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Corporate Sustainability and the Financial Implications for the European Basic Materials Industry

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Abstract

In this thesis we investigate the relationship between sustainable performance and firm performance within the basic materials industry. Specifically, and in line with prior studies, we demonstrate a significant, negative relationship between sustainable performance, (using Thomson Reuters Asset4 ESG-index) and financial firm performance (return on assets and Tobin's q) for a panel data sample between 2003 and 2013 of 94 European basic materials firms. Like many previous researchers, we find inconclusive results when testing whether this relationship is linear or non-linear. We discuss the implications of these findings.

Key words: Corporate Sustainability, ESG, Financial performance, and Basic materials industry, Europe

Foreword

We would like to thank everyone who has made this study possible. First of all we would like to thank our supervisor Diem Nguyen Van for all her guidance and the valuable support she has given us throughout the process of the thesis, and especially for challenging us in constructing a valid model. Furthermore we would like to thank the staff at Thomson Reuters for guiding us through the use of their Asset4 ESG-index. Finally, we would like to extend our gratitude to those who have continuously followed our process and provided us with both valuable input and constructive criticism.

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Table of Contents

1. Introduction

In the following section we introduce the link between corporate sustainability and financial performance. We discuss the practical and academic importance, and present a summary of our results.

The modern world is confronted with numerous environmental and social problems due to the scarcity of resources in combination with a continuously growing world population and the constant threat of climate change. To mitigate these problems and reverse global degradation, much hope is placed in the concept of sustainable development. It is argued that a substantial part of the environmental and social problems are caused by the corporate world and its short-term view on profitability. Therefore, firms' sustainable activities are vital to the solution, and the success of sustainability-related objectives will largely be determined by corporate sustainability (Peylo, 2012).

There is an ongoing debate on the exact definition of corporate sustainability and what this concept contains. However, most of the proposed definitions state that corporate sustainability contains various aspects that need to be considered simultaneously and is often clustered into three main subgroups: *Environmental* (E), *Social* (S), and *Corporate Governance* (G). Hence, ESG is a catch-all term for measuring corporate sustainability (Schaltegger and Synnestvedt, 2002; Steger, 2006). Therefore, for the remainder of this thesis ESG refers to corporate sustainability.

In today's capitalistic society, firm survival depends on its ability to gain profits and investment decisions are largely based on economic payback projections. Therefore, in order to motivate the vast majority of firms to engage in ESG activities there needs to be financial benefits from doing so. As of today, however, research is still lacking to justify the financial implications of firms' sustainable actions, and there is limited empirical evidence that such investments indeed lead to profitability or enhance firm value. Previous research on the relationship between ESG performance and financial performance presents mixed results (Singal, 2014). Therefore, the economic incentive of ESG activities remains questionable.

This thesis contributes to the discussion regarding the relation between ESG and financial performance, and in particular deepens the understanding for this link in the European basic materials industry. The basic materials industry consists of firms who often use natural

resources in the production process, such as chemicals, metals, pulp and mining. These companies are considered to have a high impact on both environment and societies thus, are in a greater position to address sustainability issues (Halme, M and Huse, M., 1997). This industry is of particular interest since prior studies on ESG often use negative screening when selecting the firms to investigate. This is a selection process where firms or entire industries are actively excluded from the study because they are involved in practices that are considered unsustainable by nature. According to Lee et al (2009) there is a bias towards firms belonging to the financial services, healthcare and technology industries in prior studies, and firms from the basic materials sector are often automatically excluded due to the negative screening process. Hence, this study addresses an academic gap through an exploration of the relation between firm performance and sustainable performance of the basic materials sector. As such, it contributes to both the corporate sustainability literature and the financial literature, and is also of interest to practitioners and other stakeholders in the basic materials industry.

Our results indicate a negative relationship between ESG and financial performance in the European basic materials industry. Hence, the financial benefits of ESG activities do not outweigh the costs. Stringent regulation regarding ESG performance forces the firms to invest in sustainability and thus increase costs. However, firms within the basic materials industry are unable to reap the benefits normally associated with improved ESG performance. A crucial element for the business case of ESG is improved stakeholder relations, which create competitive advantages on markets such as the consumer market, employers market, and financial market. In the European basic materials industry this is not achieved since the ESG activities are not in consonance with the firms' character due to the unsustainable nature of their business, and are thus not perceived as credible by stakeholders. Hence, stakeholder relations are not improved why firms cannot create a competitive advantage and reap financial benefits within this industry.

The remainder of this thesis is organized as follows: In section 2, we establish our theoretical framework and introduce previous research on ESG and its financial implications. We also state our hypotheses. In section 3, we present our methodology and data set. This includes a presentation of our models. In section 4, we present our results and analysis. Finally, in section 5, we present our conclusion.

2. Theory and Hypotheses

In this section, we present different economic views on the link between ESG and financial performance, as well as a summary of results from previous empirical research. Finally we present our hypotheses.

Investing in ESG activities is by no doubt a costly investment for the firm. However, prior studies present many financial benefits of doing such investments, which under the right conditions can outweigh the costs. These are crucial for the reader to be aware of in order to understand the scope of investigation in this study: whether or not the financial benefits of ESG outweighs the costs of ESG in the European basic materials industry. Since the costs are more apparent than the financial benefits, more emphasis will be put on explaining the benefits in the following sections.

2.1 The positive relationship between ESG and financial performance

The revisionist economic view argues that an ESG oriented strategy can lead to cost reductions and revenue increases for firms. This view is based on the stakeholder theory which emphasizes that firms should not only meet the requirements of the shareholders, but also those of a variety of stakeholders, whose support is crucial for the existence of the firm (Freeman, 1984). Engaging in ESG is a way to meet these requirements and improve stakeholder relations, which creates a competitive advantage on various markets and has a clear positive bearing on firm profitability.

Some argue that ESG improves a firm's relationship towards consumers, and thus creates a competitive advantage on the consumer market. The improved relationship derives from a better reputation and improved firm image (Porter and Kramer, 2011). Waddock and Graves (1997) prove that a firm's ESG rating has an economically and statistically significant positive effect on firm reputation. The improved relationship towards consumers could positively affect a firm's financial performance since it can entice end-consumers to buy a firm's products or services. Therefore, firms may reap price premiums or gain increase in market share. However, the financial impact of this relationship is stronger for firms in the business-to-consumer industries than firms in the business-to-business industries (Sahut and Pasquini-Descomps, 2015; Sprinkle and Maines, 2010). This indicates that firms closer to the end-consumers have more incentives to engage in ESG activities.

Moreover, a firm can improve its relationship towards current employees and increase its attractiveness towards potential employees by engaging in ESG activities, and thus gain competitive advantages on the employer's market (Economist, 2008). Employees are getting increasingly interested in working for firms with an ESG oriented agenda (Sprinkle and Maines, 2010). This indicates that a firm with such an agenda can retain their employees for a longer period of time and will attract more applicants to their vacancies. To retain the same employees affects the profitability positively, since the firm does not have to train and educate new staff to the same extent as firms with a higher employee turnover (Balakrishnan, R. Sprinkle, G.B., Williamson M.G, 2011). Furthermore, employee retention could also affect the financial performance positively since it is correlated with increased effectiveness, as an employee is more effective the longer he/she has worked in the same place. Further, a competitive employer attracts the best employees, who are likely to have a positive effect on financial results (Sprinkle and Maines, 2010).

Furthermore, engagement in ESG activities can improve a firm's relationship towards stakeholders on the financial market and thus gain competitive advantages on this market. Some researchers argue that firms who engage in ESG are regarded as more considerate of their future license to operate, why they are deemed by stakeholders on the financial market to be less risky than their peers (for overview, see: Deutsche Bank Group, 2012). Therefore, the cost of capital for these firms is lower than for their competitors both regarding cost of debt and cost of equity, due to the lowered risk premium put on them (Peylo, 2012). Some also argue that internal costs, such as agency costs, are reduced since firms engaging in ESG are more likely than their peers to report on ESG measures (Cheng, Ioannou, and Serafeim, 2015).

Some ESG activities can also result in direct cost reductions through operating efficiency benefits. When complying with increasingly stringent regulations regarding ESG performance firms avoid lawsuits and fines. Increased energy efficiency leads to reduced energy costs, and recycling of materials reduces waste and lowers materials costs (Cordeiro and Sarkis, 1997).

