way the data are measured (Horváthová, 2010). Therefore measurement errors led to wrong results as further analyses with modern methods have shown (Roman et al., 1999).

2.3 Differences between short-term and long-term studies

Besides the difficulties in measuring sustainability performance and its link to financial performance, another possible reason for the heterogeneity of results in the relationship between sustainability performance and its financial performance outcomes is given by McWilliams and Siegel (2000), which argue that, the outcome of an analysis is depending on the observed period of the data. There is a tendency for short-term studies to show more negative results while long-term studies reveal more positive findings. An explanation for this, is a time-lag which occurs when investments into sustainable activities, technologies or training of employees take place, resulting in a short-term negative impact on the financial figures, while in the long-term improvements lead to advanced financial performance (Hart and Ahuja, 1996; López et al., 2007; Zhu and Sarkis, 2007; Lougee and Wallace, 2008; Paulraj and de Jong, 2011).

2.4 Direction of causality

A question that has not been clearly answered yet, addresses the direction of causality between corporate sustainability and CFP. On the one side, improved sustainability performance might lead to an increase of financial performance. On the other side, bigger and financially successful firms have the required capital to invest into sustainability. Literature shows mixed results on this research question (Renneboog et al., 2008; Mackenzie and Rees, 2011). An approach, which brings both aspects in line, is given by Waddock and Graves (1997). Their theory of a “Virtuous Circle” between CSP and CFP assumes, that there is an interdependency between both sides. Thus both effects can be strengthened over time and therefore especially financially successful firms could profit from an improved CSP performance. This approach is confirmed by the results of various studies and meta-analysis (Orlitzky et al., 2003; Simpson and Kohers, 2002; Cheng et al., 2014).

2.5 Summary of literature review

As shown above, there is a broad divergence as well as heterogeneity in the results. The most important reasons for this are summarized in the following. First of all, the selection of indicators for measuring sustainability performance has an impact on the outcome. Second, the same problem holds true for measuring the CFP, which is due to using market-based measures, accounting-based measures or other operative figures. The selection of the corresponding figure is connected with the respective period of observation. As shown above, these are possible sources for errors, which could also occur by using the wrong methods of analysis or ignoring other influencing factors. Third, in most of the cases the sustainable parameters are used as independent variables and the financial parameters as dependent variables. However, there are research results that question the assumption that the relationship between sustainability and financial performance is one-sided. An approach linking both aspects, is the “Virtuous Circle”, which proposes an interdependency between sustainability performance and financial performance (Waddock and Graves, 1997). Nevertheless, the findings of most studies show that there is a positive relationship between corporate sustainability performance and a firm’s financial performance. Some of the negative results have been disproved by modern methods or are due to measurement errors. Despite that, the above mentioned aspects should be considered during the analysis and the interpretation of results.

3 Data and methodology

3.1 Development of hypotheses

As mentioned above, the integration of environmental, social, economic and corporate governance activities into firm processes and structures leads to overall corporate sustainability. This development is enhanced by the interests of different stakeholder groups, which put pressure on firms (Freeman, 2010). Firms have to follow these interests to keep their access to resources, to gain new market segments and to get a long-term and sustainable competitive advantage (Porter and van der Linde, 1995; Vachon and Klassen, 2008). Therefore CSR activities can make a contribution to satisfy the stakeholder interests, to improve a firm's resource supply as well as its brand image and the loyalty of its customers and employees (Artiach et al., 2010; Jacobs et al., 2010). Due to this, firms undertake strategic investments in CSR activities in order to enhance their long-term competitiveness (Porter and Kramer, 2006). Building up on these theoretical assumptions, there has been a broad field of studies trying to answer the question "Does it pay to be green?". Taking this into account, there has to be a financial benefit from investing into sustainable activities to make them valuable for a firm. The results of the literature show, that there is strong evidence for a positive relationship between corporate sustainability and an improvement in financial performance outcomes. Therefore hypothesis I follows:

Hypothesis I: The better a firm performs in sustainability, the better a firm's financial outcome will be

Building up on hypothesis I, there are different activities firms could take to improve their sustainability performance. The revised literature mentions some of these measures. Especially the development of sustainable technologies and products, emission reduction, recycling and actions to reduce waste and polluted water seem to play an important role (Orlitzky, 2008). Besides the expected environmental effects, related to these actions, managers also have to estimate their financial benefits. Being strongly influenced by the competitive environment of the firm and the industry itself, the results suggested in the literature show a broad divergence, which is strengthened when considering the duration of the observation period. These difficulties as well as the need to gather a sample big enough to gain reliable results force researchers to either limit their investigation to single activities or to use aggregated data from different sources. Thus there are only very few studies focusing the effects of corporate

sustainability activities and their impact on the financial outcomes. Nevertheless answering the question "How can a company be green and profitable" (Pagell et al., 2004), is still an interesting topic for both scientists and managers. Accordingly hypothesis II can be formulated as:

Hypothesis II: There is a positive relationship between sustainable environmental activities and a firm's financial performance

Considering that most of the measured sustainable activities in literature belong to the environmental dimension, we focus on the field of environmental activities for testing hypothesis II. Summarizing this chapter, the first hypothesis examines the relationship between a firm's overall sustainability performance, including the economic, environmental, social and corporate governance dimension, and the financial performance in terms of EBIT and market capitalization. Furthermore the second hypothesis attempts to show which sustainable environmental activities could lead to improved financial outcomes.

3.2 Data sample

The existing literature has shown the difficulties of measuring corporate sustainability. Furthermore the sustainability data and the financial data are collected from different sources. Therefore they are a possible reason for inconsistency or can be seen as an influencing factor (Kaya, 2007). Additionally most of the studies in this field analyze smaller samples from 30 to a few hundred firms. However, a larger sample size is needed for giving a substantiated answer to the above stated research questions from above. Thus this paper uses the databases of Thomson Reuters, which include more than 4000 firms worldwide in one data source, guaranteeing the required consistence of the data set.[2] The sustainability data have been collected in Thomson Reuters' database ASSET4 since 2002 and cover sustainability reports, annual reports, NGO reports and other media information. The data are structured by 130 analysts following strict rules in a multiple step approach. By using 250 key performance indicators of 18 subcategories, Thomson Reuters creates scores following the four major sustainability pillars: Economic Performance, Social Performance, Environmental Performance and Corporate Governance Performance. By adapting different weights for each industry sector, a

[2] The difficulties of measuring the sustainability performance of firms have been mentioned above. Further examination and discussion of Thomson Reuters' methodology is not part of this paper. This aspect is deepened by van den Heuvel (2012).

performance score for each of these four pillars is built, leading to an Overall Performance Score, which allows to compare firms from different sectors in terms of their sustainability performance (van den Heuvel, 2012). The methodology of Thomson Reuters is illustrated by Fig. 1.

