Exploring ESG Scores Relationships with Profitability: A Heteroscedastic Approach Across Industries and Across Time

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Abstract

This study examines the relationship between ESG Scores on profitability, measured by EBITDA per Share, across 10 U.S. industries from 2003 to 2023. Using data from Refinitiv Eikon, three regression models were applied: one focused on specific industries, showing the impact within each and two heteroscedastic regressions to study the overall performance across years and across industries. Industry-specific results indicate a small but increasing impact of ESG Scores on profitability in recent years. Overall Performance results show that the Basic Materials, Healthcare, Technology and Financials Industries experience the highest volatility of ESG Scores. These findings show the growing importance of ESG Scores in analysing profitability.

Keywords: ESG Scores, Heteroscedastic Regression, Profitability
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Resumo

Este estudo examina a relação entre ESG Scores e lucratividade, medida pelo EBITDA por ação, em 10 indústrias dos Estados Unidos, num período de 2003 a 2023. Utilizando dados do Refinitiv Eikon, foram analisados três modelos: um focado em cada indústria, mostrando o respetivo impacto em cada uma delas, e dois modelos de regressão heterocedástica para avaliar o desempenho geral ao longo dos anos e entre indústrias. Os resultados específicos de cada indústria mostram um pequeno, mas crescente, impacto dos ESG Scores na lucratividade nos últimos anos. Os resultados gerais mostram que as indústrias de Materiais Básicos, Saúde, Tecnologia e Financeira experienciam a maior volatilidade de ESG Scores. Estes resultados destacam a crescente importância dos ESG Scores na análise da lucratividade.

Palavras-Chave: ESG Scores, Regressão Heterocedástica, Lucratividade
Título: Explorando a Relação entre ESG Scores e Lucratividade: Uma Abordagem Heterocedástica entre Indústrias e ao Longo do Tempo
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Introduction

In a century where climate crisis, social injustices, and corporate scandals dominate newspaper headlines, an opportunity emerges to reshape the future by aligning financial success with ethical responsibilities. The power to make a difference, not only relies in the government and individual actions, but also in corporate strategies that shape our economy and society. In this context, Environmental, Social and Governance (ESG) practices have evolved from specific concerns to essential aspects of corporate strategy.

This shift is driven by growing awareness of critical environmental and social issues, such as human rights, climate change and gender equality. An example is the recent creation of specific laws regulating vehicle carbon emissions in the U.S. to reduce pollution levels (Kerschner, Pullins, & McCombs, 2024). As consumers and stakeholders increasingly favor companies with sustainable and responsible practises, ESG Scores have emerged as key indicators of a company's commitment to generating positive and sustainable impacts on the environment and society. Even "Goldman Sacks says its ESG stock-picking model wins most of the time" (Investment News, 2024).

The growing emphasis on ESG Scores highlights their complexity and significance in investment decision making and in the society. Research indicates that improvements in ESG Scores enhance the positive impact of Corporate Social Responsibility (CSR) on financial performance (Coelho, Ferreira, & Jayantilal, 2023). In a society where future generations resources' need to be preserved, ESG Scores play a critical role in ensuring sustainable development and long-term value creation. As a result, ESG Scores are now frequently evaluated alongside other financial metrics, influencing investors decisions on capital allocation and shaping corporate strategies to align with environmental, social and governance priorities.

ESG Scores evaluate performance across three key factors: Environmental, Social and Governance. According to the "Environmental, Social and Governance Scores from LSEG" (2023), the Environmental pillar includes resource use, emissions and innovation, the Social pillar covers workforce, human rights, community and product responsibility, and the Governance pillar includes Managements, Shareholders and CSR. According to the same document in order to calculate the overall ESG Score, different weights are assigned to each category within each pillar, with the Governance Pillar having the same weight across industries, while the Environmental and Social Pillar weights diverge per industry based on its characteristics.

This study seeks to expand the existing literature by conducting a cross-industry study of the impact of ESG Scores on profitability. While previous research often focuses on individual sectors, understandable given that each sector has different characteristics that can influence ESG Scores profitability relationship – cross industry analysis is essential, as industries together constitute the economy.

Under this study, profitability was measured as EBITDA per Share to provide a clear view on operational performance, allowing for the control of variables such as leverage and company size. This metric highlights the operational impact of ESG Scores, focusing on whether the integration of ESG practises can enhance a company's operational efficiency across industries.

The aim of this study is to assess whether certain industries, due to their unique characteristics, exhibit a stronger or weaker influence of ESG Scores on profitability relative to others, taking into account industry specific factors identified in previous literature and analysing how do these factors behave when viewed economically over time. By understanding these dynamics, this study can assist investors, stakeholders and policymakers in making more informed decisions in the ESG area, with also guiding them toward sustainable growth. Additionally, the findings may help these groups to leverage competitive advantages through enhanced ESG performance.

To achieve this goal, this research examines U.S. companies across 10 industries from 2003 to 2023. This thesis begins with an in-depth analysis of correlations between overall ESG Scores, as well as those of individual pillars, and profitability. This is followed by a performance analysis across industries and over time, using two heteroscedastic models, to provide a broad understanding of ESG impacts and the volatility of this impacts. Finally, a comparison is made with broader U.S. economic data, including the volatility of the financial markets, the growth of U.S. GDP and the uncertainty surrounding the U.S. Economic Policies.

This study starts with a comprehensive review of previous literature to provide a broader context of previous findings before in each specific industry and the economy overall. The following section details the data sources and methodology used to access the impact of ESG Scores on profitability as well as its volatility. The third section presents a detailed analysis of the results within each industry and examines overall performance over time and across industries. This thesis concludes with a summary of findings, potential areas for future research and the limitations of the present study.

Literature Review

In this section of this thesis, key studies examining the impact of ESG Scores on Profitability, covering both industry-specific analyses as well as cross-sector research from within and outside the U.S, will be reviewed. Some authors identify limitations in industry-specific research (Veltri, Bruni, Iazzolino, Morea, & Baldissarro, 2023), which is one of the reasons this thesis undertakes a cross-industry analysis.

Several studies have found that ESG Scores can have a positive impact on profitability. Authors advise companies of the importance of ESG disclosure, noting an impact of ESG disclosure on profitability (Almeyda & Darmansyah, 2019). According to one study, "roughly 90% of studies find a nonnegative ESG–CFP relation" (Friedea, Buschb, & Bassen, 2015). The studies also found that this nonnegative or positive impact appeared to be stable over time (Friedea, Buschb, & Bassen, 2015). This stability aligns with the results found by this thesis, in which the impact of ESG Scores on profitability was close to zero and constant over the period under analysis. Earlier research indicates that "ESG strengths increase firm value and that weaknesses decrease it" (Fatemi, Glaum, & Kaiser, 2018).

Not only investors prefer ESG friendly companies, but costumers are also more satisfied when they encounter such companies, especially in industries where ESG practises are very sensitive, such as sectors where human rights are put in question or where pollution levels are very high (Seok, Kim, & Oh, 2024).

The results for the Utilities Sector align with the existing literature, as previous authors found that the Environmental and Social Pillars are fundamental to generating profitability (Remo-Diez, Mendaña-Cuervo, & Arenas-Parra, 2023). In this thesis, these two pillars drive the positive correlation found between the ESG Scores and profitability.

In the Energy Sector, previous studies found a positive and significant impact of ESG Scores on profitability from 2008 to 2018 (Naeem & Çankaya, 2022), supporting the results found under the correlation analysis.

In the Consumer Cyclicals Industry, particularly in the Automobile Manufacturing Industry, results show that in China, ESG Scores positively affect long-term profitability of a company (Chen, 2024).

In the Consumer Non-Cyclicals Industry, particular in the Food Sector, ESG scores are found to have a slight positive impact on financial performance in Europe from 2017 to 2020 (Sandberg, Alnoor, & Tiberius, 2022). However, these industry specific results differ from those found in this thesis, possibly due to geographic differences and time period studied.

In the Financial Industry, a worldwide study found that an increase in profitability improves ESG Scores (Crespi & Migliavacca, 2020). In addition, U.S. financial firms are showing opposite results compared to the rest of the world, as they appear to experience a decrease in overall Corporate Social Performance (CSP) (Crespi & Migliavacca, 2020).

In the Healthcare Sector, findings from developed countries such as the U.S., suggest that companies perform better when ESG practises are in place, which means that ESG Scores have a positive impact on companies' profitability (Kalia & Aggarwal, 2023), as also proven by this thesis.

In the Real Estate Industry, the findings are very mixed, ESG ratings are associated with lower returns, but also positively affect companies' value (CAJIAS, FUERST, McALLISTER, & NANDA, 2014). A similar pattern is observed in the data from this study, where a positive correlation between companies' profitability and ESG Scores was found, alongside a negative impact of ESG Scores on profitability.

In the Mining Sector of the Basic Materials Industry ESG is seen as positive in mitigating financial risks (Fu, Yu, Guo, & Zhang, 2024), which suggests that if financial risks are mitigated, financial performance will likely improve.

In the Industrials Sector, the results previous stated in the literature align with those found in this research, ESG Scores positively impacts firm value (Chang & Lee, 2022).

Most of the previous cited studies use Return on Assets (ROA) or the Return on Equity (ROE) as measures of profitability. However, to innovate and explore different correlations between profitability and financial performance, this thesis explores an operational perspective, by using EBITDA per Share. The rationale is that while ROE focuses on the efficiency of the management team in generating profits for shareholders, emphasizing a primally accounting perspective, EBITDA per Share isolates the effects of capital structure and taxes, emphasizing an operational perspective. This isolation enables this study to better compare industries and companies as it removes the distortions caused by different capital structures.