There are studies that have proved a positive relationship between firm performance and ESG. In particular, many researchers have found that the corporate governance parameter of ESG has a positive effect on financial results (Deutsche Bank, 2012). The majority of these studies have focused on investigating the likelihood of sustainability as a factor of long-term value

creation (Orlitzky et al., 2003). Lee et al. (2009) claim that firms with superior sustainability performance enjoy lower idiosyncratic risks, and Goss (2009) show that firms with inferior sustainability performance face a higher risk of experiencing financial distress. In financial terms, Goss and Roberts (2011) found that firms with the most inferior sustainability performance face between 7 and 18 basis points more on their bank debt compared to better performing firms. Additionally, El Ghoul et al. (2011) found that firms voluntarily disclosing sustainability initiatives would overall enjoy lower cost of capital.

2.2 The negative relationship between ESG and financial performance

In contrast to the revisionist view, the neoclassical economists argue that ESG increases a firm's costs without providing enough economic compensation to make sustainable investments financially viable. Neoclassical economists often argue that ESG at its best entails a zero-sum tradeoff with corporate financial interests (Burke and Logsdon, 1996). According to this direction of thought, a corporate sustainability initiative consisting of stringent environmental standards is believed to lead to higher costs for companies, in particular for those in sectors that are sensitive to environmental issues such as the basic materials industry. As the environment and natural resources are the main production factors, imposing limitations on them will increase costs and limit the firm's ability to grow (Palmer et al., 1995; Siebert et al., 1980). Neoclassical economists often base their arguments on the shareholder theory, stating that the only social responsibility of business is to increase profits, and that doing otherwise, such as investing resources in costly sustainability initiatives, will necessarily reduce shareholder value (Friedman, 1962).

Taking on sustainable measures does require investments in new resource efficient machinery and implementation of new internal processes (Sahut and Pasquini-Descomps, 2015), and there are evident costs arising from the implementation of a sustainable structure (Porter, 1991). Walley and Whitehead (1994) demonstrates that the environmental costs are at its worst for pollution- intensive industries such as the basic materials industry. Further, when regulatory compliance rather than profit maximization drives the activities of a firm, a negative relationship between financial firm performance and ESG performance is expected, since these activities increase the costs of the firm without resulting in enough economic compensation to offset these costs (Baron, 2001; Baron et al., 2009).

Many studies have shown negative relationships between financial and sustainable firm performance. Hart and Ahuja (1996) do an empirical study on American firms investigating the effect of ESG on several financial firm performance ratios, and find that from an accounting based view, there is a short term penalty on firms exercising ESG actions. Cordeiro and Sarkis, (1997) do a study on 532 American firms, and demonstrate that there is a significant, negative relationship between environmental pro-activism and security analyst 1- and 5-year earnings performance forecasts. Also, from a market-driven point of view, Worrell et. al. (1995) find significantly negative stock market reactions to announcements related to ESG initiatives over a 5-year period. Sarkis and Cordeiro (2001) conducts a study on 482 American firms who either advocate a pro-active stance, implementing ESG into their processes, or who focus on so called 'end-of-pipe' solutions that relies on external recycling and recovery of waste. They found significantly negative relationships between ESG- and firm performance both on firms advocating the more pro-active solutions and the end-of-pipe implementations.

2.4 The non-linear relationship between ESG and financial performance

Several researchers argue that the relationship between ESG and financial performance is non-linear (Barnett and Salomon, 2012; Wagner and Schaltegger, 2004; Schaltegger and Synnestvedt, 2002; Steger, 2006; Wagner et al., 2001; Crifo, Forget, and Teyssier, 2015). This relationship could be an explanation to why empirical researchers previously have found mixed or inconclusive results (see Salzmann et al, 2005;Wagner et al., 2001; Margolis and Walsh, 2003; Hillman and Keim, 2001; Jayachandran et al., 2013; McWilliams and Siegel, 2000) ESG initiatives can have positive as well as negative effects on a firm's financial performance depending on the individual position of a firm on the curve. However, the characteristics of the proposed non-linear relationship differ between studies. For example, Barnett and Salomon (2012) suggest that the true relationship is u-shaped while Wagner and Schaltegger (2004) argue that it has an inverse u-shape.

The study conducted by Barnett and Salomon (2012) is investigating the relationship between ESG efforts and financial performance and shows that it is u-shaped. They state that firms benefit from either having none (or a very low amount of) ESG activities or having a lot of them. The breaking point, where the negative relationship turns to positive, depends on the firm's capacity to create better relationships with their stakeholders through the ESG activities. Furthermore, they argue that the key to improve stakeholder relationships lies in the

credibility of the ESG efforts. To be perceived as credible by stakeholders, ESG initiatives have to be made continuously and be in consonance with the firm's character. However, if these criteria are not fulfilled, the ESG activities can be perceived as self-serving or "greenwashing" and thus lose credibility among stakeholders (Barnett and Salomon, 2012).

Wagner and Schaltegger (2004) state that an inverse u-shaped relationship between environmental performance and financial performance demonstrates a win-win relationship, where improved environmental performance also leads to an improved financial performance. To create this inverse u-shape, a firm should use a profit maximizing strategy when choosing which environmental activities to undertake. However, the possibility of achieving the win-win relationship depends on the minimum level of environmental performance as required by regulation. If a firm faces stringent regulation, the optimal level of environmental performance may be the one that the regulation imposes. Going beyond this point may result in a trade-off between better environmental performance and worse economic performance, in line with the neoclassical view. The relationship is demonstrated in Figure 1 below.

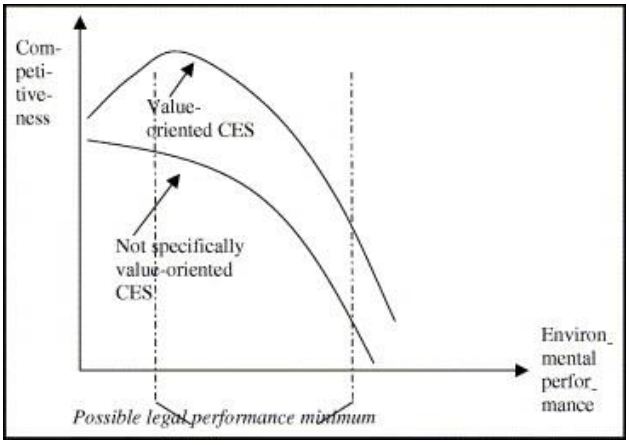

Figure 1.
Link between Environmental and Economic Performance and Regulatory Influences (CES = Corporate Environmental Strategy).
(Wagner and Schaltegger, 2004)

However, if the firm does not face stringent regulation, it can improve financial results by improving environmental performance. This is given that the environmental activities are value-oriented, meaning that they are in consonance with the firm's character (Wagner and Schaltegger, 2004).

2.5 Hypotheses

The objective of this study is to determine if there is a relationship between ESG- and financial performance for firms in the European basic materials industry. To test this empirically we set up two hypotheses.

The first hypothesis examines the relationship between ESG- and financial performance. As the environment and natural resources are the main production factors in the basic materials industry, imposing limitations on them increase costs and limits the firm's ability to grow (Palmer et al., 1995; Siebert et al., 1980). We hypothesize that this relationship is negative since firms within the basic materials industry may find it hard to reap the financial benefits of ESG but are forced to bear the costs due stringent regulation.

Hypothesis 1: *There is a negative relationship between ESG-performance and financial performance in the European basic materials industry.*

The second hypothesis examines if there is a non-linear relationship between ESG performance and financial performance. We hypothesize that the relationship is non-linear on the basis of several arguments. First, since there are not only financial disadvantages to ESG but also financial advantages a non-linear relationship is indicated. Also, many previous studies investigating on a linear framework have found mixed or inconclusive results, which also indicate that the relationship is more complex than a linear relationship.

Hypothesis 2: *There is a non-linear relationship between ESG-performance and financial performance in the European basic materials industry.*

3. Data and Methodology

First, we outline our models by discussing ESG performance and financial performance as variables, and the difficulties we encounter when we measure them. Second, we present relevant control variables. Third, we outline our dataset and the models we use to investigate the relationship between financial performance and ESG.