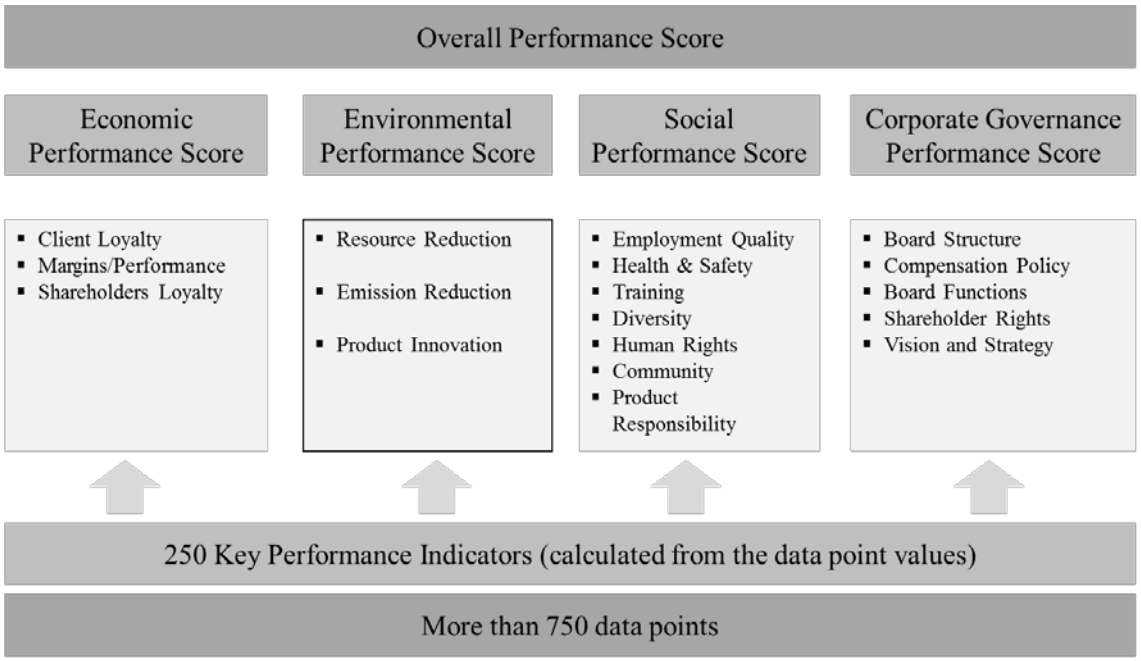

Fig. 1: Thomson Reuters ASSET4 Methodology

Fig. 1 shows that the Environmental Performance Score is built on the three subcategories emission reduction, resource reduction and product innovation. Depending on the activities undertaken by the firm, the respective values are "yes" or "no". The 17 activities related to these subcategories that we analyze in this paper are[3]: energy efficiency policy, toxic chemicals or substances reduction, renewable energy use, green buildings, water efficiency policy, environmental supply chain management, emission reduction policy, commercial risks and/or opportunities due to climate change, CO_2 reduction, ozone-depleting substances reduction, NO_x and SO_x reduction, VOC emission reduction, waste reduction initiatives, sustainable transportation, energy footprint reduction, renewable/clean energy products, product impact minimization.[4] The data set of this research is based on the year 2011. A sample of 3115 firms out of ten industry sectors has been selected for the analysis. The analyzed sectors are Basic Materials, Cyclical

[3] It has to be noted that Thomson Reuters uses more indicators for each of the three subcategories calculating the respective performance score. The 17 activities mentioned above have been selected for this paper, due to their availability for the given sample size.

[4] For further information and descriptions see Table 10 to Table 12 in the appendix.

Consumer Goods, Energy, Financials, Industrials, Non-Cyclical Consumer Goods, Technology, Telecommunications and Utilities. The financial informations of the corresponding firms have been extracted from the Thomson Reuters Datastream database. This step included extracting the values of EBIT and Market Capitalization due to their ability to mirror short-term effects (Renner, 2011), while market-based figures like ROA, ROE or ROS are more suitable for measuring long-term effects (López et al., 2007). Because of its characteristics the balance-based EBIT additionally enables an international and industrywide comparison of the operative business performance between firms (Ganguin and Bilardello, 2005). The market capitalization is an expression for the market value of equity and can be seen as a figure for measuring firm size and investment suitability of stocks (Pettit, 2004). Thus this paper includes both, a balance-based measure (EBIT) and a market-based measure (Market Cap).

3.3 Theoretical framework

Combining the chapters above, the theoretical framework for examining hypothesis I and II is presented in the following. The first hypothesis will be tested by using the Overall Score as well as the other sustainability pillars and their respective scores as independent variables and the financial figures as dependent variables. During the first step the Overall Score and its assumed relationship to the financial outcome in terms of EBIT and Market Cap is analyzed. In the second step the same type of analysis is performed by using a multiple regression analysis, which includes the performance scores of the four sustainability pillars as independent variables, as illustrated by Fig. 2.