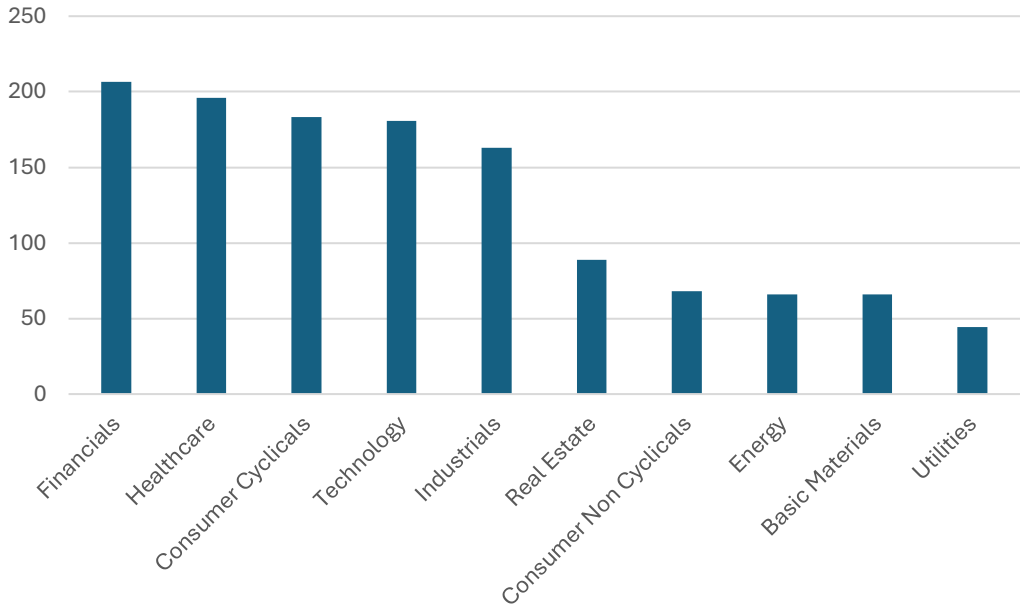
Data and Methodology

As mentioned, the aim of this project is to analyse the relationship between Environmental, Social and Governance (ESG) Scores and Profitability, measured by EBITDA per Share, across various industries in the United States (U.S.). The data were downloaded from Refinitiv Eikon and covers the period from 2003 to 2023. However, due to insufficient data from certain industries, namely Institutions, Associations and Organizations, Government Activity and Academic and Educational Services, these sectors were not included in the analysis. As a result, this project includes a total of 10 industries with the number of observations of the period under analysis shown in Figure 1.

Figure 1

Number of observations from 2003 to 2023 across industries

The Figure shows the number of observations from 2003 to 2023 across industries with the Financials Industry showing the biggest sample with over 200 observations and the Utilities Sector showing the smallest sample with less than 50 observations.

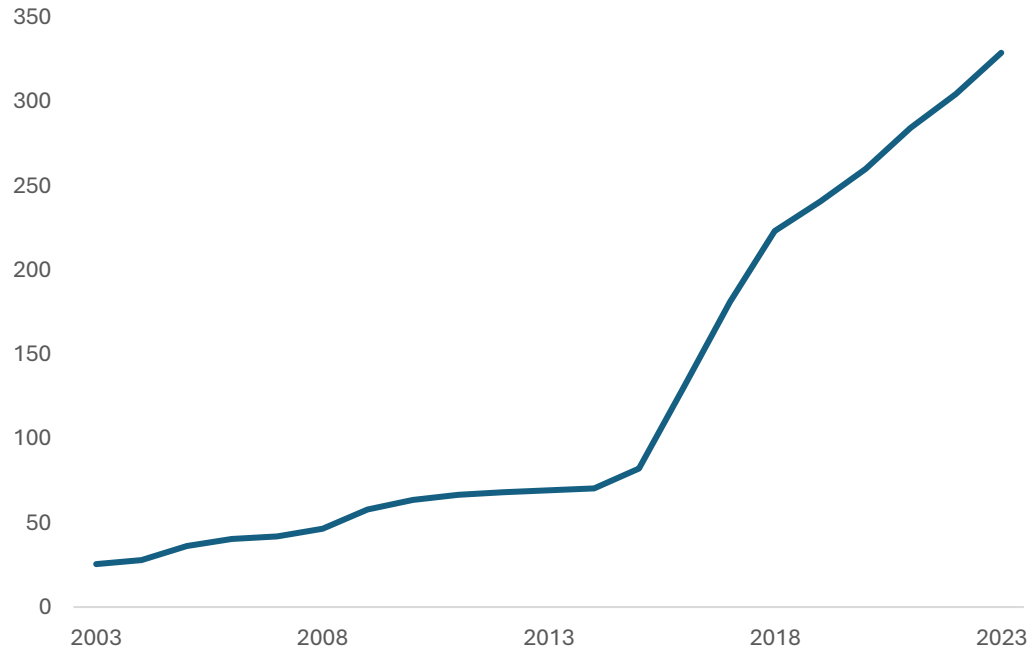


The number of companies has increased between 2003 and 2023, as expected due to the growth of the global economy (Figure 2). Over this period, the number of companies grew at an average of 14% per year, with the most significant growth recorded from 2015 to 2016. This increase can be attributed to several factors, including the ongoing recovery from the 2008 financial crisis, which led to a resurgence in economic activity, as well as the expansion of global markets, greater access to capital and increased entrepreneurial activity during that time (Wires, 2016).

Figure 2

Average Number of Companies per Year

The Figure shows the evoltion of the the Number of Companies per Year in the economy in question. In 2003 the avarage number of companies was 26 and in 2023 was 329, which shows an increase of more than 1000% consequence of the growth of the U.S. economy, with an average grow of 14% per year.

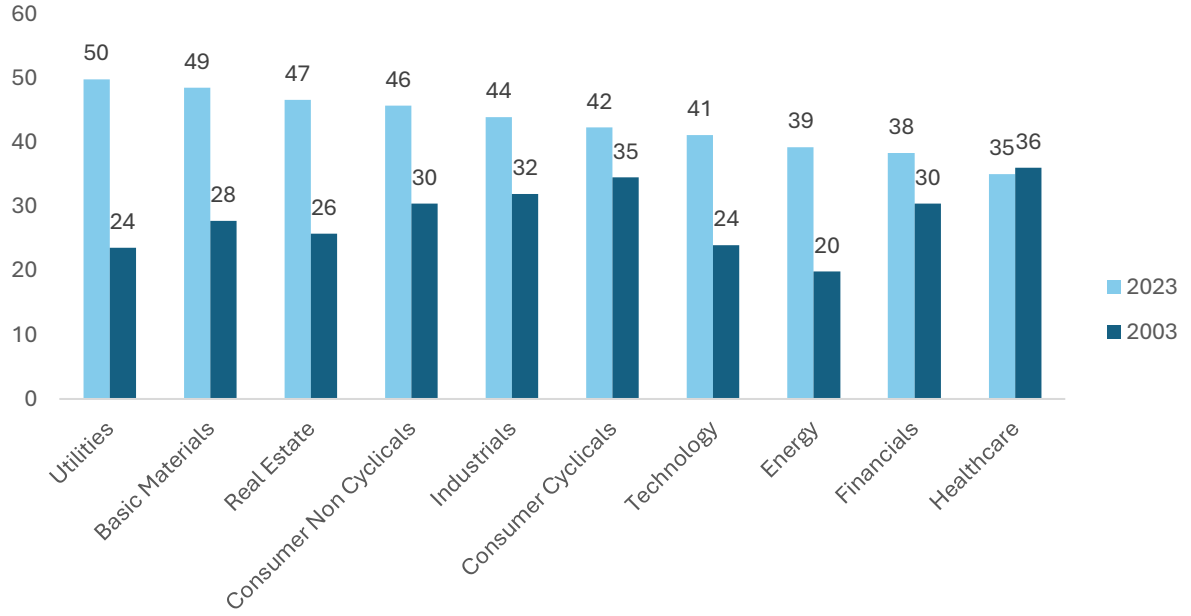


In 2023, the industry with the highest average ESG Score was the Utilities Sector, while the Healthcare Industry held the lowest average ESG Score. Interestingly, this represents a reversal from the start of the sample period in 2003, when the Healthcare Industry had the highest ESG Score average while Utilities ranked much lower (Figure 3). This shift indicates a significant change in ESG priorities and performance across industries over time, a trend that will be analysed in detail for each sector. A possible reason for this shifting not being reflected in the Healthcare Industry is that this sector is more people-oriented, and people are not often engaged unless it is necessary.

Figure 3

Average ESG Score in 2003 and 2023 per industry

The Figure shows the average ESG Score in 2003 and 2023 per industry, with every industry with the exception of the Healthcare industry showing an increase on this metric.



To understand the relationship between ESG performance and financial outcomes, I began by calculating the correlations between the two main variables of this study per industry: EBITDA per Share and ESG Scores. In addition to this step, I also calculated the correlation of each ESG Pillar with EBITDA per Share to discover which one of the pillars drove the correlations found in the first place.

Next, to study the evolution of the impact of ESG Score in EBITDA over time, I did the following regression for each industry:

$$\text{EBITDA}_{i,t} = \beta_0 + \sum \beta_t \, \text{ESGScore}_{i,t} \, \text{FY}_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable is $EBITDA_{i,t}$ which represents the value of EBITDA per share in the industry i on the year t. The independent variables are $ESGScore_{i,t}$ that represent the value of the ESG Score in the industry i on the year t and FY_t which is a dummy variable for each one of the years in analysis.

Finally, to study the dispersion between Profitability and ESG Scores across the industries I did two models of a heteroscedastic regression which are an extend of the linear regression. This models can be seen as two different equations, the mean equation (2) and the variance equation (3.1 and 3.2):

$$EBITDA_{i,t} = \beta_0 + \beta_1 ESGScore_{i,t} + \beta_2 Book\,Value_{i,t} + \beta_3 Debt\ to\ Asset\ Ratio_{i,t} + \beta_4 Size_{i,t} + \beta_5 FY_t + \beta_6 Industry_i + \varepsilon_{i,t} \quad (2)$$

$$\text{Log}\,\sigma_t^2 = \gamma_0 + \gamma_1 FY_t \quad (3.1)$$

$$\text{Log}\,\sigma_i^2 = \gamma_0 + \gamma_1 Industry_i \quad (3.2)$$

Equation (2), the mean equation, models the average EBITDA per Share, aiming to predict how profitability levels fluctuate with changes in ESG Scores. Equations (3.1) and (3.2) are variance equations that explain the residual variance of EBITDA per Share, assessing the model's accuracy in capturing the impact of ESG Scores on profitability. Specially, Equation (3.1) examines how the model's explanatory power evolves, while Equation (3.2) assesses differences across industries. Larger coefficients in the variance equation indicate that residual factors play a greater role in explaining the EBITDA per Share.

This methodology allows the two equations to be treated as independent since the parameters of the mean equation and the variance equation are uncorrelated. This methodology was first proposed by Harvey (1976) and was applied in a practical example in the paper by Cerqueiro, Degryse, & Ongena (2010).