3.1 ESG performance

We use a recognized constructed index when we measure ESG performance, as opposed to the alternatives of constructing our own index, or performing interviews. We use Thomson Reuters' Asset4 ESG sustainability index, which uses a uniform measure for ESG performance, by rating companies against more than 250 key performance indicators (KPIs) and more than 750 individual data points. The index covers more than 4300 firms covering the following indices: MSCI World, MSCI Europe, STOXX 600, Nasdaq 100, Russell 2000, SandP500, FTSE 100, ASX 300 and MSCI Emerging Market (Thomson Reuters).

As mentioned before, ESG consists of three sub factors, the *Environmental* factor, the *Social* factor, and the *(corporate) Governance* factor. First, the *Environmental* factor examines the performance within: resource usage and reduction, emissions and emissions reductions, environmental activism, and initiative and product or process innovation. Second, the *Social* factor looks to performance within: employment quality, health and safety issues, training, diversity, human rights, community involvement, and product responsibility. Third, the *Governance* factor examines performance within: board structure, compensation policy, board functions, financial and operational transparency, shareholder rights, and vision and strategy. More details on what key performance indicators are appreciated under each pillar are presented in Appendix 4.

Sustainable performance is difficult to measure quantitatively since it consists of qualitative factors (Graves and Waddock, 1994), and due to different levels of transparency it is also difficult to understand and interpret ESG performance of a firm. One problem with ESG is that there is no common consensus on what social responsibility really means, and as of today, there are no fully accepted reporting standards when it comes to ESG performance (Thomson Reuters). ESG metrics, tools and rankings, even though they continue to evolve

and become more precise, should be viewed "with a heavy dose of skepticism" according to Maclean (2012). Further, the identification of key performance indicators varies across studies and is a crucial problem with a large impact on the research (Ullmann, 1985). Carroll (1979) argues that social responsibility should be divided into 4 different categories ranging over not only the environmental but also economic, legal, ethical and discretionary fields, and also identified two main problems: first, that sustainable issues differs depending on industry and, second, issues also differs across time. Time trends are apparent to change when it comes to product safety, occupational safety, business ethics, environment, discrimination and consumerism, as it has changed over time and most certainly will change in the times to come. Further, the time reference highlights that caution should be taken when looking over longer time periods. Thus, ESG is not only difficult to appreciate, but there is also a lack of agreement on what should and should not be viewed as a sustainable measure, which can cause a measurement error in the ESG variables.

According to Graves and Waddock (1994), the usage of a broad index can help overcome problems associated with measuring sustainable performance, since an index uniformly measures sustainable performance for a consistent range of important issues across a wide range of companies. This is our reason for choosing the index constructed by Thomson Reuters' Asset4, as a proxy for ESG performance. The data points that are collected stems from public available resources, such as company reports, company filings, company websites, NGO websites, CSR reports and media (Thomson Reuters, 2015). The database has a high credibility as it is used by recognized leading firms, such as BlackRock, KBC Asset Management, and Green Alpha.

3.2 Dependent variables

We measure financial performance with one accounting based, and one market based approach. The ratios are return on assets (ROA), and Tobin's q. The reader should note that our financial performance measures are merely summary measures of performance and limited to a brief time period. This should be considered as a limitation of our study, as it only appreciates a fragment of our firms' financial performance.

3.2.1 ROA

ROA is an accounting-based measure, and an indicator of the financial health of the firm. ROA captures the internal efficiency of the firm as it measures the firm's use of capital and attempts to answer the question of what the profitability of investments in real asset is (Bodie et al., 2014). Firms with higher ROA offer prospects of better returns on the firm's investments, and should have a heightened ability to raise capital in security markets than firms with lower ROA (ibid.).

ROA is defined as the ratio of earnings before interest to total assets:

$$\frac{Net\ income + ((Intrest\ Expense\ on\ Debt - Interest\ expense\ capitalized)\ \times\ (1 - Tax\ Rate))}{Average\ of\ Last\ Year'sand\ Current\ Year's\ Total\ Assets\ \times\ 100}$$

3.2.2 Tobin's q

Tobin's q is a market-based performance measure. The market-based measures give indications of the effectiveness of the firm from an investment perspective and represent the response of the market to internal organizational decisions (Orlitzky et al., 2003).

Tobin's q measures the financial performance by comparing the market value of the assets to the replacement cost, or the book value, of the same assets. Firms with values above 1.0 have been found to be better investment opportunities, have higher growth, and are an indication of firm success (Wolfe et al., 2005).

Tobin's q is defined as:

$$\frac{Market\ Capitalization + Market\ Value}{Total\ Liabilities + Common\ Stock}$$

3.3 Control variables

Many recognized and cited studies only include a few control variables. Such as Margolis et al. (2007) who's model only controls for size, risk, and industry. Including few variables often cause endogeneity to the variables included in the models. We approve upon previous research by adding more control variables to our model. We combine factors that are included

in different prior studies when examining the relationship between firm performance and sustainable performance, and include variables that have been found to have an impact on our dependent variables (ROA and Tobin's q) when estimating firm performance. The model includes ten to eleven independent variables; of which one to two are variables of interest (measuring ESG) and three are dummy variables.

We consider *firm size*, *risk*, *business sector*, *age*, *leverage*, *country*, and *year* as control variables in our study as they affect both financial performance and ESG performance according to previous studies (Margolis and Walsh, 2003; Galbreath and Shum, 2012; Wu, 2006; Margolis et al. 2007; Feldman et al.,1997; Rettab et al., 2009; Saeidia et al., 2015; Barron et al., 1994; Modigliani and Miller, 1958; Mendelson, 1970; McWilliams and Siegel, 2000; Gleason and Klock, 2006; Halme, M. and Huse, M. 1997). The arguments for what control variables are included, and the anticipated magnitude and signs are developed in Appendix 5.

3.4 Dataset

The ESG scores are our starting point when we collect firm information. The scores are obtained as 3 separate scores for each firm from Thomson Reuters' Asset4 database. The E, S, and G scores are distributed on a scale varying from 0 to a 100, 0 being the poorest performance on the scale, and 100 being the best performance on the scale.
First, we download scores on all European firms in the database, which are 1157 firms in total. Second, we download scores on all basic materials firms in the database (a global sample), which are 583 firms in total. By doing a cross-reference search in excel, we arrive at 94 European basic materials firms in total, which constitute our sample.

We collect panel data over 11 years, from 2003 to 2013. We consider this a sufficient time frame to get enough data points but narrow enough to be able to make generalizations over time, in line with the arguments of Carroll (1979).

Due to the fact that some firms are created within the time frame, the maximum amount of data points for a variable is 1016. For some variables there are no record for all years, which explains why there is a lower amount of data points for some variables than others.

Table 3.1 Descriptive statistics

Variable	N	Mean	Median	SD	Min	Max
Tobin's q	986	1.50	1.25	0.76	0.68	4.47
ROA	995	6.70	6.05	7.69	-15.36	37.37
Size	968	15.00	15.02	1.60	6.48	19.44
Age	1016	68.63	62	52.62	0	196
R&D	665	1.70	0.84	2.40	0	13.08
Leverage	1014	33.45	34.61	20.84	0	207.61
Risk	947	0.05	0.045	0.024	0.012	1.63
E	788	73.01	84.92	25.13	8.78	97.04
S	788	69.10	79.33	26.67	3.59	98.56
G	788	56.06	60.68	26.49	1.91	96.74

The data points of the financial performance of the firms are from Thomson Reuters' Worldscope Global Databases, a premier source of financial statement data on firms outside the USA,that in 2010 included approximately 37,000 active firms, representing 95% of global market capitalization (Worldscope Data Definition Guide, 2014).

Our investigated firms are distributed over the following business sectors: *Chemicals*, *Mineral Resources*, and *Applied Resources* as follows (see table 3.2).

Table 3.2 Business sectors	**N**
Mineral Resources	53
Chemicals	26
Applied Resources	15
Total	**94**

The sample consists of firms from 18 European countries. A large proportion (more than 30%) of our investigated firms originates from the United Kingdom. Hence, the reader should note that our sample may not perfectly represent the basic materials industry in Europe.