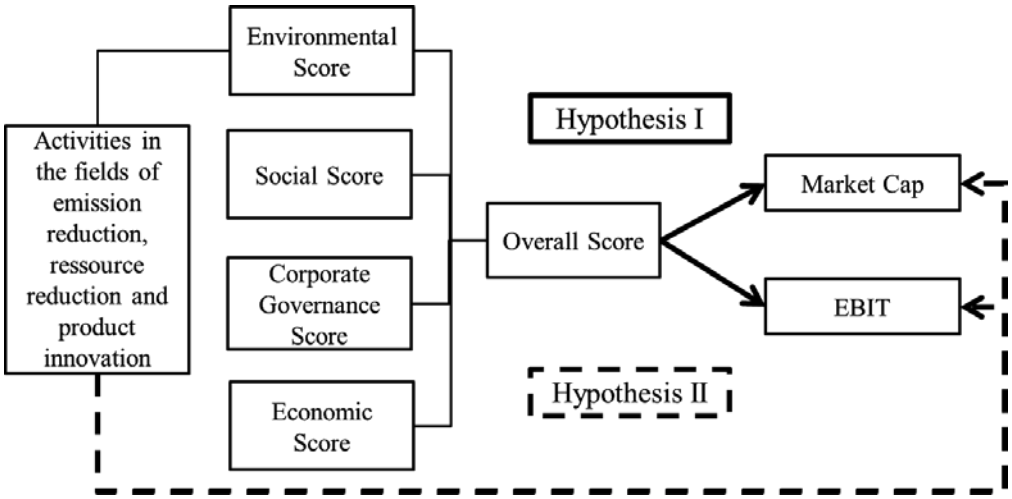

Fig. 2: Theoretical Framework

The third step consists of an introduction of the control variable “Sector”, which splits up the data set. Afterwards the first two steps are repeated for each of the ten industry sectors. For testing the second hypothesis the control variable remains in the model and a multiple regression analysis is performed. Separate regression models are used for the three environmental subcategories and their related activities.

3.4 Methodology

Before continuing, the data have to be controlled and adjusted for further analyses. In this step the environmental activities for testing hypothesis II have been transformed from yes/no answers to binary variables. Following the hypotheses, which assume a linear relationship, the next step included testing whether the given data set is suited for linear regression analysis: First, as in all regression models, the number of the estimated parameters has to be smaller than the number of observations. Second, the error terms have to have the expected value of zero and homoscedasticity and non-collinearity between the independent and the dependent variables have to be given. In addition to this, multicollinearity between the various independent variables has to be excluded. Finally, the data set has to be normally distributed. Testing these assumptions, the histogram of normal distribution as well as the p-p-plot of standardized residuals showed that the data is not normally distributed and a non-linear relationship exists. Testing for multicollinearity the VIF was less than 10 and the condition index was less than 30. Therefore, multicollinearity could be excluded. Testing for heteroscedasticity the scatterplot of the standardized residuals showed a certain pattern, indicating heteroscedasticity. The reason for the results stated above are “heavy tails” in the data set of the financial parameters. For testing this non-linear relationship with linear regression analysis the data have to be linearized. Following Chatterjee and Price (1995), transforming the dependent variable with natural logarithm is a common and widely spread technique in literature (Botosan and Plumlee, 2002; Choi et al., 2010; Sharfman and Fernando, 2008; Walls et al., 2012), which reduces heteroscedasticity and asymmetry of the data. After transforming the dependent variables with logarithm, the same test methods have to be applied again. The results showed a normal distribution of the data and no heteroscedasticity. Besides these effects, due to the logarithm characteristics, firms with negative values are excluded from further analysis. This reduces the number of observations by 275 in terms of EBIT. These pretests have been applied to all models and will not be mentioned in the further course of this paper.

4 Results

4.1 Descriptive Statistics

Table 1 to Table 4 in the appendix provide descriptive statistics for the entire sample of the examined year of 2011. The first three tables show the distribution of the firms across countries, regions and sectors.

The sample includes firm information from a total of 55 countries. Around 88 percent of all firms are located in the EU (826), Asia (782) and the NAFTA countries (1135). Most firms are located in the United States (911), followed by Japan (388), the United Kingdom (270), Australia (235) and Canada (217). As illustrated by Table 3, the sectors with the highest number of firms are Financials (625) and Industrials (532), while Telecommunications has the lowest quantity of firms (96).

As shown by Table 4, the highest Overall Performance is reached by the technology firm *Applied Materials* within a score of 96,71 out of 100. The highest Environmental Score is reached by *Coca-Cola* (94,77) and the highest Social Score is noted for *Microelectronics* (97,49), while *Entergy* shows the highest value in terms of Corporate Governance Score (96,26). The mean value for the different pillars range from approximately 51 to 57. The standard deviations of the different scores indicate that there is a broad range in terms of sustainability performance between firms.

The firms across the sample have an average market capitalization of 11,775 billion dollar, which indicates that the firms generally have a rather big size, even though the standard deviation shows a huge divergence between firms. The leading firm in this field is *Apple* with a market capitalization of almost 400 billion dollars.

The highest EBIT is documented for *Exxon Mobil* with 58 billion dollars in 2011. Greek *Eurobank Ergasias* showed the lowest EBIT with a minus of 8,9 billion dollars. This range is also mirrored by standard deviation. As mentioned above, due to the natural logarithm transformation of EBIT, the number of firms for Log EBIT is reduced from 3067 in the full sample to 2792 observed firms, which remain in the subsample.

4.2 Results of testing hypothesis I

For testing the first hypothesis a regression analysis was performed using the Overall Score as independent variable and the Log EBIT as dependent variable. The adjusted R^2 is 0.138. Therefore almost 14 percent of the total variation of the outcomes can be explained by the model (Cohen, 2003). Considering the amount of factors that could possibly influence the EBIT, this result shows a rather satisfying quality compared to other studies (Wu, 2006; Margolis et al., 2009). The analysis of variance (ANOVA) shows that the null hypothesis can be rejected within a predefined alpha error of 5 percent significance (Backhaus, 2008). The B-value of the unstandardized regression coefficients is 0.018 (p-value≤0.01). This implicates that a growth of the Overall Score by one point leads to an increase of the Log EBIT of the corresponding firm by this value. Due to the non-linear relationship of the model, firms with a higher EBIT could gain bigger profits by improving their Overall Score than firms with a lower EBIT. The same results hold on for the analysis of the relationship between the Overall Score and the Log Market Cap. The adjusted R^2 is 0.142, while the null hypothesis can be rejected and the B-Value is 0.018 (p-value≤0.01).

The next step was to run a multiple regression model using the environmental, economic, social and corporate governance scores as independent variables and the Log EBIT as dependent variable. As documented by an adjusted R^2 of 0.179 the quality of the model advanced. The null hypothesis can be rejected due to ANOVA and a significant relationship between the different scores and the Log EBIT is reported. While the Economic Score shows the highest B-value (0.012, p-value≤0.01), the Corporate Governance Score is related negatively to the financial figure by having a B-value of -0.004 (p-value≤0.01), which indicates that an improvement in this score leads to a decrease of the Log EBIT. The same model using the Log Market Cap as dependent variable shows similar results in terms of Economic, Environmental and Corporate Governance Score. Only the null hypothesis for the Social Score cannot be rejected because the level of significance of 5 percent is exceeded. Table 5 and Table 6 summarize these results.