The dependent variable of the mean equation was EBITDA per Share, and the main independent variable was ESG Score. Control variables were included in the model to enhance the precision of the effect of ESG Scores in the model. The control variables used were Size, Book Value per Share and Debt to Assets Ratio. These variables have been previously suggested in the literature. The variable Size was suggested by Malik (2015) who affirms that size is shown to explain differences in environmental disclosures. The variable Debt to Assets Ratio was suggested by Waddock & Graves (1997) who argue that this ratio can be used as a control variable since it is a proxy for management's risk tolerance which influences Corporate Social Responsibilities (CSR) and firm performance, a view also supported by Ullman (1985). Because these variables have been shown to significantly impact Corporate Social and Environmental Disclosures, they likely influence ESG Scores and, consequently EBITDA per

Share. Additionally, I included interactions of every control variable with a dummy for each year to account for time-varying effects and isolate year-specific variations in the relationships under study. Finally, I also added a dummy for every year and industry.

As mentioned before, I used two variations of this model. Both variations have the same mean equation, however, they differ in the specification of the variance equation. In Model 1, representing the first heteroscedastic regression, the variance equation analyses the variance of the impact of ESG Scores in EBITDA per Share over time, Equation (3.1), achieved by including a dummy variable for each year. In contrast, in Model 2, the second heteroscedastic regression, the variance equation examines the variance of the impact of ESG Scores in EBITDA per Share across industries, Equation (3.2), achieved by including a dummy variable for each industry.

The variable Size was calculated as following to reflect an overall market size of a company, enabling a consistent comparison across firms of different scales:

$$\text{Size} = Log\ (\text{Close Price} * \text{Number of Shares Outstanding}) \quad (4)$$

To validate the findings from the first model of the heteroscedastic regression, a comparison with the US economy was conducted. This analysis considered three key factors: Financial Markets Volatility (measured by the VIX Index), the annual GDP growth in the US, both retrieved from the FRED database and, additionally, an overall measurement of economic policy uncertainty retrieved from DataStream was included. To ensure consistency when comparing the model's results with these three key factors, all values were normalized. These indicators provide a comprehensive backdrop for assessing model consistency within the US economic context.

Analysis and Results

In this section, I will present the specific results for each industry, along with an analysis of the overall performance across years and industries.

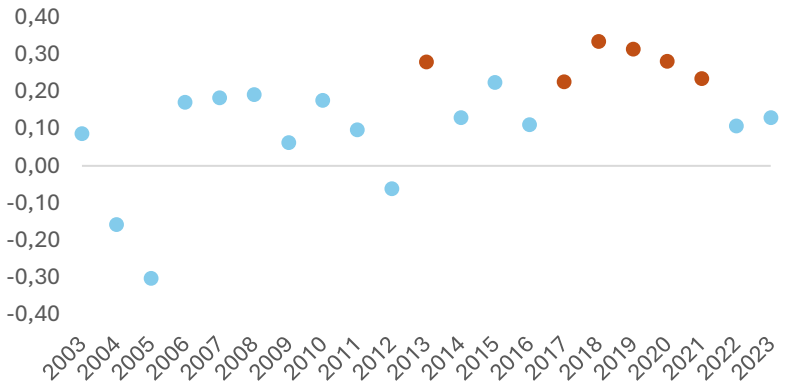
Basic Materials

The Basic Materials Industry is composed by 3 main subsectors: chemicals, mining resources and applied resources. Known for high pollution levels and significant energy consumption, both factors impact ESG Scores. During the period of analysis, the correlation of ESG Scores and EBITDA per Share was generally positive but not statistically significant, with the exception of the period between 2017 and 2021. During this period, following the Paris Agreements in 2016, the correlation was in average 0.28 and statistically significant at a 5% level (Figure 4).

Figure 4

Correlation between EBITDA per Share and ESG Score in the Basic Materials Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Basic Materials Industry. The points in orange are statistically significant at a 5% confidence level.



Additionally, the correlation between the Environmental Pillar and EBITDA per Share was found to be statistically significant in the same period, and similar trends were found for the Social and Governance Pillar for the period between 2018 to 2021 (Figure 18 – in appendix). These findings suggest a positive impact of the Paris Agreements on the Basic Materials industry.

Regression (1) for the Basic Materials Industry analysed the impact of ESG Scores in EBITDA per Share, showing that a one unit increase in the value of ESG Score corresponds approximately to a 2% increase in the EBITDA per Share *ceteris paribus*. (Table 3 - in appendix). However, this increase is not statistically significant at a 5% confidence level,

indicating that ESG Scores do not have significant impact on EBITDA per Share in the Basic Materials Industry. While the impact is not consistent over time, it seems to stabilize after 2016, aligning with the trends observed under the correlation analysis and reflecting the influence of the Paris Agreements. This suggests potential fluctuations in how ESG Scores influence financial performance in the Basic Materials Industry over time.

Consumer Non-Cyclicals

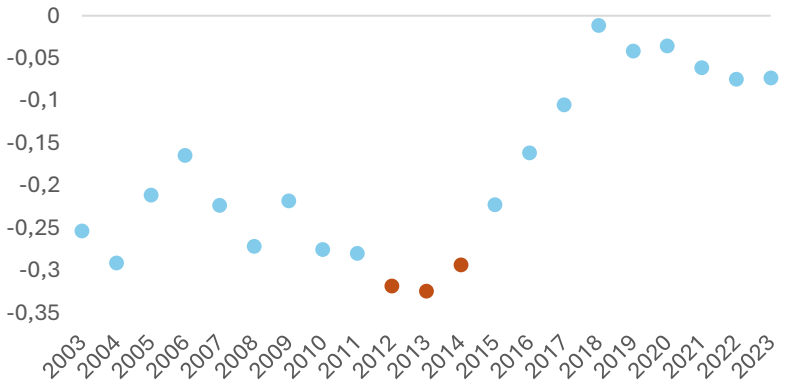
The Consumer Non-Cyclicals Industry includes essential products such as food, beverages and household items, which are less affected by economic conditions due to their necessity. While this industry doesn't have a particular high average ESG Score, improvements have been observed over time as will be discussed further in this section.

Despite these improvements, the correlation between ESG Scores and Profitability in the Consumer Non-Cyclicals Industry was negative from 2003 to 2023. Statistically significant values were observed between 2012 and 2014, with a clear increase afterward gradually approaching zero (Figure 5). These results indicate that ESG Scores have become less correlated with profitability compared to the beginning of the sample, when their relationship was negative.

Figure 5

Correlation between EBITDA per Share and ESG Score in the Consumer Non-Cyclicals Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Consumer Non-Cyclicals Industry. The points in orange are statistically significant at a 5% confidence level.



The correlation between the Environmental Pillar and EBITDA per Share is statistically significant in 2012 and 2013, explaining the overall ESG Score's significant correlation with EBITDA per Share in those years. In 2014, the significant correlation was due to the Social Pillar's relationship with EBITDA per Share (Figure 19 – in appendix).

In order to further study this relationship, I conducted regression (1), which showed no statistically significant relationship between ESG Scores and EBITDA per Share in this industry. The results indicate that a one unit increase in ESG Score leads to an approximately 2847% decrease in EBITDA per Share (Table 4 - in appendix). Additionally, the interaction between the ESG Scores and the year-specific dummies, revealed that, similar to what was found in the Basic Materials Industry, after 2018 there is a stabilization of the coefficients.

Consumer Cyclicals

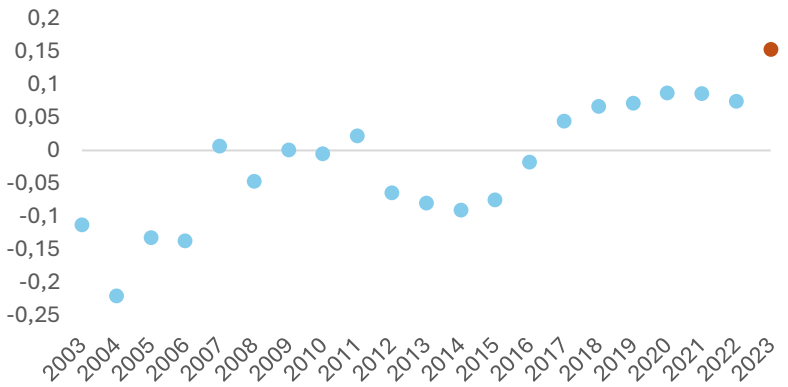
Unlike the Consumer Non-Cyclicals Industry, which focus on essential products, the Consumer Cyclicals sector encompasses industries such as automotive, travel and luxury goods. This industry is highly sensitive to economic conditions, making it more vulnerable to demand fluctuations and, consequently, more responsive to ESG practises. When economic conditions improve, consumer spending in this sector tends to rise.

At the begin of the period of research, the correlation between EBITDA per Share and the ESG Score was negative. However, a shift to a positive correlation was observed after 2016, suggesting a potential positive impact of the Paris Agreements in 2016. This indicates that companies adopting ESG practises are experiencing higher profitability (Figure 6). The statistically significant result in 2023, combined with the increasing correlation in recent years suggests that the industry is gradually becoming more aware of the importance of environmental, social and governance practises.

Figure 6

Correlation between EBITDA per Share and ESG Score in the Consumer Cyclicals Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Consumer Cyclicals Industry. The point in orange is statistically significant at a 5% confidence level.



A similar trend was also found is the ESG individual pillars, particularly on the Governance pillar, which showed an earlier transaction and a stronger positive correlation in the more recent years (Figure 20 – in appendix).

Similar to the previous industries, regression (1) was also applied. The results indicate that for a one unit increase in the ESG Score, the EBITDA per Share decreases 5%. (Table 5 – in appendix). In addition, the interactions of the year dummies with the ESG Score variable, shows the same trend previous noted in the correlations, a clear improvement on the coefficients and consequently in the relationship between ESG Scores and EBITDA.

Energy

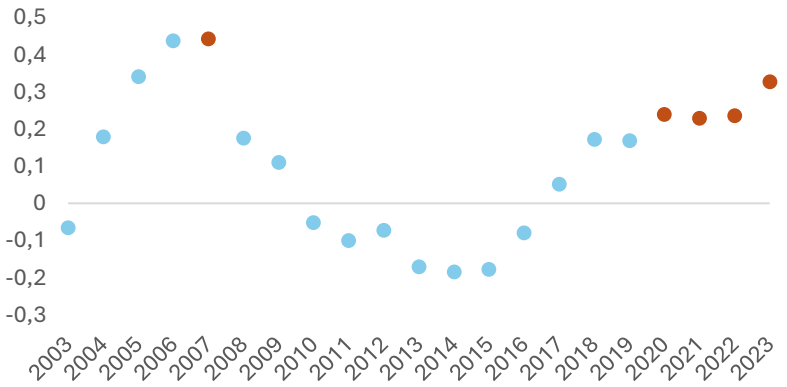
The energy sector ranks as the third lowest in terms of average ESG Score under the period in analysis, primarily due to high pollution levels traditionally associated with the industry. However, the recent shift toward renewable energies may have contributed to an improvement in the relationship between EBITDA per Share and ESG Score.