Table 3.2

Country	N	Country	N
UK	29	Norway	3
Germany	10	Poland	3
Switzerland	8	Turkey	3
Finland	7	Ireland	2
France	6	Italy	2
Sweden	5	Portugal	2
Austria	4	Spain	2
Belgium	3	Denmark	1
Netherlands	3	Greece	1
Total			**94**

3.5 Quantitative Model

When dealing with panel data the simplest and most straight forward way is to estimate a pooled regression, where all the data is estimated in a single equation using an ordinary least squares (OLS) estimator (Brooks, 2014). OLS assumes that the average values of the variables and the relationships between them are constant over time and across all cross-sectional units in the sample (Brooks, 2014). Overall, the variables show little variation within each object, and especially for the firms that only have recorded ESG scores over a few years. Therefore, the starting point for our model is an OLS estimator, see model (1).

$$(1)\ \varphi_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

$\varphi = Financial\ performance\ (Tobin's\ q, ROA)$

$ESG = ESG\ Score, lagged\ 1\ year$

$Size = Logarithm\ of\ Market\ Capitalization$

$Age = Logarithm\ of\ Years\ Since\ Incorporation$

$RandD = RandD\ intensity$

$Risk = Standard\ Deviation\ of\ Weakly\ Price\ Returns$

$Leverage = Debt\ to\ Total\ Assets$

$Country = Country\ Dummy\ Variable$

$Sector = Business\ Sector\ Dummy\ Variable$

$Year = Year\ Dummy\ Variable$

$i = unique\ firm$

$t = time\ in\ years$

Hart and Ahuja (1996) use a time lag on ESG in their study, to allow for the ESG scores to materialize on the financial performance ratios, why we also choose to lag ESG scores by one year in all our models. In Appendix 2 model (8) is tested without the lag on ESG, and the coefficient of ESG is *insignificant*. This supports our use of a 1-year lag of ESG in our models. We deal with outliers by winsorizing our data in Stata. We address potential heteroscedasticity by using the *cluster id* command in Stata, and by using robust standard errors.

In model (1) ESG is measured as an equally weighted proxy of the individual scores. Since some prior research suggests that ESG should be measured as a disaggregated score we also use the scores separately in models (2), (3) and (4). In our sample, the correlation between the E and the S scores is more than 0.8 (see appendix 3). Hence, to mitigate the effect of multicollinearity in our model, we put together the E and S scores as an equally weighted aggregated score, naming it the E/S score. Since the correlation between the E/S score and the G score still is 0.4, we drop one of them in the disaggregated models (2) and (3). First we drop the G score, see model (2), and then drop the E/S score in the following estimation, see model (3). In model (4) we include both the E/S score and the G score.

$$(2)\ \varphi_{it} = \beta_0 + \beta_1 ES_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

$$(3)\ \varphi_{it} = \beta_0 + \beta_1 G_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

$$(4)\ \varphi_{it} = \beta_0 + \beta_1 ES_{it-1} + \beta_2 G_{it-1} + \beta_3 logSize_{it} + \beta_4 logAge_{it} + \beta_5 RandD_{it} + \beta_6 Risk_{it} + \beta_7 Leverage_{it} + \beta_8 Country_{it} + \beta_9 Sector_{it} + \beta_{10} Year_{it} + \varepsilon_{it}$$

As there is some variation of ESG scores within each firm over the years, we want to investigate what occurs when removing the effects of variables that don't change over time. Therefore, we use a fixed effects (FE) model, see model (5).

$$(5)\ \varphi_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \mu_i + v_{it}$$

We test for a (inverse) u-shaped relationship between ESG and financial performance by adding squared ESG performance to model (1), see model (6)

$$(6)\ \varphi_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 ESG_{it-1}{}^2 + \beta_3 logSize_{it} + \beta_4 logAge_{it} + \beta_5 RandD_{it} + \beta_6 Risk_{it} + \beta_7 Leverage_{it} + \beta_8 Country_{it} + \beta_9 Sector_{it} + \beta_{10} Year_{it} + \varepsilon_{it}$$

We also test for nonlinearity in the relationship between ESG and financial performance by transforming ESG performance into log, implying that a 1 % increase in ESG causes a $0.01 \times \beta_1$increase in φ_{it}, see model (7)

$$(7)\ \varphi_{it} = \beta_0 + \beta_1 logESG_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

We deal with outliers by winsorizing our data in Stata. We address potential heteroscedasticity by using the *cluster id* command in Stata, and by using robust standard errors.

4. Results and Analysis

In the following section we present our results and analyze them accordingly. We finish this section with a summary and evaluation of our hypotheses

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4.1 The negative relationship between ESG and financial performance

Tables 4.1, 4.2, and 4.3 show that when controlling for size, age, R&D, risk, leverage, country, subsector, and year, an improved ESG score has a negative effect on financial performance when measured as both Tobin's Q and ROA.

4.1.1 Aggregated ESG performance

In table 4.1 we present the results we obtain when we run model (1):

$$(1)\ \varphi_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

Table 4.1 Impact of ESG (OLS)

Independent Variables	**(1) Tobin's Q**	**(2) ROA**
ESG _t-1	-.0067**	-.0598***
	(.0028)	(.0224)
Size	.1251**	1.403***
	(.0492)	(.4185)
Age	-.0120	.0497
	(.0432)	(.4427)
R&D	.0523**	.0727
	(.0233)	(.2225)
Risk	.0005	.0526
	(.0067)	(.0663)
Leverage	-.0064*	-.1183***
	(.0038)	(.0229)
Constant	-.5673	-9.7161
	(1.0250)	(9.0210)
Country fixed effects	Yes	Yes
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	457	452
R-squared	0.6361	0.5064

Legend: *p<.1; **p<.05; ***p<.01

When we test model (1), we find that aggregated ESG score has a statistically *significant negative* effect on both Tobin's Q and ROA (see table 4.1). The results indicate that an increase in ESG score by one unit results in a 0.007 decrease in Tobin's q and a 0.06 decrease in ROA. Our results are in line with several studies investigating the relationship between ESG and financial performance, such as Hart and Ahuja (1996), Worrell et. al. (1995), Cordeiro and Sarkis, (1997), and Sarkis and Cordeiro (2001), who all find evidence of a negative relationship between ESG performance and firm performance. The found negative effect is relatively small in magnitude compared to the effect of the control variables, meaning that ESG affects financial performance less than firm size, R&D expenditure and leverage. This is in line with previous studies that also confirm the effect of ESG to be relatively small.

The relationship between our control variables and financial performance are in general as expected and in line with previous research. Size has a positive impact on both financial performance measurements in all regressions as anticipated. R&D has a significant positive impact on Tobin's Q but not a significant impact on ROA. This is in line with previous studies, indicating a stronger relationship between R&D intensity and market based financial measurements than accounting based. We keep R&D as a control variable when regressing on return on assets although it is insignificant, since the theoretical framework supports it (see appendix 5). Further, leverage has a statistically significant negative effect on return on assets but not on Tobin's q, which is in line with previous research (Hart and Ahuja, 1996). Unexpectedly, the effect of risk and age are not statistically significant for either Tobin's Q or ROA. This may imply that the models still suffer from omitted variable bias and endogeneity, which should be taken into consideration as a limitation of the model.

4.1.2 Disaggregated ESG performance

In table 4.2 we present the results we obtain when we run model (2):

$$(2)\ \varphi_{it} = \beta_0 + \beta_1 ES_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

Table 4.2 Impact of E/S (OLS)		
Independent Variables	**(1) Tobin's Q**	**(2) ROA**
E/S_t-1	-.0056**	-.0482**
	(.0275)	(.0202)
Size	.1205**	1.3517***
	(.0473)	(.4146)
Age	-.0083	.0782
	(.0425)	(.4434)
R&D	.0499**	.0450
	(.0231)	(.2171)
Risk	.0009	.0559
	(.0067)	(.0656)
Leverage	-.0068*	-.1221
	(.0037)	(.0224)
Constant	-.4865	-9.1642
	(.1.0156)	(9.0597)
Country fixed effects	Yes	Yes
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	457	452
R-squared	0.6343	0.5037
Legend: *p<.1; **p<.05; ***p<.01		

When we test model (2), the stand-alone effect of the E/S score, we find a *significant negative* effect on both Tobin's q and on ROA (see table 4.2). Hence, firms that improve their joint E and S scores by one unit would expect a decrease in Tobin's q by 0.006, and a decrease in ROA by 0.05. Here the effect is larger on ROA than on Tobin's q, in line with the results from prior studies.