After this the control variable “Sector” was introduced, splitting up the data set into ten different industry sectors. The results for the Overall Score and the Log EBIT (see Table 7) show that the adjusted R^2 is higher than 0.10 for all models except for Cyclical Consumer Goods and Industrials. The highest values are measured for the sectors Energy

(0.316), Healthcare (0.254) and Technology (0.259) indicating a high pattern quality. The null hypothesis can be rejected for all sectors. The B-values have a range from 0.016 (Basic Materials) to 0.035 (Energy). Therefore, by improving the Overall Score by one point, a corporation of the Energy sector could gain more than twice the increase of the EBIT compared to a firm of the Basic Material sector. The same findings hold true for using Log Market Cap as dependent variable. For this case, the models of the Energy sector (0.235) and the Healthcare sector (0.259) show the highest pattern quality, while the B-values range from 0.017 (p-value≤0.01) in the Utilities sector to 0.350 (p-value≤0.01) in the Energy sector.

In the following the control variable remains in the models and the first hypothesis is tested by using the Environmental, Economic, Social and Corporate Governance Score as independent variable. This step led to an improvement in terms of pattern quality for all multiple regression models. The adjusted R^2 of 0.421 for testing these scores and the Log EBIT in the Energy sector implicates that more than 40 percent of the total variation of the outcomes can be explained by the scores of the model. The F-test for linearity shows, that the null hypothesis can be rejected for all models. As illustrated by Table 8, the t-test shows a broad divergence in the results for the various sectors. Therefore the null hypothesis cannot be rejected for all models. One finding is that the Corporate Governance Score is negatively related to Log EBIT in most of the cases. Furthermore the B-values of the Economic Score and the Environmental Score show a significant positive relationship to Log EBIT in most of the cases. In contrast, the Social Score shows no relationship between the independent variables and the dependent variable for more than the half of all sectors. The Telecommunications sector is the only one where no relationship between the sustainability scores and the Log EBIT has been found. The highest B-value is reported for the Economic Score in the Energy sector within a value of 0.026 (p-value≤0.01).

The same approach as before was analyzed for the ESG scores and the Log Market Cap. The adjusted R^2 is higher than 0.10 for all sectors. The highest pattern quality is given for the Energy sector (0.370), followed by Basic Materials (0.339) and Healthcare (0.301). The F-Test led to a rejection of the null hypothesis for all sectors. As illustrated in the model before the t-test showed mixture results. With the exception of the Technology sector, the Corporate Governance Score revealed either no relationship or a negative relationship towards Log Market Cap. Except of Financials and the Utilities sector, the

findings for the Social score also show no relationship. Contrary to this the Economic Score as well as the Environmental Score are positively and significantly linked to Log Market Cap. The highest B-value evolved for the Economic Score in the Energy sector with a value of 0.035 (p-value≤0.01).

After testing the first hypothesis with various regression models, the most important findings shall be summarized at this point. First, hypothesis I is basically confirmed by the results, which show a positive relationship between the Overall Score and the Log EBIT and with Log Market Cap. These findings hold true after analysis has been performed with using the different sustainability performance scores as independent variables. After introducing the control variable "Sector" the model remains its pattern quality, even though the results show a divergence between sectors. A surprising result is the negative relationship between the Corporate Governance Score and the financial figures in many sectors. Another finding is, that the Social Score seems not to be related with the financial outcome in most of the cases. The Environmental Score as well as the Economic Score are positively related to Log EBIT and Log Market Cap for most of the sectors. The biggest impact of the various performance scores has been documented for the sectors Energy, Financials and Industrials in terms of Log EBIT and for Basic Materials and Cyclical Consumer Goods in terms of Log Market Cap. Furthermore, the non-linearity of the relationship implicates that especially bigger and financially more successful firms could profit from an enhancement of their sustainability performance.

4.3 Results of testing hypothesis II

For testing the second hypothesis the different environmental activities in the fields of emission reduction, resource reduction and product innovation and their relationship to the financial figures Log EBIT and Log Market Cap is analyzed. Therefore the control variable "Sector" remains for the various regression models. With exception of the Financials sector all models fulfill the requirements of the pretests for linear regression analysis.

First, the results for Log EBIT shall be mentioned. As shown in Table 9, the Basic Materials sector has a positive and significant coefficient on Log EBIT for "product impact minimization" (0.440. p-value≤0.05) and indicates a positive tendency of the activities "environmental SCM", "CO_2-reduction" and "energy footprint reduction". The Energy sector has positive and significant coefficients on Log EBIT for "green buildings"

(1,388, p-value≤0.01), “energy efficiency policy” (0.584, p-value≤0.05), “emission reduction policy” (0.726, p-value≤0.05), “clean energy products” (1,068, p-value≤0.01) and a positive trend for “environmental SCM” (0.482, p-value≤0.1). The Financials sector has a positive and significant coefficient on Log EBIT for “product impact minimization” (0.474, p-value≤0.01). The sector of non-cyclical Consumer Goods has a positive tendency for “toxic chemicals or substances reduction”. The Technology Sector has positive and significant coefficients on Log EBIT for “green buildings” (0.708, p-value≤0.01), “waste reduction initiatives” (0.709, p-value≤0.05) and “product impact minimization” (0.644, p-value≤0.05), while the results indicate a negative trend for “energy efficiency policy (-0.464, p-value≤0.1). The Telecommunications sector has positive and significant coefficients for “environmental SCM” (0.730. p-value≤0.05), “commercial risks and/or opportunities due to climate change” (0.836, p-value≤0.05), “energy footprint reduction” (0.727, p-value≤0.05) and “product impact minimization” (0.681, p-value≤0.05). The Utilities sector has positive and significant coefficients on Log EBIT for “environmental SCM” (0.618, p-value≤0.05), “NO_x and SO_x emissions reduction” (0.444, p-value≤0.05), “sustainable transportation” (0.496, p-value≤0.05) and “product impact minimization” (0.430. p-value≤0.05). Contrary to the findings above, there was no significant relationship found for one of the activities in the sectors Cyclical Consumer Goods, Healthcare and Industrials.