From 2003 to 2023, the correlation between EBITDA per Share and ESG Score has significantly improved, rising from -0.07 to 0.33. This suggests that Energy sector companies have been enhancing their ESG practises leading to increased profitability. Notably, from 2020 to 2023, the correlation was also statistically significant at a 5% confidence level, reinforcing the growing strength of the relationship (Figure 7). The clear improvement on these correlations, along with the statistically significant results from 2020 to 2023, indicates that the industry has begun its transition to ESG friendly industry.

Figure 7

Correlation between EBITDA per Share and ESG Score in the Energy Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Energy Industry. The points in orange are statistically significant at a 5% confidence level.



A similar trend was observed in each of the correlations of the individual ESG pillars with EBITDA per Share (Figure 21 – in appendix), with the Governance Pillar showing an earlier transaction to a positive correlation. Both the Governance and the Social Pillars show statistically significant results at a 5% confidence level from 2020 to 2023, as the overall ESG Score.

The results of regression (1) applied to the Energy sector, show that for one unit increase in ESG Score, the EBITDA per Share, decreases 2% (Table 6 – in appendix). This suggests that prior to a significant shift in industry practises, improvements in the ESG scores did not positively correlate with financial performance during the period under analysis.

The interactions of year specific dummies with the ESG Score variable reveals a critical shift around 2014. Prior to this, there was a clear negative impact of the ESG Score on EBITDA per Share. However, after 2014, the data shows a positive impact aligned with the correlation trends and reflecting the industry ongoing transaction to ESG practises.

Industrials

The Industrials sector encompasses a wide range of companies, including those in manufacturing, construction, aerospace, defence and transportation. Over recent years, this sector has increasingly adopted green technologies and sustainable practices, a shift that is expected to significantly impact ESG Scores. The move towards sustainability reflects the industry's broader efforts to align with global environmental and governance standards.

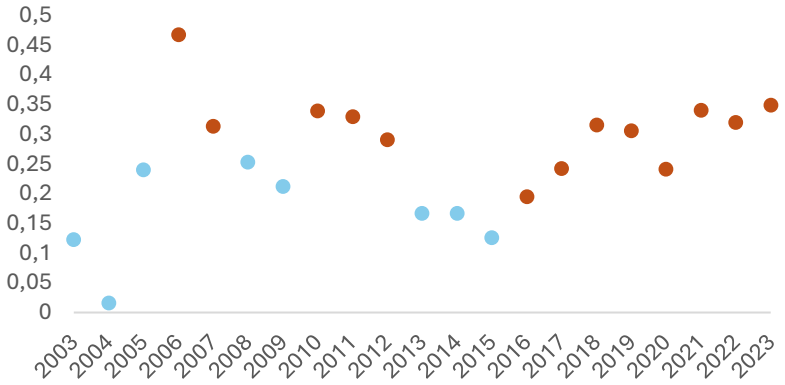
The relationship between ESG Scores and Profitability in the Industrials sector has grown stranger over time, as indicated by the increasing correlation between these metrics. In 2023, the correlation reached approximately 0.35, the highest observed in this study for that year. Since 2016, these correlations have consistently been statistically significant at a 5% confidence level (Figure 8), underscoring the lasting influence of the 2016 Paris Agreements. This is particularly notable given that the Industrials sector doesn't have the highest average ESG Score.

A similar pattern is evident when examining the correlations between the individual ESG pillars and EBITDA per Share. The Environmental Pillar, in particular, has shown the most pronounced growth, indicating the sector's increasing emphasis on reducing the environmental impact (Figure 22 – in appendix).

Figure 8

Correlation between EBITDA per Share and ESG Score in Industrials Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Industrials Industry. The points in orange are statistically significant at a 5% confidence level.



To further investigate this findings, regression analysis (1) was applied. The results indicate that a one unit increase in the ESG Score corresponds to an approximately 7.8% increase in EBITDA per Share holding other factors constant (Table 7 – in appendix). This result corroborates the positive correlation and suggests that ESG Practises are becoming increasingly embedded within the Industrials Industry, translating to tangible profitability gains.

Although the interactions between the year specific dummies and the ESG Score variables is less pronounced compared to the correlation analysis, they still demonstrate a clear upward trend in coefficients over time. This reflects the industry's gradual but steady shift toward better ESG practises and their associated financial benefits.

Real Estate

The Real Estate Industry, similar to the Industrials industry, is undergoing a significant transition toward adopting green technologies. This includes advancements such as energy efficient buildings, sustainable construction methods, and responsible land use. However, the industry faces unique challenges in integrating these practises into its operations.

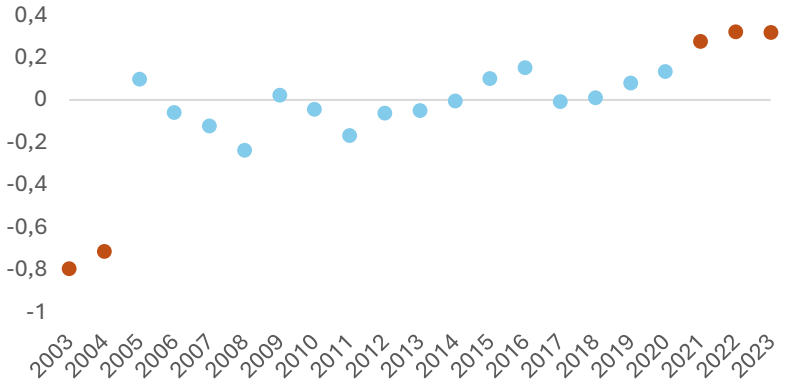
This transformation is reflected in the evolving relationship between ESG Scores and EBITDA per Share. Over the analysis period, the correlation between ESG Scores and EBITDA per Share rose dramatically from -0.8 in 2003 to 0.32 in the last two years – a notable increase compared to other industries (Figure 9). Moreover, in the past three years, this correlation has consistently

been statistically significant at a 5% confidence level, further reenforcing the notion that the Real Estate Industry is increasingly aligning with ESG principles.

Figure 9

Correlation between EBITDA per Share and ESG Score in the Real Estate Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Real Estate Industry. The points in orange are statistically significant at a 5% confidence level.



Among the individual ESG pillars, the Social Pillar exhibits the strongest correlation with EBITDA per Share, peaking at 0.34. One possible explanation for this could be the increased focus on social responsibilities such as tenant welfare and community engagement (Figure 23 – in appendix).

However, regression (1) reveals contrasting results: a one unit increase in the ESG Score corresponds to a 25% decrease in the EBITDA per Share ceteris paribus. This discrepancy may be attributes to the strong negative correlation (-0.80) observed at the beginning of the analysis period, which likely skewed the overall regression results (Table 8 – in appendix). Additionally, the interactions between the ESG Score and the year dummies do not reveal a clear trend.

Technology

The Technology sector encompasses a broad range of products, including hardware, digital infrastructure, Fintech innovations and software-based services. As one of the most dynamic and involving sectors, Technology plays an important role in shaping the US economy.

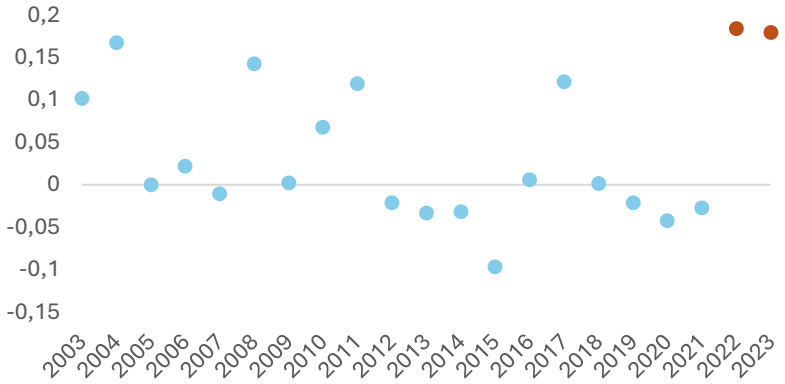
The relationship between profitability and ESG Scores in the Technology sector, as evidenced by the correlation analysis, reveals a modest yet inconsistent upward trend over the analysis period (Figure 10). This fluctuation can likely be attributed to the sector's fast paced nature and its susceptibility to external factors. For instance, negative correlations observed from 2019 to

2021 potentially reflect disruptions caused by the COVID-19 pandemic, contrasting with the positive and statistically significant correlations recorded in 2022 and 2023.

Figure 10

Correlation between EBITDA per Share and ESG Score in the Technology Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Technology Industry. The points in orange are statistically significant at a 5% confidence level.



In the past two years, statistically significant correlations were also observed for the individual pillars. Even though all pillars demonstrate similar trends, the Environmental Pillar recorded a slight decline of 0.02 in 2023 compared to the beginning of the analysis period (Figure 24 – in appendix).

Regression (1) further highlights a positive impact of ESG Score on profitability, indicating that a one unit increase in ESG Score is associated with a 3% increase in EBITDA per Share, holding other factors constant (Table 9 – in appendix). However, similar to other industries analysed, the interaction of ESG Score and yearly dummy variables does not reveal a definitive trend, emphasising the dynamic and multifaced nature of the Technology sector.

Utilities

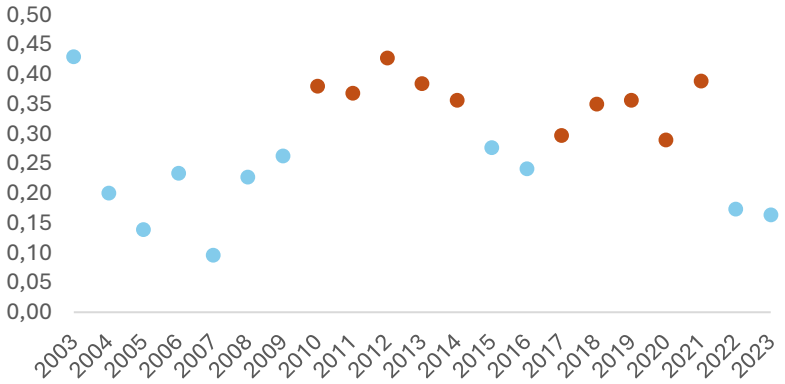
As of 2023, the Utilities sector holds the highest average ESG Score among all industries analysed in this study. This sector primarily compromises essential services, such as electricity, water and natural gas. Giving the increasing global focus on responsible resource management and sustainability – ensuring future generations inherit a liveable planet - it is understandable that Utilities sector ranks highly in average ESG Score.