In table 4.3 we present the results we obtain when we run model (3):

$$(3)\ \varphi_{it} = \beta_0 + \beta_1 G_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

When we test model (3), the stand-alone effect of the G score, we find a *significant negative* effect on both Tobin's q and on ROA (see table 4.3). A decrease by one unit in G score

implies a decrease by 0.004 in Tobin's q, and a decrease in 0.04 in ROA. Again the negative effect is larger for ROA than for Tobin's q.

Table 4.3 Impact of G (OLS)		
Independent Variables	**(1) Tobin's Q**	**(2) ROA**
G _t-1	-.0039*	-.0385**
	(.0021)	(.0191)
Size	.1112**	1.2947***
	(.0551)	(.4314)
Age	-.0222	-.0439
	(.0447)	(.4449)
R&D	.0466*	.0302
	(.0251)	(.2347)
Risk	.0007	.0531
	(.0070)	(.0695)
Leverage	-.0071	-.1230***
	(.0043)	(.0251)
Constant	-.5396	-9.5457
	(1.1187)	(9.2980)
Country fixed effects	Yes	Yes
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	457	452
R-squared	0.6289	0.5013
Legend: *p<.1; **p<.05; ***p<.01		

When we test model (3), the stand-alone effect of the G score, we find a *significant negative* effect on both Tobin's q and on ROA (see table 4.3). A decrease by one unit in G score implies a decrease by 0.004 in Tobin's q, and a decrease in 0.04 in ROA. Again the negative effect is larger for ROA than for Tobin's q. Moreover, the effect is significant on a 5% significance level on ROA, compared to 10% significance level on Tobin's q.

In table 4.4 we present the results we obtain when we run model (4):

$$(4)\ \varphi_{it} = \beta_0 + \beta_1 ES_{it-1} + \beta_2 G_{it-1} + \beta_3 logSize_{it} + \beta_4 logAge_{it} + \beta_5 RandD_{it} + \beta_6 Risk_{it} + \beta_7 Leverage_{it} + \beta_8 Country_{it} + \beta_9 Sector_{it} + \beta_{10} Year_{it} + \varepsilon_{it}$$

Table 4.4 Impact of E/S and G (OLS)		
Independent Variables	**(1) Tobin's Q**	**(2) ROA**
E/S_t-1	-.0046	-.0363
	(.0032)	(.0230)
G_t-1	-.0021	-.0239
	(.0023)	(.0212)
Size	.1251**	1.4040***
	(.0495)	(.4194)
Age	.0116	.0400
	(.0422)	(.4442)
R&D	.0522**	.0742
	(.0233)	(.2251)
Risk	.0006	.0522
	(.0067)	(.0664)
Leverage	-.0065*	-.1181***
	(.0039)	(.0232)
Constant	-.5631	-9.7857
	(1.0591)	(9.1064)
Country fixed effects	Yes	Yes
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	457	452
R-squared	0.6361	0.5065
Legend: *p<.1; **p<.05; ***p<.01		

When we test model (4), i.e. having the disaggregated E/S and G scores in one model, we get an *insignificant negative* relationship (see table 4.4). Both the E/S coefficient and the G coefficient on both Tobin's q and ROA have negative signs, as predicted. Multicollinearity is indicated in model (4) as the regression of this model, including both of the disaggregated variables, finds an insignificant coefficient of the independent variables E/S and G, and models (2) and (3), measuring the stand-alone effects of the E/S- and G scores in two separate models show significant results. Hence, more reliability should be put to models (1), (2), and (3), who all indicate significant negative results.

In line with previous research, the results indicate that the E/S score has a more substantial negative effect on financial performance than the corporate governance score. Since the magnitude of the negative effect of the E/S score is similar to the one of the aggregated ESG score, we can conclude that most of the negative effect from ESG on financial results derives from the E/S parameters. Also, in contrast to some previous studies that state that corporate

governance has a positive effect on financial results, this study shows that in the European basic materials industry, also corporate governance has a negative effect. As previously mentioned, the magnitude of this negative effect is smaller than for the E/S score in line with prior studies (Deutsche bank, 2012)

4.1.3 Aggregated ESG performance (Fixed Effects)

In table 4.5 we present the results we obtain when we run model (5):

$$(5)\ \varphi_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \mu_i + v_{it}$$

Table 4.5 Impact of ESG (FE)

Independent Variables	**(1) Tobin's Q**	**(2) ROA**
ESG_t-1	-.0003	-.0320
	(.0031)	(.0254)
Size	.4729***	3.7381***
	(.1019)	(.7745)
Age	.4369***	2.3891
	(.1606)	(1.9448)
R&D	-.0504	-.5951
	(.0502)	(.5008)
Risk	.0287**	.1991*
	(.0135)	(.1038)
Leverage	-.0048	-.1272***
	(.0036)	(.0305)
Constant	-8.2509***	-59.4134***
	(2.0658)	(17.2492)
Year fixed effects	Yes	Yes
N	**457**	**452**
R-squared (within)	0.4247	0.3922

Legend: *p<.1; **p<.05; ***p<.01

When we use fixed effects, see model (5), we find an *insignificant negative* effect of ESG on ROA and on Tobin's q. When removing the time constant effects, our results are not robust as they are no longer significant. Other studies also face the same robustness problem when measuring the relationship between ESG and firm performance. For example, Barnett and Salomon (2012) who estimates ESG performance in relation to ROA, also finds significant results when using an OLS model, but insignificant results when using a Fixed Effects model.

The results are further in line with arguments put forward by McKinnish (2000) who states that insignificant results from a Fixed Effects model, should not be interpreted as finding no effect, since these models tends to cause the coefficient estimates to become "considerably smaller, and often insignificant" (ibid.). Similar results is also presented by Freeman (1984), and by Baker, Benjamin, and Stanger (1999), who show that models such as Fixed Effects tend to estimate smaller effects than models such as OLS. We argue that our result from our Fixed Effects model is caused by measurement errors in the ESG variables, in combination with temporal persistence in our independent variables. The measurement errors are likely to stem from problems such as the subjective quantitative appreciation of qualitative factors, lack of consensus, and lack of fully accepted reporting standards of ESG performance (Graves and Waddock, 1994; MacLean, 2012; Ullmann, 1985; Carroll, 1979). Thus, some caution should be taken into consideration when making inferences from our results, but as our overall results strongly suggests a negative relationship between ESG performance and financial performance, and are in line with prior studies, we choose to put emphasis on the results from our OLS models showing a *significant negative effect* of ESG on financial performance.

4.1.4 Discussion on the negative relationship

Our results indicate that the effect of ESG performance on financial performance is negative in the European basic materials industry. The sign of the ESG coefficient is negative in all OLS estimations that are statistically significant. The sign is negative independent on if the financial performance is Tobin's q, or ROA, and in all forms of ESG; as aggregated score, see table 4.1, as disaggregated score, see table 4.2 and 4.3. Thus, our results are at first glance discouraging to firms in the European basic materials industry that are aiming to develop their ESG strategies. However, our results should not be interpreted as ESG activities having no positive impact on firm financial performance. On the contrary, we do believe that the positive impacts presented in our theory do hold and does contribute to a better financial output, but that the benefits do not outweigh the costs that are imposed on the firm from engaging in such activities, at least not in this industry and in the short run.

We believe that environmental strategies aiming to improve effectiveness and productivity leads to lower costs for raw material and waste disposal which has a positive effect on financial firm performance at some point in time, but not in the short run as demonstrated by

our results. This is in line with Sarkis and Cordeiro (2001), who achieve similar results as us, and discuss a comparison of ESG costs to R&D- or TQM (total quality management) costs. Such costs have short-term financial penalties, but may reap financial benefits for the firm in the long run (ibid.). Hart and Ahuja (1996) also find support for long-run financial benefits possibly stemming from ESG activities. Moreover, majority of studies that have proved a positive relationship between ESG- and financial performance, have investigated sustainability as a factor of long-term value creation (Orlitzky et al., 2003). However, it is beyond the scope of investigation of this thesis to make inferences about the long-term relationship between ESG- and financial performance, why we suggest further studies evaluating the ESG- and financial performance relationship in the long run.