The most important results of the multiple regression analyses between the various environmental activities and the Log Market Cap are summarized in the following. As shown in Table 9, the Basic Materials sector has a positive and significant coefficient on Log Market Cap for “product impact minimization” (0.440. p-value≤0.05) and positive tendencies for “environmental SCM” and “CO_2-reduction”. There is a positive and significant coefficient for “emission reduction policy” (1,004, p-value≤0.01) and “product impact minimization” (0.822, p-value≤0.01) in the Energy sector. The Financials sector has positive and significant coefficients for “commercial risks and/or opportunities due to climate change” (0.304, p-value≤0.05), “clean energy products” (0.346, p-value≤0.05) and “product impact minimization” (0.320. p-value≤0.05). Furthermore there is a negative tendency for “ozone-depleting substances reduction” and a positive trend for “green buildings”. The sector of non-cyclical Consumer Goods only has a positive and significant coefficient for “product impact minimization” (0.414, p-value≤0.05). The Technology sector shows positive and significant coefficients on Log

Market Cap for “green buildings” (0.748, p-value≤0.01), “waste reduction initiatives” (0.704, p-value≤0.01) and “product impact minimization” (0.619, p-value≤0.05) as well as a positive trend for “water efficiency policy”. The Telecommunications sector has positive and significant coefficients for “renewable energy use” (0.869, p-value≤0.05), “CO_2-reduction” (0.712, p-value≤0.05) and “energy footprint reduction” (0.969, p-value≤0.01). In addition to this there a positive tendencies for “environmental SCM” and “commercial risks and/or opportunities due to climate change”. The results for the Utilities sector show a positive and significant coefficient on Log Market Cap for “environmental SCM” (0.511, p-value≤0.01) and “sustainable transportation” (0.472, p-value≤0.01) as well as positive tendencies for “toxic chemicals or substances reduction”, “green buildings”, “commercial risks and/or opportunities due to climate change” and “NO_x and SO_x emissions reduction”. As before on Log EBIT, there have also been no findings for relationships between the environmental activities and Log Market Cap in the sectors Cyclical Consumer Goods, Healthcare and Industrials.

After testing the second hypothesis, a few facts shall be summarized. The results show a broad divergence of single activities and their impact on the financial figures for the different sectors. This is an expectable result, because the potential success of certain activities is strongly influenced by the business environment and depending on industry characteristics. Furthermore there have been no findings for the sectors Cyclical Consumer Goods, Healthcare and Industrials. This might be due to the relatively low pattern quality of the models for these sectors, which might be improved by including further industry-specific factors in the model.

4.4 Major findings and implications

In the literature there are three main streams of interpretation regarding the effects of sustainability on financial performance. The neoclassical approach assumes a negative relationship, while in recent years more studies indicate a positive relationship. The approach of Waddock and Graves (1997) assumes a positive link due to the interdependency of both fields. We state a positive non-linear link between sustainability performance and financial performance in terms of Log EBIT and Log Market Cap, thus confirming hypothesis I. The results also hold true, after introducing the control variable “Sector”. Existing non-linearity leads to four major implications.

First, it has to be mentioned, that using the logarithm transformation of the dependent variables excludes about ten percent of all firms from the analysis, because negative values cannot be transformed. This could have an impact on the results, if the excluded firms would also have a high overall performance score.

Second, non-linearity of the relationships shows that especially firms with an existing high level of EBIT or Market Cap can gain higher profits from improving their sustainability performance. This confirms the approach of the “Virtuous Circle” as stated in the literature which assumes that bigger and more successful firms are forced by the public to also become more sustainable in order to satisfy the demands of their stakeholders.

Third, firms with a high level of sustainability face both, more difficulties and higher costs by attempting to increase their overall performance score than firms with a lower level of sustainability. This aspect will be further discussed and illustrated by an example in the remaining paper.

Fourth, it has to be mentioned that the independent variables only explain a certain degree of the deviation. Accordingly, financial figures are also influenced by other factors, which have not been included yet. Nevertheless, the regression models are reliable and the results are valid.

After introducing the control variable “Sector”, the results of the detailed analyses show that the environmental as well as the economic dimension have the biggest impact on Log EBIT. For this reason sustainable activities in these fields seem to be most promising. In contrast, the Social Score indicates no relationship between social performance and financial success for most of the industry sectors. The results of the Corporate Governance Score even show a negative link for most of the cases. This is surprising, because this dimension mirrors a firms’ ability to create a long-term value for its shareholders. Therefore, an increase of this score would lead to a decrease of the EBIT or the Market Cap in some sectors. A possible explanation could be that the investments into improving this field leads to non-monetary benefits, like an improvement of the firms’ brand image, which are not part of the regression model (Jacobs et al., 2010).

The detailed anaylsis of hypothesis II has shown a broad mixture of results for the different sectors. In the following an example shall be given to illustrate the findings. The regression model between the Environmental Score and the Log EBIT of firms in the

Energy sector explains 42,1 percent of the total deviation. The value of the B-coefficient is 0.01593, which indicates that, depending on the starting level of the EBIT, firms could increase their EBIT by this value. Taking *Exxon Mobil* as an example, this firm theoretically could enhance their EBIT from 58,215 billion dollars to about 59,150 billion dollars, which is an increase of around 935 million dollars. This calculation is performed by adding the value of the B-coefficient to the Log EBIT variabe. After that, the inverse function of the logarithm transformation is used to calculate the real impact on the EBIT. Following this logic, *Exxon Mobil* could gain the above mentioned increase by improving their Environmental Score from 91,54 to 92,54. The following figure illustrates the calculation for *Exxon Mobil* as well as for the mean value of the possible EBIT increase in the Energy sector.