However, an examination of correlations reveals a decline in the relationship between the overall ESG Score and the EBITDA per Share over time, even though the correlation remains positive at 0.16 in 2023. This suggests that, while the ESG Scores are improving, this trend is not fully mirrored in the sector's profitability (Figure 11). Statistically significant correlations at the 5% confidence level were observed during two periods: 2009 - 2014 and 2017 – 2021. These intervals coincide with major global events, such as the 2008 economic crisis the 2016 Paris agreements, highlighting the sector's responsiveness to these developments.

Figure 11

Correlation between EBITDA per Share and ESG Score in the Utilities Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Utilities Industry. The points in orange are statistically significant at a 5% confidence level.



Looking at individual ESG Pillars, similar downward trends are evident, with the Governance Pillar showing a negative correlation since 2022. Conversely, the Social Pillar has experienced the smallest decline, likely due to the increased investments in community resilience projects, environmental justice initiatives for undeserved areas, and workforce diversity initiatives, critical social priorities for the Utilities Sector in the US (Figure 25 – in appendix).

Regression (1) analysis results for the Utilities Industry indicate that a one unit increase in the ESG Score reflects an approximately 9% increase in EBITDA per Share, assuming other factors remain constant. This outcome aligns with the correlation analysis, indicating a positive, though modest, relationship between ESG performance and profitability (Table 10 – in appendix).

Finally, an analysis of interactions between yearly dummy variables and ESG Scores reveals no significant changes in the impact of the ESG Score on the EBITDA per Share over the years under analysis. This consistency suggests that the impact of ESG performance on profitability

in these sectors has been stable over time, even as industry navigates evolving sustainability standards and market pressures.

Financials

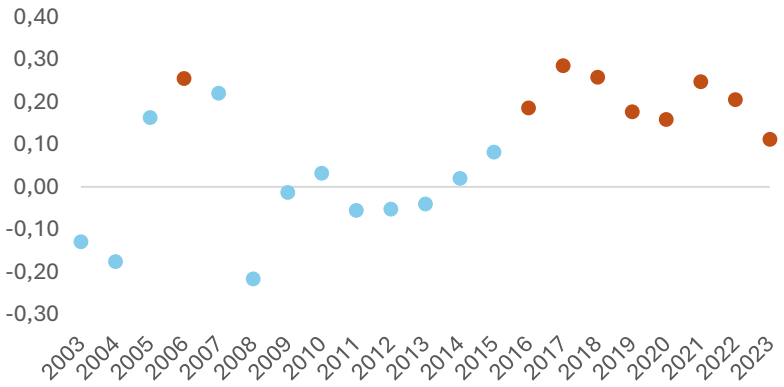
The Financials Industry is a complex and diverse sector covering a wide array of services, including money management, investments, financial transfers and lending. It comprises the traditional banking services, investment services and insurance.

Following the 2008 financial crisis, the U.S. implemented significant regulatory reforms that emphasised ESG Practises, aiming to align financial industry more closely with sustainability and ethical standards. This shift is reflected in the correlation analysis, which recorded the most negative correlation in 2008 (-0.22) between the overall ESG Pillar and EBITDA per Share. Since then, despite some fluctuations, a modest upward trend has developed until 2021 and registering a decline after that, maintaining however a positive correlation of 0.11 in 2023, with statistically significant results observed after 2015 (Figure 12).

Figure 12

Correlation between EBITDA per Share and ESG Score in the Financials Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Financials Industry. The points in orange are statistically significant at a 5% confidence level.



When examining the individual ESG pillars, both the Environmental and Social Pillars exhibit trends similar to the overall ESG Score, reflecting a gradual alignment with profitability. However, the Governance Pillar follows a slightly different trajectory, as it did not reach its lowest point in 2008. This divergence may be attributed to governance specific challenges faced by the financial institutions, including compliance and ethical considerations (Figure 26– in appendix).

Regression analysis (1) reveals that, contrary to the positive correlation trends, increases in the ESG Score negatively impact EBITDA per share. Specifically, a one unit increase in the ESG Score corresponds to a decrease of approximately 17% in the EBITDA per Share, assuming other factors remain constant. (Table 11– in appendix).

The analysis of the interactions of annual dummy variables with the ESG Scores further highlights the industry's evolution. In 2008, ESG Scores registered the most negative impact on EBITDA per Share, reflecting the industry's struggles during the financial crisis. However, this impact shifted to positive in the years following, aligning with the observed correlation trends. This shift underscores the Financials sector's progress in adopting more robust ESG practises and integrating them into profitability strategies in recent years.

Healthcare

The Healthcare Industry is dedicated to providing essential medical goods, services and technologies designed to enhance and maintain public health. This sector faces unique challenges particularly in the United States, where healthcare costs per capita rank among the highest globally. Additionally, growing demands for improved patient outcomes and more efficient healthcare have placed added pressure on the industry to adapt and innovate.

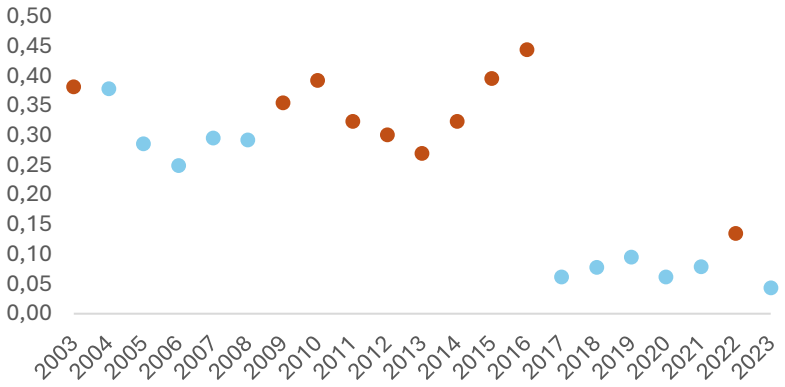
Among all industries analysed in this study, the Healthcare Industry stands out as the only one to show a decrease in average ESG Score from 2003 to 2023. This downward trend mirrors the results from the correlation analysis, where the relationship between ESG Scores and EBITDA per Share weakened significantly, dropping from 0.38 in 2003 to a near neutral 0.04 in 2024 (Figure 13). Unlike other industries that have demonstrated consistent improvements in the ESG performance linkage, the Healthcare Industry shows statistically significant results only between 2009 – 2016. After this period, the correlation experienced a notable decline.

When analysing the individual ESG pillars and their correlation with EBITDA per Share, the overall downward trajectory is consistent. Among the pillars, the Governance Pillar has seen the steepest decline. This may be attributed to increased scrutiny on corporate governance practises in U.S. Healthcare sector, aimed at ensuring compliance with ethical and operational standards (Figure 27 – in appendix).

Figure 13

Correlation between EBITDA per Share and ESG Score in the Healthcare Industry

The Figure represents the correlation between EBITDA per Share and ESG Scores in the Healthcare Industry. The points in orange are statistically significant at a 5% confidence level.



Despite the decline in correlation over time, the regression analysis (1) shows that a one unit increase in ESG Scores is associated with an approximate 9% increase in EBITDA per Share, assuming other factors remain constant (Table 12 – in appendix). This finding suggests that while the correlation between ESG Scores and profitability has weakened, ESG practises still positively influence financial performance. Interactions between yearly dummy variables and ESG Scores further support this trend, showing a positive impact of ESG Scores on profitability over time.

A potential explanation for the disparity between the declining correlations and the positive regression outcomes lies in the evolving nature of ESG implementation. While the predictability of ESG's impact on profitability has diminished, the benefits of incorporating ESG practises into operational strategies remain evident. This indicates that ESG factors continue to add value, though their influence may not be more nuanced, and complex compared to earlier years.

Overall Performance

This study applied two heteroscedastic regression models, based on the methodology proposed by Harvey (1976) to assess the overall performance of ESG Scores on profitability in the United States over the analysis period. While, both models share the same mean equation, they differ in the variance equation, enabling a comprehensive understanding of the relationship between ESG Scores and financial performance.

Model 1 incorporates yearly dummy variables in the variance equation, which provides insights into how ESG Scores impact EBITDA per Share over time. The mean equation reveals that for a one unit increase in ESG Scores, the EBITDA per Share increases approximately 2.1%, assuming all other factors remain constant. (Table 2). However, interactions between ESG Scores and yearly dummy variables, present in the mean equation, indicate that the predictable impact of ESG Scores on profitability remains close to zero.

The variance equation highlights the volatility of this impact. Specifically, when the effect of ESG Scores on profitability moves further from zero, the volatility associated with this impact also increases. This suggests that during periods of elevated volatility in ESG Scores' influence, their effect on profitability becomes more significant as it shifts further away from zero (Figure 14 and Figure 15). Moreover, the variance equation reveals an increase in coefficients after 2016, signalling that, beyond this point, differences in profitability are less easily explained by ESG Scores alone. This shift suggests that residual factors play a more significant role in determining profitability after 2016.

Figure 14

Impact of ESG Scores in EBITDA per Share over time

The Figure shows how ESG Scores impact the EBITDA per Share from 2003 to 2023. The coefficent of 2003 represents the EBITDA per Share variable in regression (1). The figure also displays in grey the error bars indicating uncertainty levels.