As mentioned, revisionist economic theory states that improved ESG performance leads to improved stakeholder relations on various markets. Improved stakeholder relationships on the consumers market means that a firm can add price premiums to their products or gain increases in market share, which in turn increases revenue (Porter and Kramer, 2011). Moreover, improved stakeholder relationships on the employers market attracts the best employees and retains them for a longer period of time, which increases effectiveness and revenue (Sprinkle and Maines, 2010). Furthermore, improved stakeholder relationships on the financial market lead to a reduced cost of capital due to lowered risk premiums (Deutsche Bank, 2012). However, the underlying assumption is that stakeholder relationships are in fact improved. Thus our results indicate that firms within the European basic materials industry fail to do this. The improved stakeholder relationships derive from improved reputation and firm image. However, firms in the basic materials industry are often considered to be "dirty" firms, meaning they are associated with products and activities that are considered as non-sustainable or labeled as unethical or environmentally unfriendly. Therefore, they are also considered to have questionable practices by nature, which makes it harder for them to create an ESG oriented profile and improve stakeholder relationships. Moreover, firms within the basic materials industry often offer their products business to business and not to the end-consumer directly. The business to business-market has been shown to be less sensitive to ESG related issues (Sahut and Pasquini-Descomps, 2015), which adds on to the difficulties for these firms to gain competitive advantages due to engagement in ESG.

The majority of prior studies that succeeds in proving a significant positive relationship between ESG performance and financial performance demonstrate this from using cost of

capital as a financial performance measure (see Lee et al., 2009; Goss, 2009; Goss and Roberts, 2011; El Ghoul et. al, 2011; Peylo, 2012). For example Peylo proved in his study that sustainable firms enjoy a lower cost of capital than their peers both regarding cost of debt and cost of equity as financiers puts a lower risk premium on these firms (Peylo, 2012). However, a substantial difference between Peylo's study and our study is that Peylo investigated 30 German firms that were not limited to one industry. Thus, the study of Peylo is not limited to firms with the 'questionable' characteristics such as the basic materials firms, which could explain why his inferences on the relationship between financial- and ESG performance differs from ours. The same explanation could be imposed on the other studies proving a positive relationship, as they also have other industries as a scope of investigation, either US samples ranging over all industries (see Goss, 2009; Goss and Roberts 2011; El Ghoul et al. 2011) or using global samples, also ranging over all industries (see Lee et al., 2009). Furthermore, El. Ghoul et al. (2011) finds that firms that participate in "dirty" industries has a higher cost of equity, while ESG oriented firms can enjoy a lower cost of equity. Hence, that we find a negative relationship between ESG and financial performance in the European basic materials industry indicates that shareholders puts higher emphasis on the "dirty"-factor than on good ESG performance within this industry. However, it is important to note that we do not prove that there are no financial benefits arising from a potential lower cost of capital in this industry. Nonetheless, from our results we can conclude that if such benefits would exist, they do not outweigh the costs related to ESG initiatives, at least not in the short run.

Thornton, Kagan and Gunningham (2003) on the other hand, find a negative relationship between ESG and financial performance. They also investigated firms included in the basic materials industry. This strengthens our argument that our found negative impact of ESG on financial performance is highly related to our choice of industry. Firms within particularly harmful industries do not gain enough financial benefits to compensate for the costs, due to their difficulties to improve their image and thus stakeholder relations. Furthermore, Hart and Ahuja (1996) conduct a study with a similar methodology as ours and find the relationship between ESG- and financial performance to be negative. They also evaluate financial performance as ratios, more precisely return on equity (ROE), return on assets (ROA) and, return on sales (ROS), and measure ESG performance with time lags. Thus, as our results are in line with prior studies we argue that they are credible.

4.2 The non-linear relationship between ESG and financial performance

Several researchers argue that the true relationship between ESG and financial performance is non-linear (Barnett and Salomon, 2012; Wagner and Schaltegger, 2004), but the characteristics of the proposed non-linear relationship differ between studies. Our results presented in tables 4.6 and 4.7 indicate that the true relationship between ESG and financial performance in the European basic materials industry is not u-shaped or inverse u-shaped. Instead it is over all negative.

4.2.1 The u-shaped or inverse u-shaped relationship between ESG and financial performance

In table 4.6 we present the results we obtain when we run model (6):

$$(6)\ \varphi_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 {ESG_{it-1}}^2 + \beta_3 logSize_{it} + \beta_4 logAge_{it} + \beta_5 RandD_{it} + \beta_6 Risk_{it} + \beta_7 Leverage_{it} + \beta_8 Country_{it} + \beta_9 Sector_{it} + \beta_{10} Year_{it} + \varepsilon_{it}$$

Table 4.6 Impact of squared ESG (OLS)		
Independent Variables	**(1) Tobin's Q**	**(2) ROA**
ESG Score (one year lag)	.0001	-.0369
	(.0091)	(.0919)
ESG^2 Score (one year lag)	-.0001	-.0002
	(.0001)	(.0008)
Size	.1283***	1.4140***
	(.0484)	(.4137)
Age	-.0126	.0475
	(.0433)	(.4458)
R&D	.0514**	.0704
	(.0235)	(.2220)
Risk	-.0003	.0497
	(.0065)	(.0648)
Leverage	-.0064	-.1183***
	(.0038)*	(.0228)
Constant	-.7740	-10.3826
	(1.0231)	(9.1840)
Country fixed effects	Yes	Yes
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	457	452
R-squared	0.6370	0.5065

Legend: *p<.1; **p<.05; ***p<.01

To test whether a u-shaped or inverse u-shaped relationship exists in the European basic materials industry, we regress the squared ESG score on financial results, see model (6). Our results show that the relationship between ESG and financial performance is neither u-shaped nor inverse u-shaped as model (6) shows insignificant results for the squared ESG coefficient. This means that conclusions presented by previous research, such as Barnett and Salomon (2012) and Wagner and Schaltegger (2004) do not apply in the European basic materials industry. Instead, based on results from our previous regressions, we argue that the relationship is all over negative.

As mentioned, our results contradict the findings of Barnett and Salomon (2012) that demonstrate that the relationship between ESG and financial performance is u-shaped. There are some possible explanations for this that are based on the theory behind the u-shaped relationship presented by Barnett and Salomon (2012). Fist, a possible explanation is that the firms included in our study all perform poorly on ESG parameters, and will therefore not be found on the right side of the u-shape where ESG activities are translated into improved financial results (Barnett and Salomon, 2012). However, there are not only unethical/environmentally unfriendly companies included in our study. The mean for the aggregated ESG score, on a scale between 0 and 100, is approximately 60, and the dispersion between the worst in class and best in class is substantial. The maximum ESG performance is approximately 96, whereas the minimum ESG performance is approximately 6. This means that under other circumstances the best performing firms would be found on the right side of the u-shape. But apparently the relationship between ESG and financial performance is over all negative. Hence, we can reject this explanation. A second possible explanation is that since the basic materials industry is labelled as a typically ”dirty” industry, ESG activities performed within this industry does not seem credible to stakeholders and may instead be perceived as “greenwashing”. Thus, these activities are unable to contribute to improved relationships with stakeholders and therefore the breaking point where negative financial results turn positive does not exist. Therefore, firms within this industry cannot reap the financial benefits of ESG but are still left with the costs. This explanation is also in line with the reasoning of Barnett and Salomon (2012), and therefore we argue that this is the most credible explanation.

Since the squared ESG score is not statistically significant, our results shows that in the European basic materials industry there is neither an inverse u-shaped relationship between financial performance and ESG performance. Based on theory put forward by researchers such as Wagner and Schaltegger (2004), this indicates that the firms within this industry do not have a profit maximizing aim or strategy for their ESG activities. Furthermore, this conclusion is supported by the fact that firms within this industry faces stringent regulations regarding sustainability due to the nature of their business (Halme, M & Huse, M., 1997). Therefore, investing more in ESG activities than are required by regulations, would have a negative impact on financial results (Wagner and Schaltegger, 2004), which supports our results.