Environmental Score - EBIT - Sector: Energy				
Exxon Mobil	EBIT	Log EBIT	B-coefficient	Score
EBIT (in USD)	$ 58,215,010,000.00	17.8797	0.01593	**91.54**
New EBIT/Log EBIT/Score	$ 59,149,564,352.49	17.8956		**92.54**
Difference =	**$ 934,554,352.49**			
Mean value	EBIT	Log EBIT	B-coefficient	Score
EBIT (USD)	$ 2,638,379,620.97	17.8797	0.01593	**46.36**
New EBIT/Log EBIT/Score	$ 2,680,734,834.14	17.8956		**47.36**
Difference =	**$ 42,355,213.17**			

Fig. 3: Calculation of EBIT after improving the Environmental score

Obviously, this calculation has to be seen as a simplified illustration. It is only based on the given data and it does not consider other factors like overall economic parameters, which influence the outcomes as well. Being close to the maximum score of 100. *Exxon Mobil* will probably face greater efforts and difficulties improving their Environmental Score compared to other firms in the same industry sector, which have a lower Environmental Score. Even though the financial benefits might overcompensate the related expenditures, these effects are part of the managerial decision making process.

Building up on these data-based considerations, firms need to know which sustainable activities could lead to gains in the financial outcome. At this point the results of testing hypothesis II for the Energy sector show, that the following environmental activities are positively related to Log EBIT: Energy Efficiency Policy, Green Buildings, Environmental SCM, Emission Reduction and Clean Energy Products. Thus, these activities are generally the most promising and firms of this industry sector should focus

on them, in order to improve their sustainability performance as well as their financial performance.

4.5 Managerial Implications

This paper has shown, that it can pay off to invest into sustainable activities. Therefore managers need to analyze their firm's competitive environment by considering industry-specific characteristics, proof their financial capabilities and with this knowledge develop a sustainable strategy. Thereafter, as the literature has shown, this decision making process can be quite complex and managers can choose from a variety of activities. At this point this paper has provided an approach as to how managers can substantiate their decision by regarding industry-specific sustainability activities. Depending on the existing sustainability performance level of the firm, managers have to decide, if further investments in sustainability activities will lead to enhanced financial performance. We provided a framework that relies on a large sample of empirical data, addressing the environmental dimension and including activities in the fields of emission reduction, resource reduction and product innovation. As the results have shown, there has been a wide range of financially successful sustainable activities, which seem to have no effect on the financial outcome. Further research in this context could include other dimensions of sustainability and consider other industry-specific characteristics in order to gain a more detailed picture, thus providing a more comprehensive collection of handling options for managers Finally, a comprehensive and more precise calculation method, e.g. including interest, could be developed. It should be noted that the fact that managerial decisions regarding investments in sustainable performance could be better substantiated by our approach. It also might become easier for the firm to get access to monetary funds from banks or investors.

5 Conclusion

5.1 Summary

The purpose of this paper was to analyze whether there is a link between a firm's sustainability performance and its financial performance that can be empirically proofed. Therefore the data of Thomson Reuters ASSET4 and Datastream have been collected for the year 2011 and the data has been analyzed applying multiple regression analysis. The results are mixed.

The testing of the first hypothesis clearly shows a positive link between sustainability performance and the logarithmized, dependent variables EBIT and Market Cap. The results indicate a non-linear relationship, which implicates that financially superior firms could gain higher profits from investing in sustainability than less financially successful firms. This confirms the theory of a "Virtuous Circle", developed by Waddock and Graves (1997). Within the ten industry sectors mixed results have been reported for the relationship between the economic, the environmental, the social and the corporate governance pillars and the respective financial performance outcome. Therefore, further research is needed for examining the different sectors by integrating sector-specific factors in the analysis.

The testing of the second hypothesis showed a mixture of sustainable environmental activities in the field of resource reduction, emission reduction and product innovation, which indicate a positive relationship to financial success in terms of a higher EBIT and Market Capitalization. Depending on the firm's business environment, managers can choose appropriate activities to fulfill their sustainability targets.

5.2 Limitations and further research

This paper and the results we showed are subject to limitations. First, the data, which has been used for the analyses cover only a single year. Time-related dynamics are therefore neglected, e.g. the long-term effects of sustainable firm activities on the financial outcome.

Second, because of using a logarithm transformation of the dependent variables, all negative EBIT values have been excluded from further analyses. Results might have to be altered, if firms with negative EBIT values would have reached a high score in the respective sustainability performance pillars for the revised period.

Third, as the mixed results we found suggest, the analyzing process can be highly influenced by strong fluctuations in the data. This is confirmed in the literature as well, where several problems in measuring sustainability as well as financial performance are reported.

Besides these limitations, this paper is in line with other papers which try to close the research gap between corporate sustainability performance and a firm's financial success. Nevertheless, further research needs to be done in this field. As mentioned before a more dynamic view would be eligible to analyze the long-term effects of sustainable actions on financial outcomes. Given a database as large and consistent as in this paper, a long-term analysis would be a rather advanced big step. Furthermore, other financial measures like ROE, ROS or ROA should be used. In addition, a more detailed and industry-orientated analysis is a logical next step of this approach. This sector-specific research could be improved by taking relevant factors into account. Another, more practical approach could built up on the results of the second hypothesis and includes the integration of further sustainability dimensions in terms of economical environmental, social and corporate governance actions. This could lead to an industry-specific catalog of sustainable activities which indicate the biggest opportunities for financial success, also answering the research question "how it pays to be green". A question that has not been clearly answered yet, addresses the direction of effect between sustainability and financial performance. In this light this paper is just a starting point for further research in this field.

Appendix

Descriptive Statistics

Table 1: Sample Distribution across Countries

COUNTRY	***N***	***COUNTRY***	***N***
ABU DHABI	1	LUXEMBOURG	4
AUSTRALIA	235	MALAYSIA	34
AUSTRIA	18	MEXICO	7
BELGIUM	22	MOROCCO	2
BRAZIL	32	NETHERLANDS	24
CANADA	217	NEW ZEALAND	10
CHILE	4	NIGERIA	1
CHINA	51	NORWAY	21
COLOMBIA	3	OMAN	1
CYPRUS	1	PHILIPPINES	6
CZECH REPUBLIC	3	POLAND	13
DENMARK	23	PORTUGAL	11
DUBAI	1	QATAR	2
EGYPT	2	RUSSIAN FEDERATION	23
FINLAND	26	SAUDI ARABIA	6
FRANCE	80	SINGAPORE	46
GERMANY	73	SOUTH AFRICA	42
GREECE	17	SOUTH KOREA	55
HONG KONG	101	SPAIN	38
HUNGARY	4	SRI LANKA	1
INDIA	38	SWEDEN	44
INDONESIA	6	SWITZERLAND	59
IRELAND	14	TAIWAN	41
ISRAEL	10	THAILAND	15
ITALY	39	TURKEY	15
JAPAN	388	UNITED KINGDOM	270
JORDAN	1	UNITED STATES	911
KUWAIT	3		
Total		**3115**	