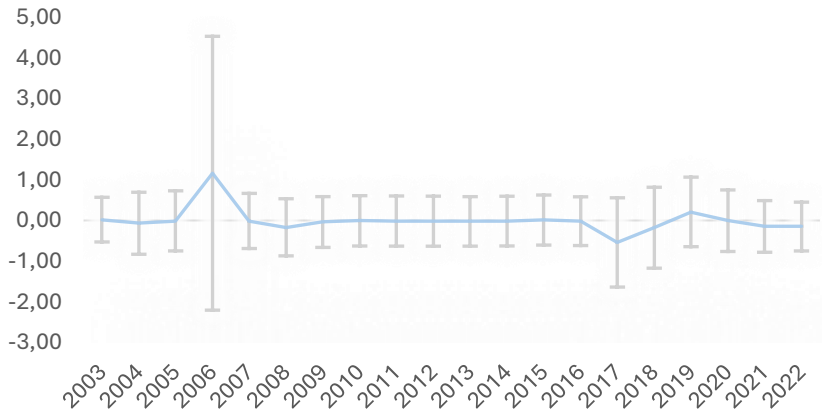
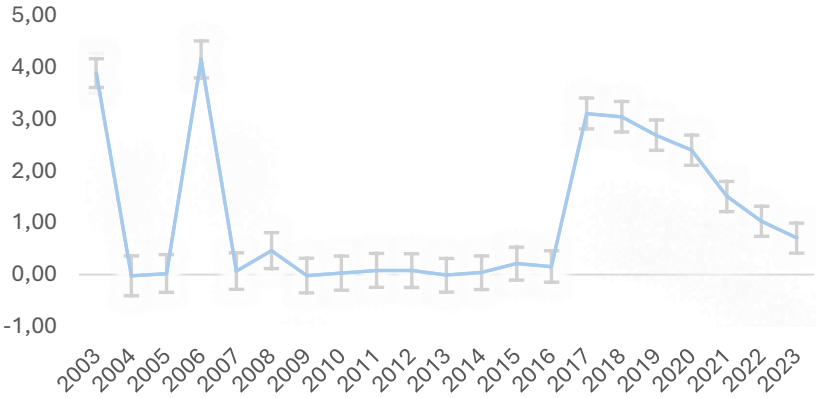


Figure 15

Volatility of impact of ESG Scores on profitability over the years

The Figure shows the evolution of the volatility of the impact of ESG Scores on profitability from 2003 to 2023 obtained from Model 1 results. The coefficient of 2003 is given by the coefficient of the constant on the variance equation of Model 1. The figure also displays in grey the error bars indicating uncertainty levels.



To study the volatility accuracy of the impact of ESG Scores, correlations were analysed with three key economic indicators: the VIX Index (measuring Financial Markets Volatility), US GDP Growth and US Economic Policy Uncertainty. The results (Table 1 and Figure 16) show a weak but positive correlation between ESG Scores impact volatility and both Economic Policy Uncertainty (0.05) and US GDP Growth (0.07). This suggests that economic uncertainty and GDP growth influence the variability of ESG Scores' effects on profitability. Conversely, Financial Markets Volatility (VIX) exhibits a negative correlation (-0.21), indicating that during periods of high market turbulence, the impact of ESG Scores on profitability becomes less volatile.

Table 1

Correlations between the volatility of ESG Score impact and key Macroeconomic Indicators

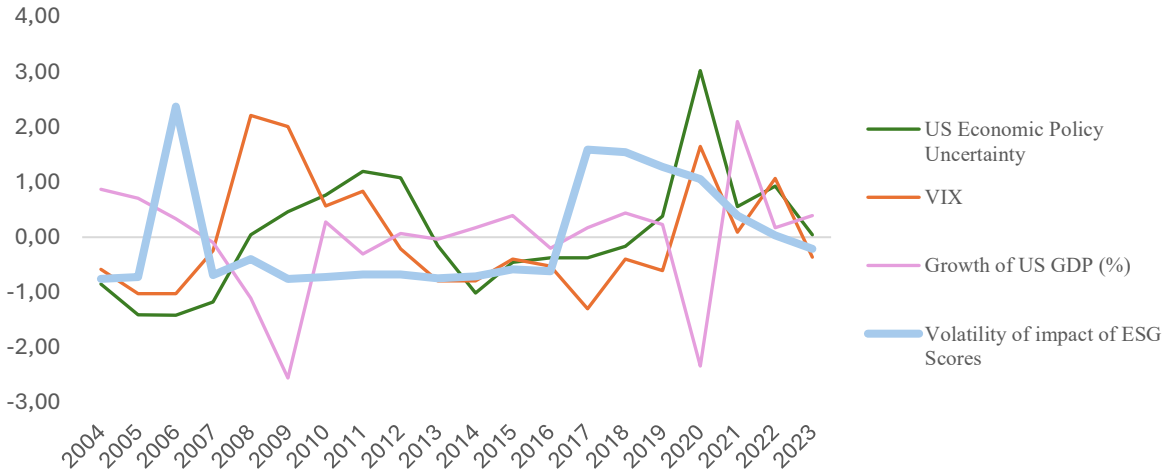
The Table summarizes the correlations between four normalized variables: the volatility of ESG Scores impact found under Model 1 and three macroeconomic variables: US Economic Policy Uncertainty, Financial Markets Volatility (VIX) and the percentual growth of US GDP.

	Volatility of impact of ESG Scores	US Economic Policy Uncertainty	VIX	Growth US GDP
Volatility of impact of ESG Scores	1	0.05	-0.21	0.07
US Economic Policy Uncertainty	0.05	1	0.63	-0.46
VIX	-0.21	0.63	1	-0.67
Growth US GDP	0.07	-0.46	-0.67	1

Figure 16

Evolution of Macroeconomic Variables and Volatility of impact of ESG Scores

The Figure shows the evolution of three normalized macroeconomic variables: US Economic Policy Uncertainty, Financials Market Volatility (VIX) and Growth of US GDP (%). The Figure also shows the evolution of the normalized volatility of impact of ESG Score over time.



In contrast to Model 1, Model 2 incorporates industry specific dummy variables in the variance equation. The mean equation for Model 2 estimates that a one unit increase in ESG Scores results in a 1% increase in EBITDA per Share, assuming all other factors remain constant. This model also offers insights into the volatility of ESG Scores' impact across different industries.

Results show that Basic Materials, Healthcare, Technology and Financials Industries exhibit the highest levels of ESG Scores impact volatility. This volatility is statistically significant at 5% confidence level, demonstrating the robustness of these findings (Table 2 and Figure 17).

Figure 17

Volatility of ESG Scores across industries

The Figure shows the evolution of the volatility of ESG Scores across the 10 industries under this study obtained from Model 2 results. The coefficient of the Basic Materials Industry is given by the coefficient of the constant on the variance equation of Model 2. The figure also displays in grey the error bars.

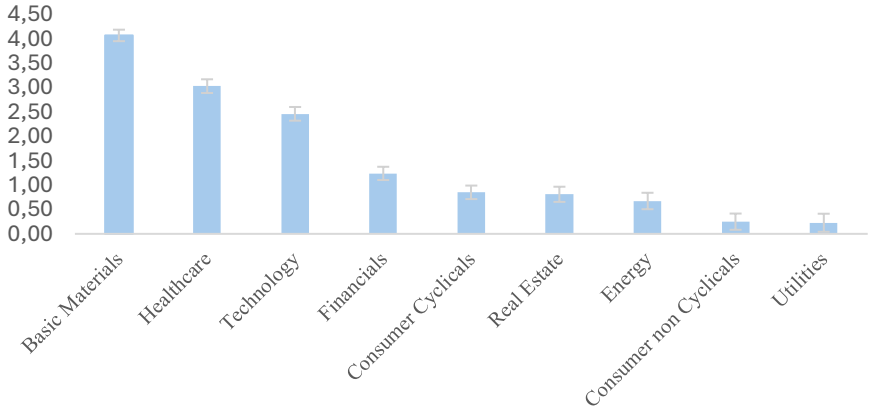


Table 2

Heterocedastic Models 1 and 2 Results

This table shows the results of the heterocedastic Models 1 and 2 from the mean equation (2) – equal in both models - and variance equations of each model (3.1 and 3.2). Model's 1 variance equation integrates yearly dummy varriables and Model's 2 integrates industry dummy variables. Book Value per Share, Debt to Assets Ratio and Size are control variables. The interactions of the yearly dummy variables with the control variables as well as the yearly dummy variables and industry dummy variables were omitted from the table, but included in the model.The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	**Model 1**	**Model 2**
ESG Score	0.02	0.01
Book Value per Share	0.16*	0.16*
Debt to Assets Ratio	9.25	12.53
Size	0.76	1.25
Variance Equation		
γ_0	3.89*	4.07*
FY 2004	-0.02	
FY 2005	0.02	
FY 2006	4.16*	
FY 2007	0.07	
FY 2008	0.46*	
FY 2009	-0.02	
FY 2010	0.03	
FY 2011	0.08	
FY 2012	0.08	
FY 2013	-0.01	
FY 2014	0.04	
FY 2015	0.21	
FY 2016	0.16	
FY 2017	3.11*	
FY 2018	3.05*	
FY 2019	2.69*	
FY2020	2.40*	
FY 2021	1.51*	
FY 2022	1.03*	
FY 2023	0.70*	
Healthcare		3.03*
Technology		2.46*
Financials		1.24*
Consumer Cyclicals		0.85*
Real Estate		0.81*
Energy		0.67*
Consumer Non Cyclicals		0.25*
Utilities		0.23*
Industrials		0.22*
Number of Observations	24 422	24 422

Overall, the analysis underscores the complexity of ESG Scores' relationship with profitability. While the mean equation from both models suggest a positive but modest effect of ESG Scores on EBITDA per Share, the variance equations reveal that this impact is subject to significant volatility, influenced by macroeconomic factors and industry specific dynamics. These findings suggest that while ESG practises contribute positively to financial performance, their impact is not uniform and can vary significantly across different economic and industry contexts.

Main Conclusions

This thesis focuses on exploring the relationship between profitability, measured by EBITDA per Share, and ESG Scores, offering an in-depth analysis of this correlation across 10 industries in the United States from 2003 to 2023. The primary objective was to assess how these factors interact over time, with a particular emphasis on identifying trends and differences across industries.

One of the key findings from this study is that the Financials Industry had the highest average number of companies per year over the analysis period. In contrast, the Utilities Industry, showed the lowest average number of companies. However, it is important to note that the average number of companies in a given industry does not always correlate with higher ESG Scores. For example, despite having the lowest number of companies, the Utilities Industry achieved the highest average ESG Score in 2023, whereas the Financials Industry ranked second to last, just ahead of the Healthcare Industry. This shift in ESG performance is notable, particularly considering that the Healthcare Industry had the highest average ESG Score in 2003, while the Utilities Sector ranked at the bottom.