4.2.2 The logged relationship between ESG and financial performance

In table 4.7 we present the results we obtain when we run model (7):

$$(7)\ \varphi_{it} = \beta_0 + \beta_1 logESG_{it-1} + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

Table 4.7 Impact of Log (ESG) (OLS)		
Independent Variables	**(1) Tobin's Q**	**(2) ROA**
Log ESG_t-1	-.2332*	-2.136*
	(.1280)	(1.1722)
Size	.1134**	1.3034***
	(.0510)	(.4272)
Age	-.0133	.0392
	(.0438)	(.4408)
R&D	.0495**	.0476
	(.0240)	(.2236)
Risk	.0018	.0640
	(.0068)	(.0669)
Leverage	-.0070*	-.1233***
	(.0040)	(.0237)
Constant	.1636	-3.2832
	(1.1398)	(9.6871)
Country fixed effects	Yes	Yes
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	457	452
R-squared	0.6298	0.5010
Legend: *p<.1; **p<.05; ***p<.01		

The non-existing (inverse) u-shaped relationship is further supported through the significant negative results we obtain when we test model (7), regressing logged ESG on financial results, as presented in table 4.7. This indicates that the true relationship has more similarities to a logged relationship than a u-shaped or inverse u-shaped relationship. The coefficient of ESG performance in log form on financial performance is approximately -2.14 when estimating ROA, meaning an increase in ESG score by one unit results in a 0.0214% decrease in ROA. When estimating Tobin's q it is -0.23, meaning an increase in ESG score by one unit results in a 0.0023% decrease in Tobin's q. This indicates a negative and non-linear relationship between ESG performance and financial performance, meaning it is downward sloping but levels out as the ESG score increases. However, the R-squared is lower when regressing logged ESG score on financial performance than when regressing the untransformed aggregated ESG score, meaning the non-linear model (7) has less explanatory power than the linear model (1). Moreover, the logged ESG score is significant on a 10% significance level, compared to a 5% significance level for the untransformed ESG score. Hence, we cannot conclude from these results whether the real relationship is linear or non-linear. Thus, the true relationship may be more complex than anticipated and further research is needed to identify it. According to theory presented by Wagner and Schaltegger (2004), the true relationship between ESG and financial performance in the European basic materials industry may be downward sloping at an increasing rate, due to the stringent regulations. However, to investigate this relationship is beyond the scope of this thesis. Yet, since this proposed relationship has more similarities to the relationship between the logged form of ESG and financial performance than squared ESG and financial performance, this could explain why we get significant results when testing model (7) but not when testing model (6).

Ullman (1985) argues that there should be a nonlinear relationship between financial performance and ESG performance, and that it could be explained by the ambivalent nature of ESG. On the one hand, firms are sometimes forced to practice ESG and it is generally accepted as beneficial for the sake of employees, external stakeholders and surroundings, and might also mitigate risk and affect the future license to operate (Porter, 1991, Deutsche Bank Group, 2012, Sharfman and Fernando, 2008, Sprinkle and Maines, 2010). On the other hand it is costly, and managers that spend too much on sustainable investments might be faced with the neo-classical arguments that one is practicing a lavish type of spending and wasting resources, which necessarily will decrease shareholder value (Palmer et al., 1995; Siebert et al., 1980, Friedman, 1962). Since both financial advantages and disadvantages of ESG exist,

we argue that the relationship between ESG and financial performance should be more complex than a linear relationship, and should therefore be non-linear.

4.3 Summary and evaluation of hypotheses

Based on the results presented in tables 4.1, 4.2, 4.3 and 4.7 we conclude that the effect of ESG on financial performance in the European basic materials industry is negative. Therefore, *we do not reject hypothesis (1)*. However, we cannot conclude whether the true relationship between ESG and financial performance is linear or non-linear, meaning if financial results decrease with the same rate for every additional unit of ESG score or if it decreases at an increasing or decreasing rate. Hence, *we do not reject hypothesis (2).*

Hypotheses	
1. *There is a negative relationship between ESG-performance and financial performance in the European basic materials industry.*	Not Rejected
2. *There is a non-linear relationship between ESG-performance and financial performance in the European basic materials industry.*	Not Rejected

6. Conclusion

In the following section we provide our conclusion based on our results and analysis. Furthermore, we present a suggestion for future research and possible solutions to the problems we have found.

In this thesis, we investigate the relationship between ESG performance and financial performance for firms in the European basic materials industry through a series of multiple regressions. Consistent with previous empirical studies, we find that the relationship is negative. However, like many previous researchers, we cannot conclude whether the true relationship between ESG- and financial performance is linear or non-linear. This indicates that the relationship is more complex than we first anticipated, and further research is needed to identify it.

Since the relationship is negative, we can conclude that the financial benefits of ESG activities do not outweigh the costs in the European basic materials industry. This indicates that firms within this particular industry do not have the right conditions to reap the financial benefits of ESG to a sufficient extent. A crucial element for the business case of ESG is improved stakeholder relations which create competitive advantages in markets such as the consumer market, employers market, and financial market. However, in the European basic materials industry ESG activities do not imply improved stakeholders relationships. Since the ESG activities are not in consonance with the firms' character due to the unsustainable nature of their business, the ESG activities are not perceived as credible by stakeholders. Thus, stakeholder relationships remain unaffected and the positive impact on financial performance fails to materialize. At the same time, the firms are forced to bear the costs of ESG due to stringent regulation, which results in an overall negative impact.

Presumably, the ESG activities lead to direct cost reductions in form of e.g. energy efficiency, waste reduction and reduced agency costs. However, these cost reductions are not enough to compensate for the initial cost of investment in the ESG activities in the short run. Nonetheless, it is possible that ESG can have a positive impact on financial performance in the long run, as previous literature argues that it takes several years for ESG to materialize into financial results (Hart and Ahuja, 1996). Thus, we recommend future studies to investigate this relationship over a longer period of time.

In order to reverse global degradation it is important to create financial incentives to engage in ESG for firms in particularly harmful industries, such as the basic materials industry. Shifting the focus from short-term to long-term financial goals could be one of several actions to help firms find financial meaning to engage in ESG (UN PRI, 2012). Furthermore, tougher penalties, in form of for example higher fines when performing poorly on ESG parameters, would create a financial incentive to improve ESG performance. Moreover, increased reporting on ESG activities, so called Integrated Reporting, will make basic materials firms' ESG status more accessible and transparent to various stakeholders. This would mitigate the credibility problem and improve the vital stakeholder relationships that create competitive advantages in various markets. In turn, ESG activities performed within the European basic materials industry would be given the opportunity to positively impact financial results.

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Appendix 1 Variables, definitions and sources of data

Table A.1 – Variables, definitions and sources of data

Variables	Description	Datastream code
Environmental (E)	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.	ENVSCORE
Social (S)	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.	SOCSCORE
Corporate Governance (G)	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.	CGVSCORE
ROA	(Net income + ((Interest Expense on Debt – Interest expense capitalized) * (1-Tax Rate))) / (Average of Last Year's and current year's Total Assets *100)	WC08326
Tobin's q	(Market Capitalization + Market Value) / (Total liabilities + Common stock)	
Size	Market capitalization	MV
Age	t* - Company Founded Date (WC18272)	
R&D		
Leverage	Total Debt % Common Equity	WC08231
Risk	Standard deviation calculated on weekly returns	
Country		GEOC
Business Sector		

*Year between 2003 and 2013

Appendix 2 – ESG without time lag

$$(8)\ \varphi_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 ESG_{it} + + \beta_2 logSize_{it} + \beta_3 logAge_{it} + \beta_4 RandD_{it} + \beta_5 Risk_{it} + \beta_6 Leverage_{it} + \beta_7 Country_{it} + \beta_8 Sector_{it} + \beta_9 Year_{it} + \varepsilon_{it}$$

Table A.3 Impact of ESG (OLS)		
Independent Variables	**(1) Tobin's Q**	**(2) ROA**
ESG _t-1	-.00385**	-.0671*
	(.00189)	(.0253)
ESG	.000177	.028
	(.00146)	(.026)
Size	.0491***	.824***
	(.0176)	(.319)
Age	.0165	.0178
	(.0159)	(.249)
R&D	.0273**	.0169
	(.0110)	(.143)
Risk	.0779	1.162
	(.188)	(2.659)
Leverage	-.00174	-.0818***
	(.00169)	(.0209)
Constant	-.360	-3.834
	(.307)	(5.471)
Country fixed effects	Yes	Yes
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	457	452
R-squared	0.816	0.587
Legend: *p<.1; **p<.05; ***p<.01		

Appendix 3 – Correlation between variables

Table A.2. Correlation between E, S and G			
	E	S	G
E	1.00		
S	0.80	1.00	
G	0.32	0.46	1.00

Table A.3. Correlation between E/S and G		
	E/S	G
E/S	1.00	
G	0.41	1.00

Appendix 4 - Key performance indicators for ESG parameters

Environmental parameter (E)

Examples of *Environmental* data points and KPIs are: the percentage of company sites or subsidiaries that are certified with any environmental management system; total CO2 and CO2 equivalents emission in tonnes; total amount of waste produced in tonnes; whether the company claim to have an ISO 14000 certification; total direct and indirect energy consumption in gigajoules; whether the company describe initiatives to reduce the energy footprint of its products during their use; total recycled and reused waste produced in tonnes; total amount of environmental expenditures.