Table 2: Sample Distribution across Regions

Region	***N***	***Percent***
EU	826	26,52
NAFTA	1135	36,44
Asia	782	25,10
Rest of the world	41	1,32
South America	39	1,25
Australia	245	7,87
Africa	47	1,51
Total	**3115**	**100**

Table 3: Sample Distribution across Sectors

Sector	***N***	***Percent***
Basic Materials	363	11,7
Cyclical Consumer Goods	491	15,8
Energy	251	8,1
Financials	625	20,1
Healthcare	180	5,8
Industrials	532	17,1
Non Cyclical Consumer Goods	218	7,0
Technology	224	7,2
Telecommunications	96	3,1
Utilities	135	4,3
Total	**3115**	**100,0**

Table 4: Descriptive Statistics

Descriptive Statistics					
	N	***Minimum***	***Maximum***	***Mean***	***Std. Deviation***
Overall Score	3115	0.00	96.71	54.1863	30.14622
Economic Score	3115	0.00	98.10	51.0360	29.39278
Environmental Score	3115	0.00	94.77	53.5588	32.23667
Social Score	3115	0.00	97.49	53.3131	30.50249
Corporate Governance Score	3115	0.00	96.26	56.3947	29.64229
EBIT (Thousand USD)	3067	-8,890,953.00	58,215,010.00	1,323,236.12	3,697,349.29
Market Cap (Thousand USD)	3115	1,180.00	394,263,300.00	11,775,923.12	25,743,028.51
Log EBIT	2792	6.71	17.88	13.12	1.44
Log Market Cap	3115	7.07	19.79	15.28	1.46

Regression Results

Table 5: B-values of unstandardized coefficients of Overall Score

B-values of unstandardized coefficients of Overall Score

B-value	*(adjusted) R^2*	*N*	*Measure*
0.018*	0.138	2792	Log EBIT
0.018*	0.142	3115	Log Market Cap

* p≤ 0.01, ** p≤ 0.05, *** p≤ 0.10. based on one-tailed tests, robust standard errors

Table 6: B-values of unstandardized coefficients of ESG Scores

B-values of unstandardized coefficients of Economic Score (1), Environmental Score (2), Social Score (3) and Corporate Governance Score (4)

B-value (1)	*B-value (2)*	*B-value (3)*	*B-value (4)*	*(adjusted) R^2*	*N*	*Measure*
0.012*	0.007*	0.005*	-0.004*	0.179	2792	Log EBIT
0.017*	0.006*	0.002	-0.003*	0.189	3115	Log Market Cap

* p≤ 0.01, ** p≤ 0.05, *** p≤ 0.10. based on one-tailed tests, robust standard errors

Table 7: B-values of unstandardized coefficients of Overall Score per sector

B-values of unstandardized coefficients of Overall Score

Sector	*B-value*	*(adjusted) R^2*	*N*	*Measure*
Basic Materials	0.016*	0.113	307	Log EBIT
	0.024*	0.235	363	Log Market Cap
Cyclical Consumer Goods	0.014*	0.094	452	Log EBIT
	0.012*	0.065	491	Log Market Cap
Energy	0.035*	0.316	202	Log EBIT
	0.035*	0.283	251	Log Market Cap
Financials	0.019*	0.161	554	Log EBIT
	0.018*	0.159	625	Log Market Cap
Healthcare	0.024*	0.254	162	Log EBIT
	0.029*	0.259	180	Log Market Cap
Industrials	0.013*	0.070	492	Log EBIT
	0.013*	0.074	532	Log Market Cap
Non Cyclical Consumer Goods	0.022*	0.227	205	Log EBIT
	0.023*	0.223	218	Log Market Cap
Technology	0.025*	0.259	202	Log EBIT
	0.021*	0.205	224	Log Market Cap
Telecommunications	0.017*	0.153	90	Log EBIT
	0.017*	0.148	96	Log Market Cap
Utilities	0.017*	0.216	126	Log EBIT
	0.017*	0.256	135	Log Market Cap

* p≤ 0.01, ** p≤ 0.05, *** p≤ 0.10. based on one-tailed tests, robust standard errors

Table 8: B-values of unstandardized coefficients of ESG Scores per sector

B-values of unstandardized coefficients of Economic Score (1), Environmental Score (2), Social Score (3) and Corporate Governance Score (4)

Sector	*B-value (1)*	*B-value (2)*	*B-value (3)*	*B-value (4)*	*(adjusted) R^2*	*N*	*Measure*
Basic Materials	0.017*	0.000	0.009***	-0.010*	0.220	307	Log EBIT
	0.021*	0.009**	0.003	-0.007*	0.339	363	Log Market Cap
Cyclical Consumer Goods	0.011*	0.008*	0.000	-0.003	0.124	452	Log EBIT
	0.011*	0.005***	0.002	-0.005**	0.100	491	Log Market Cap
Energy	0.026*	0.016*	0.003	-0.009**	0.421	202	Log EBIT
	0.035*	0.002	0.005	-0.003	0.370	251	Log Market Cap
Financials	0.007*	0.010*	0.011*	-0.007*	0.206	554	Log EBIT
	0.010*	0.007*	0.006***	-0.002	0.176	625	Log Market Cap
Healthcare	0.001	0.013**	0.009	0.010**	0.277	162	Log EBIT
	0.015*	0.024*	-0.008	0.007	0.301	180	Log Market Cap
Industrials	0.015*	0.009*	-0.002	-0.006*	0.142	492	Log EBIT
	0.019*	0.004	-0.003	-0.004*	0.153	532	Log Market Cap
Non Cyclical Consumer Goods	0.009**	0.006	0.009***	0.003	0.227	205	Log EBIT
	0.010**	0.013*	0.06	-0.001	0.247	218	Log Market Cap
Technology	0.005	0.010**	0.011***	0.004	0.257	202	Log EBIT
	0.006	0.006	0.008	0.007**	0.200	224	Log Market Cap
Telecommunications	0.005	0.011	0.007	-0.003	0.187	90	Log EBIT
	0.007	0.020**	-0.006	-0.001	0.176	96	Log Market Cap
Utilities	0.002	0.011**	0.009	0.001	0.251	126	Log EBIT
	0.006	0.006	0.008***	0.002	0.272	135	Log Market Cap