The correlation analysis revealed an overall positive trend between profitability and ESG Scores for most industries, with the exception of the Utilities industry. Among the industries, the Real Estate Industry exhibited the most significant improvement in this correlation, suggesting a growing alignment between sustainability practises and financial performance.

When breaking down the results by individual ESG pillars, the most striking developments were observed in the Environmental and Social pillars. The Industrials Industry, for instance, registered the highest correlation between the Environmental pillar and profitability, along with the largest increase in this metric over the period. The Governance pillar also showed substantial improvements, with the Energy sector registering the highest positive correlation in 2023, indicating that governance related practises increasingly influence profitability in this industry.

Regression (1) indicate that in most industries the direct impact of ESG Scores on profitability, as measured by EBITDA per Share, is relatively modest, generally accounting for less than 10% increase in profitability with one unit increase in ESG Scores, *ceteris paribus*. Furthermore, through interactions between the dummy variables and ESG Scores, most industries show a relatively stable impact over time, with a slight upward tendency in recent

years. However, there were exceptions, particularly in the Consumer Non-Cyclicals Industry and Consumer Cyclicals Industry, where the impact was more volatile and exhibited clear trends of growth over time, respectively.

The two heteroscedastic regression models applied to assess overall performance aligned with the industry specific results observed in the correlation and regression analysis.

Model 1, which included yearly dummy variables in the variance equation, showed that the influence of ESG Scores remained consistently close to zero, but the volatility of ESG Scores impact was connected with the variations in the impact. When the effect of ESG Scores on profitability was higher, the volatility of this impact tended to deviate more significantly from zero.

Comparing the results of Model 1 variance equation with three key macroeconomic factors, the analysis revealed a weak positive correlation between the volatility of ESG Scores impact and both U.S. GDP Growth and U.S. Economic Policy Uncertainty, this indicates that during periods of economic uncertainty or growth, the volatility of ESG Scores impact tends to increase. On the other hand, a negative correlation with Financial Market volatility was observed, suggesting that during times of higher financial market volatility, the variability of ESG Scores impact on profitability tends to decrease.

Model 2, which incorporated industry specific dummy variables in the variance equation, revealed that the Basic Materials, Healthcare, Technology and Financials industries displayed the highest volatility on the ESG Scores impact on profitability. This volatility was statistically significant at a 5% confidence level, suggesting that these industries are experiencing greater fluctuations in their ESG impact, which, in turn, may have a stronger and more variable effect on profitability.

These findings, combined with the existing literature, suggest that ESG Scores while not insignificant, do not always directly translate into higher profitability. The impact varies across industries, and while some sectors show a stronger correlation between ESG practices and profitability, others, such as Healthcare and Financials, still have room to better integrate ESG considerations into their operations. Furthermore, most industries show a tendency toward increasing impacts of ESG Scores on profitability in the later years of the period under analysis, as corporate attitudes toward sustainability and responsible governance evolve.

For further research, it would be beneficial to expand this study across different geographical regions, such as Europe and China, to explore regional differences and industry specific practices in these areas. Additionally, revising this analysis in a few years with updated data could offer insights into how increasing global awareness of ESG issues will further shape industry practices.

A limitation of this study is the inclusion of years when ESG practices were less prominent, which may have influenced the results. Although, given the increasing emphasis on ESG factors in corporate strategies, it is expected that this shift will become even more pronounced in the coming years.

The insights from this study provide valuable guidance for investors and companies looking to implement and enhance their ESG practices. Industries that currently show limited or negative correlations between ESG Scores and profitability may benefit from focusing on improving their sustainable efforts, which could lead to higher long-term profitability. Conversely, industries that already demonstrate a positive correlation can use these insights to assess where their investments are likely to yield the greatest return from ESG initiatives.

In conclusion, this study reinforces the growing importance of ESG Scores in determining corporate profitability. It provides a detailed examination of how different industries are aligning sustainability with financial performance, as well as how macroeconomic trends influence this relationship. Ultimately, it highlights the dynamic and evolving nature of ESG considerations and their increasing significance in shaping the future of global awareness.

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Appendix

Figure 18

Correlation between ESG pillars and EBITDA per Share in the Basic Materials Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Basic Materials Industry. The points in orange are statistically significant at a 5% confidence level.

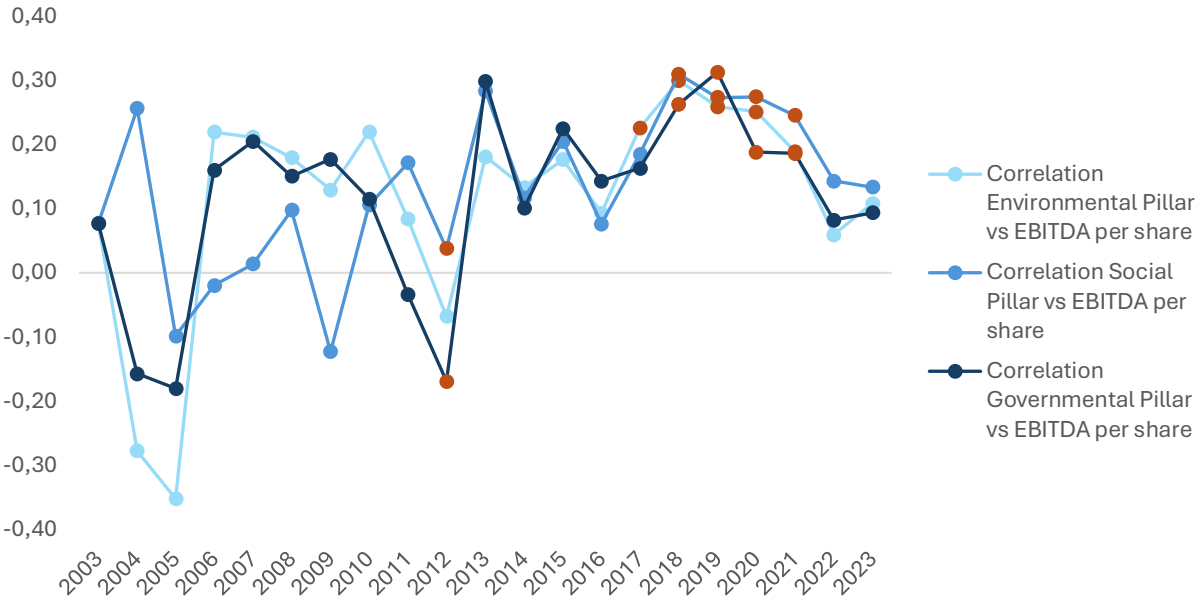

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Table 3

Regression (1) results on the Basic Materials Industry

This table shows the results of the results of regression (1) on the Basic Materials Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	0.02
FY 2004	4.40
FY 2005	5.24
FY 2006	1.17
FY 2007	0.73
FY 2008	-0.68
FY 2009	1.83
FY 2010	2.01
FY 2011	3.35
FY 2012	3.77
FY 2013	1.92
FY 2014	3.15
FY 2015	1.87
FY 2016	2.59
FY 2017	1.96
FY 2018	1.05
FY 2019	0.44

FY2020	0.03
FY 2021	2.18
FY 2022	4.34
FY 2023	2.70
ESG Score * 2004	-0.08
ESG Score * 2005	-0.11
ESG Score * 2006	0.13
ESG Score * 2007	0.15
ESG Score * 2008	0.20
ESG Score * 2009	0.02
ESG Score * 2010	0.01
ESG Score * 2011	0.00
ESG Score * 2012	-0.04
ESG Score * 2013	0.03
ESG Score * 2014	0.00
ESG Score * 2015	0.01
ESG Score * 2016	0.00
ESG Score * 2017	0.03
ESG Score * 2018	0.05
ESG Score * 2019	0.06
ESG Score * 2020	0.05
ESG Score * 2021	0.06
ESG Score * 2022	0.04
ESG Score * 2023	0.04

Figure 19

Correlation between ESG pillars and EBITDA per Share in the Consumer Non-Cyclicals Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Consumer Non-Cyclicals Industry. The points in orange are statistically significant at a 5% confidence level.

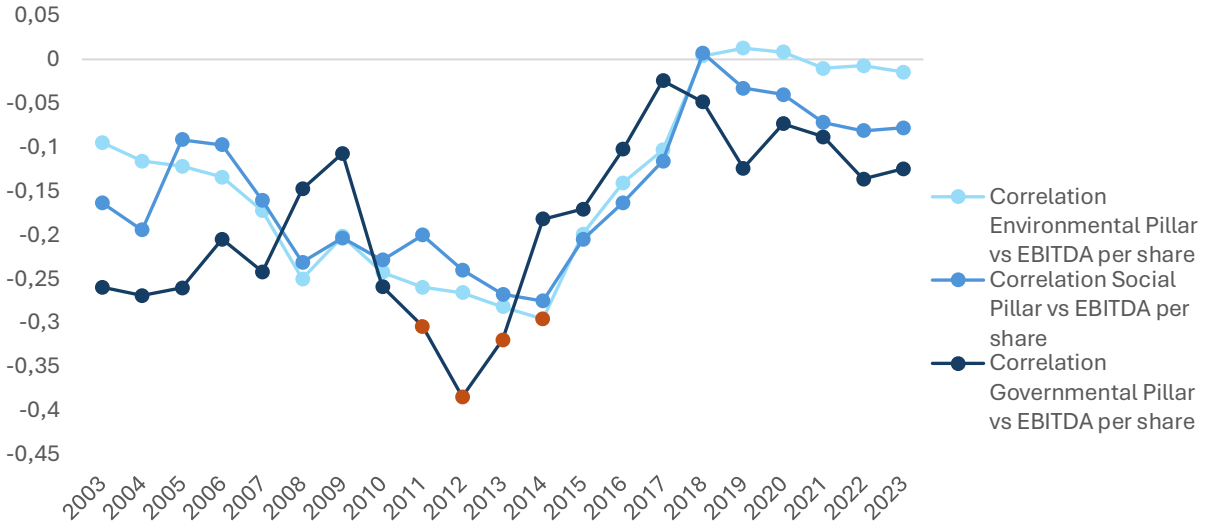

Table 4

Regression (1) results on the Consumer Non-Cyclicals Industry

This table shows the results of the results of regression (1) on the Consumer Non-Cyclicals Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	-28.47
FY 2004	-78.83
FY 2005	19.30
FY 2006	-81.00
FY 2007	607.74
FY 2008	654.80
FY 2009	-227.69
FY 2010	773.05
FY 2011	761.83
FY 2012	1509.52
FY 2013	2049.96
FY 2014	2099.92
FY 2015	1169.26
FY 2016	15.79
FY 2017	-485.15
FY 2018	-743.87
FY 2019	-608.35
FY2020	-709.61
FY 2021	-481.12
FY 2022	-362.23
FY 2023	-233.85
ESG Score * 2004	2.62
ESG Score * 2005	4.74
ESG Score * 2006	12.75
ESG Score * 2007	-1.07
ESG Score * 2008	0.24
ESG Score * 2009	15.34
ESG Score * 2010	-0.14
ESG Score * 2011	0.60
ESG Score * 2012	-9.76
ESG Score * 2013	-18.14
ESG Score * 2014	-17.66
ESG Score * 2015	-5.47
ESG Score * 2016	11.47
ESG Score * 2017	20.02
ESG Score * 2018	27.33
ESG Score * 2019	24.12
ESG Score * 2020	25.03
ESG Score * 2021	21.48
ESG Score * 2022	19.20
ESG Score * 2023	17.55

Figure 20

Correlation between ESG pillars and EBITDA per Share in the Consumer Cyclicals Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Consumer Cyclicals Industry. The points in orange are statistically significant at a 5% confidence level.