Social parameter (S)

Examples of *Social* data points and KPIs are: percentage of employee turnover; number of injuries and fatalities reported by employees and contractors while working for the company; number of controversies linked to business ethics in general, political contributions or bribery and corruption; average hours of training per year per employee; percentage of women managers; average age of employees; total amount of all donations by the company; number of controversies linked to human rights issues; number of controversies published in the media linked to customer health and safety.

Corporate Governance parameter (G)

Examples of corporate *Governance* data points and KPIs are: whether the company comply with regulations regarding the general effectiveness and independence of its board committees; whether the company comply with regulations regarding board independence; whether the company comply with regulations on performance oriented compensation; whether the company have a policy regarding shareholder rights; number of controversies published in the media linked to shareholder engagement infringements; the percentage ownership by voting power of the single biggest owner.

Appendix 5 – Comments on the control variables

Firm Size

Firm size can affect the ability to practice sustainable investments, where larger firms might have greater resources to invest in sustainable actions (Margolis and Walsh, 2003). Further, large firms might be more pressured by stakeholders to take sustainable actions (Rettab et. al, 2009). Further, too small firms might not have enough resources to address social responsibilities properly nor report on sustainable initiatives (Galbreath and Shum, 2012; Gallo and Christensen, 2011). The opposite could also prove true as larger firms have higher responsibilities and are more pressured towards financial goals at the expense of sustainable goals, thus affecting sustainable performance negatively (Wu, 2006).

Prior studies suggest a positive impact of size on financial performance, arguing that large firms generate stronger competition (Baum, 1996). Orlitzky (2001) argues that there is a positive correlation between firm size and financial performance due to greater control over resources and external stakeholders, and greater attraction and retention of better employees. Size could also have a negative impact on financial performance, as larger firms might be more bureaucratic and inert than smaller more flexible firms (Wu, 2006).

Since size is argued to affect both sustainable and financial performance, we choose to include size as a control variable in our model.

Risk

When one investigates the relationship between firm performance and sustainable performance, *risk* is among the most common factors to control for (Margolis et al. 2007).

Risk mitigation is one of the reasons why firms engage in sustainable activities (Deutsche Bank Group, 2012). Financiers will add risk and liquidity premiums to the cost of capital for firms with questionable practices, and higher default risks and dissolved stakeholder relationships are associated with poor environmental management (ibid.).

Feldman et al. (1997) found that firms that manage sustainability risks obtain a lower cost of capital, and create shareholder value by working proactively and therefore being less risky.

Firms that are potential objects of lawsuits, criminal legal proceedings and regulatory governmental intervention, due to for example pollution or other violations that could be measured from a sustainability point of view, faces an increased firm risk, and usually have a low ESG score (Orlitzky and Benjamin 2001). On the other hand, many managers and financial analysts believe that corporate sustainable engagement increases firm risk (Orlitzky and Benjamin 2001).

Industry

Prior studies use *industry* as control variable (see Graves and Waddock, 1994; Luo and Bhattacharya, 2006; Margolis et al., 2007; Rettab et al., 2009; Galbreath and Shum, 2012; Saeidia et al., 2015).

Not only practices of sustainable performance vary across industries, but also industries are looked upon as more or less "dirty", depending on what activities they are associated with (Margolis et al. 2007). We limit this uncertainty as we only focus on one industry, the basic materials.

However, even though we only focus on the basic materials industry, we control for the business activity on a higher level, by controlling for business sector, which is the second level of activity classification in Thomson Reuters' organization of business activity. The three business sectors are the following: *Chemicals*, *Mineral Resources*, and *Applied Resources*.

In the *Chemicals* sector, firms are working with producing paint, fertilizers, pesticides, and other chemicals, to name a few. In the *Mineral Resources* sector, firms are working with e.g. gold-, silver-, and coal mining, steel, smelting and alloying, and other activities associated with metals and mining. In the *Applied Resources* sector, firms are working with e.g. paper products, pulp, containers, and packaging. The distribution over business sectors can be seen in table 3.3.

Age

Previous studies control for *age* (see Margolis et al., 2007; Rettab et al., 2009; Galbreath and Shum, 2012; Saeidia et al., 2015).

Age can have a positive effect on financial performance as older firms have survived through a selection process, to a greater extent than younger firms have. However, over time the weak firms are eliminated, why one would expect a positive correlation between financial performance and firm age (Jovanovic, 1982). Jovanovic (1982) also states that firms over time are pressured to increase profits in order to survive, and with age learns how to be efficient. Barron et al. (1994) on the other hand argues that as firms get old, they get more inert and less productive, hence pointing out a negative relationship between financial performance and firm age.

Leverage

It is argued that because of interest expenses and debt repayments, high *leverage* reduces cash flow available for investment, and therefore also reduces firm ability to invest in projects (Harris and Raviv, 1991). Harrison and Coombs (2006) argue that social performance is costly, and that firms with a high leverage will have low ESG scores. In their study they manage to find evidence that high leveraged firms neglect both employee and product areas associated with social performance (Harrison and Coombs, 2006).

For firm performance, the use of debt to a reasonable extent is advantageous. Debt financing is cheaper than equity financing as tax interest is a deductible expense, thus creating value for the shareholders as the cost of capital tends to fall as leverage is increased (Modigliani and Miller, 1958). However, as Modigliani and Miller also puts forward, when taken too far, the yields demanded by lenders tends to increase as the leverage of the firm goes up, and points out that there is a U-shaped relationship between leverage and the cost of capital as the risk of bankruptcy increases with increased leverage. Increased leverage may also limit the freedom of the managers as creditors get to stipulate the terms (ibid.) and the fact that mandated to pay debt holders might limit unprofitable decisions (Jensen, 1986).

Mendelson (1970) suggests there would be a high correlation between the cost of capital and the return on assets, why the same is suggested in this study.

R&D

Padgett and Galan (2010) show that sustainable performance and *Research and Development (R&D) intensity* are positively related. They also state that R&D intensity varies according to the industry and is usually more intense in manufacturing industries than in non-

manufacturing ones and that R&D intensive industries may face particular incentives to engage in CSR activities that boost the long-term supply of highly skilled labor (Padgett and Galan, 2010). McWilliams and Siegel (2000) argued and showed the positive relationship between social social performance and R&D intensity since they are associated with process and product innovation, the two are positively correlated.

A firm's intangible assets are positively related to Tobin's q of a firm (Black et al., 2006) and several studies finds a positive relationship between R&D intensity and Tobin's q (see Connolly and Hirschey (2005); Dutta et. al (2005); Gleason and Klock (2006), Black et al., 2006). Moreover, Danielson (2005) finds that R&D expenses can distort the ROA measurement. Since it is argued that R&D affects both sustainable and financial performance, we decide to include R&D in the model.

Geography

Sustainable performance has a tendency to differ across geographical regions (Halme, M. and Huse, M. 1997). Reasons might be cultural differences and attitudes towards sustainability. Some regions are considered being more responsible than others, such as the Scandinavian region (Samuelsson and Westergren, 2014), which is recognized as *green* and forward looking in sustainable terms. Even though the legal framework within Europe is similar when it comes to regulations that govern ESG, there are still large differences across countries in Europe when dealing with sustainability issues. Through the use of dummy variables, the study controls for differences across European countries that might affect the collective sustainable performance of the sample.

Due to natural differences and macroeconomic conditions, financial performance could differ across countries and regions that are subject to different laws and regulations that firms are subject to. Geographical impacts on financial performance are anticipated to be either positive or negative.