* $p \leq 0.01$, ** $p \leq 0.05$, *** $p \leq 0.10$. based on one-tailed tests, robust standard errors

Table 9: Results of testing hypothesis II

Activities \ Sector		Basic Materials	Energy	Financials	Non Cyclical Consumer Goods	Technology	Telecom-munications	Utilities	Measure
Ressource Reduction	Energy Efficiency Policy		0.584**			-0.464***			Log EBIT
									Log Market Cap
	Toxic Chemicals or Substances Reduction				0.538***				Log EBIT
								0.361***	Log Market Cap
	Renewable Energy Use								Log EBIT
							0.869**		Log Market Cap
	Green Buildings		1.388*			0.708*			Log EBIT
				0.218***		0.748*		0.316***	Log Market Cap
	Water Efficiency Policy								Log EBIT
						0.410***			Log Market Cap
	Environmental SCM		0.482***				0.730**	0.618*	Log EBIT
		0.333***					0.692***	0.511*	Log Market Cap
Emission Reduction	Emission Reduction Policy		0.726**						Log EBIT
			1.004*						Log Market Cap
	Commercial Risks and/or Opportunities due to Climate Change			0.286***			0.836**		Log EBIT
				0.304**			0.679***	0.356***	Log Market Cap
	CO2-Reduction								Log EBIT
		0.365***					0.712**		Log Market Cap
	Ozone-Depleting Substances Reduction								Log EBIT
				-0.460***					Log Market Cap
	NOx and SOx Emissions Reduction							0.444**	Log EBIT
								0.310***	Log Market Cap
	VOC Emissions Reduction								Log EBIT
									Log Market Cap
	Waste Reduction Initiatives					0.709**			Log EBIT
						0.704*			Log Market Cap
	Sustainable Transportation							0.496**	Log EBIT
								0.472*	Log Market Cap
Product Innovation	Energy Footprint Reduction	0.398***					0.727**		Log EBIT
							0.969*		Log Market Cap
	Clean Energy Products		1.068*						Log EBIT
				0.346**					Log Market Cap
	Product Impact Minimization			0.474*		0.644**	0.681**	0.430*	Log EBIT
		0.440**	0.822*	0.320**	0.414**	0.619**			Log Market Cap

* $p \leq 0.01$, ** $p \leq 0.05$, *** $p \leq 0.1$

Further Information

Table 10: Description of ASSET4 Pillars

(from ASSET4 documents)

Pillar	Description
Economic Performance Pillar	The economic pillar measures a company's capacity to generate sustainable growth and a high return on investment through the efficient use of all its resources. It is reflection of a company's overall financial health and its ability to generate long term shareholder value through its use of best management practices.
Social Performance Pillar	The social pillar measures a company's capacity to generate trust and loyalty with its workforce, customers and society, through its use of best management practices. It is a reflection of the company's reputation and the health of its license to operate, which are key factors in determining its ability to generate long term shareholder value.
Corporate Governance Performance Pillar	The corporate governance pillar measures a company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders. It reflects a company's capacity, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long term shareholder value.
Environmental Performance Pillar	The environmental pillar measures a company's impact on living and non-living natural systems, including the air, land and water, as well as complete ecosystems. It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities in order to generate long term shareholder value.

Table 11: Description of ASSET4 Environmental Categories

(from ASSET4 documents)

Pillar	Category	Description
Environmental Performance	Resource Reduction	The resource reduction category measures a company's management commitment and effectiveness towards achieving an efficient use of natural resources in the production process. It reflects a company's capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.
	Emissions Reduction	The emission reduction category measures a company's management commitment and effectiveness towards reducing environmental emission in the production and operational processes. It reflects a company's capacity to reduce air emissions (greenhouse gases, F-gases, ozone-depleting substances, NOx and SOx, etc.), waste, hazardous waste, water discharges, spills or its impacts on biodiversity and to partner with environmental organisations to reduce the environmental impact of the company in the local or broader community.
	Product Innovation	The product innovation category measures a company's management commitment and effectiveness towards supporting the research and development of eco-efficient products or services. It reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed, dematerialized products with extended durability.

Table 12: Description of ASSET4 Environmental Activities

(from ASSET4 documents)

Category	Activity	Description
Resource Reduction	Energy Efficiency Policy	Does the company have a policy to improve its energy efficiency?
	Toxic Chemicals or Substances Reduction	Does the company report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances?
	Renewable Energy Use	Does the company make use of renewable energy?
	Green Buildings	Does the company report about environmentally friendly or green sites or offices?
	Water Efficiency Policy	Does the company have a policy to improve its water efficiency?
	Environmental Supply Chain Management	Does the company use environmental criteria (ISO 14000, energy consumption, etc.) in the selection process of its suppliers or sourcing partners?
Emissions Reduction	Emissions Reduction Policy	Does the company have a policy to reduce emissions?
	Commercial Risks and/or Opportunities Due to Climate Change	Is the company aware that climate change can represent commercial risks and/or opportunities?
	CO2 Reduction	Does the company show an initiative to reduce, reuse, recycle, substitute, phase out or compensate CO2 equivalents in the production process?
	Ozone-Depleting Substances Reduction	Does the company report on initiatives to recycle, reduce, reuse or substitute ozone-depleting (CFC-11 equivalents, chlorofluorocarbon) substances?
	NOx and SOx Emissions Reduction	Does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulphur oxides) or NOx (nitrogen oxides) emissions?
	VOC Emissions Reduction	Does the company report on initiatives to reduce, substitute, or phase out volatile organic compounds (VOC)?
	Waste Reduction Initiatives	Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out total waste?
	Sustainable Transportation	Does the company report on initiatives to reduce the environmental impact of transportation of its products or its staff?
Product Innovation	Energy Footprint Reduction	Does the company describe initiatives in place to reduce the energy footprint of its products during their use?
	Renewable/Clean Energy Products	Does the company develop products or technologies for use in the clean, renewable energy (such as wind, solar, hydro and geo-thermal and biomass power)?
	Product Innovation/ Product Impact Minimization	Does the company reports about take-back procedures and recycling programmes to reduce the potential risks of products entering the environment? OR Does the company report about product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use?

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