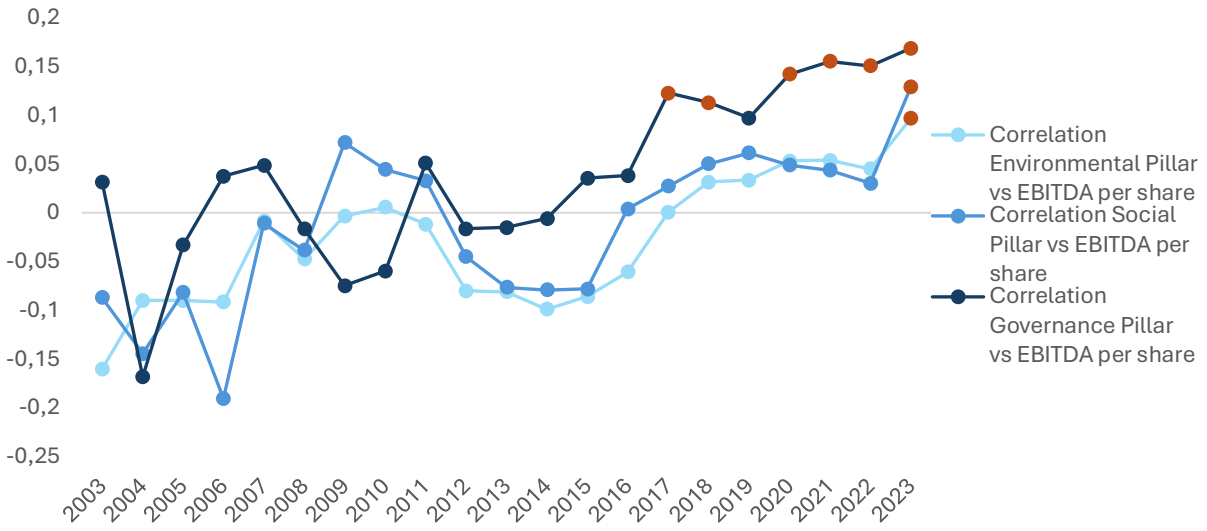

Table 5

Regression (1) results on the Consumer Cyclicals Industry

This table shows the results of the results of regression (1) on the Consumer Cyclicals Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	-0.05
FY 2004	8.61
FY 2005	7.43
FY 2006	6.29
FY 2007	-0.52
FY 2008	-0.93
FY 2009	-1.69
FY 2010	-0.89
FY 2011	-0.75
FY 2012	1.30
FY 2013	3.10
FY 2014	4.65
FY 2015	5.26
FY 2016	2.97
FY 2017	0.16
FY 2018	-0.98
FY 2019	-1.16

FY2020	-4.25
FY 2021	-2.25
FY 2022	-2.18
FY 2023	-21.53
ESG Score * 2004	-0.22
ESG Score * 2005	-0.16
ESG Score * 2006	-0.11
ESG Score * 2007	0.05
ESG Score * 2008	0.03
ESG Score * 2009	0.05
ESG Score * 2010	0.05
ESG Score * 2011	0.05
ESG Score * 2012	0.02
ESG Score * 2013	0.00
ESG Score * 2014	-0.01
ESG Score * 2015	-0.02
ESG Score * 2016	0.03
ESG Score * 2017	0.09
ESG Score * 2018	0.11
ESG Score * 2019	0.12
ESG Score * 2020	0.14
ESG Score * 2021	0.17
ESG Score * 2022	0.19
ESG Score * 2023	0.53

Figure 21

Correlation between ESG pillars and EBITDA per Share in the Energy Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Energy Industry. The points in orange are statistically significant at a 5% confidence level.

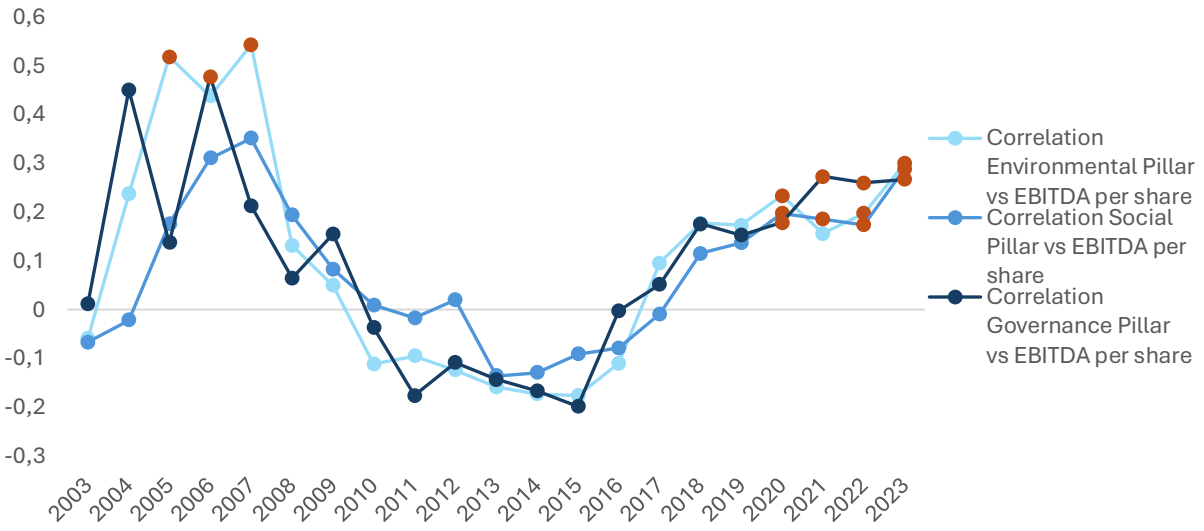

Table 6

Regression (1) results on the Energy Industry

This table shows the results of the results of regression (1) on the Energy Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	-0.02
FY 2004	-1.31
FY 2005	-1.74
FY 2006	-0.66
FY 2007	-0.68
FY 2008	3.60
FY 2009	0.47
FY 2010	11.69
FY 2011	14.56
FY 2012	11.66
FY 2013	20.98
FY 2014	26.09
FY 2015	20.32
FY 2016	2.40
FY 2017	-1.50
FY 2018	-1.96
FY 2019	-2.49
FY2020	-6.21
FY 2021	-4.31
FY 2022	-2.67
FY 2023	-5.42
ESG Score * 2004	0.06
ESG Score * 2005	0.12
ESG Score * 2006	0.13
ESG Score * 2007	0.14
ESG Score * 2008	0.11
ESG Score * 2009	0.06
ESG Score * 2010	-0.07
ESG Score * 2011	-0.11
ESG Score * 2012	-0.07
ESG Score * 2013	-0.26
ESG Score * 2014	-0.35
ESG Score * 2015	-0.34
ESG Score * 2016	-0.06
ESG Score * 2017	0.03
ESG Score * 2018	0.07
ESG Score * 2019	0.07
ESG Score * 2020	0.08
ESG Score * 2021	0.12
ESG Score * 2022	0.19
ESG Score * 2023	0.20

Figure 22

Correlation between ESG pillars and EBITDA per Share in the Industrials Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Industrials Industry. The points in orange are statistically significant at a 5% confidence level.

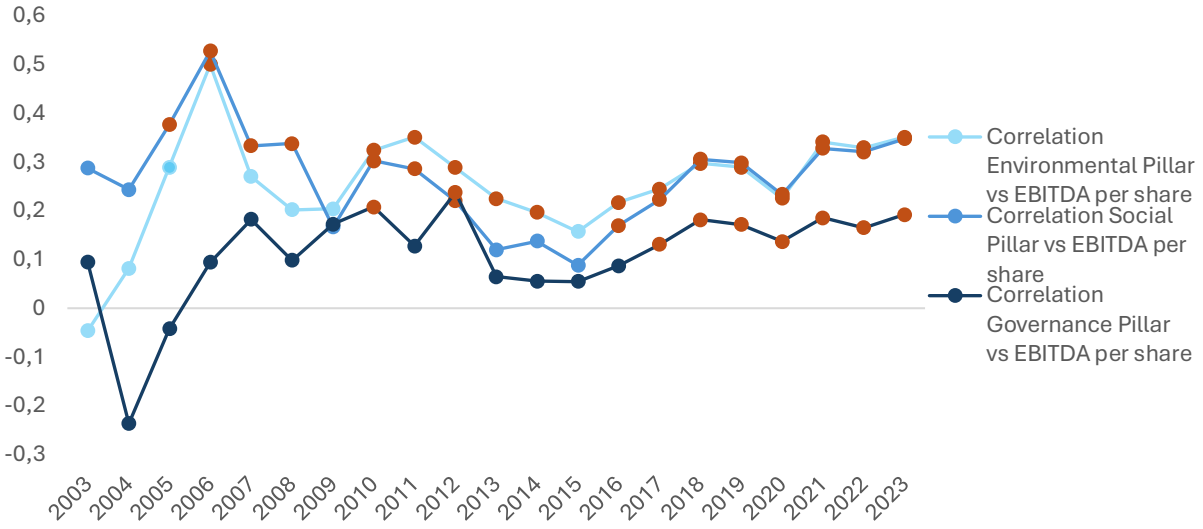

Table 7

Regression (1) results on the Industrials Industry

This table shows the results of the results of regression (1) on the Industrials Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	0.08
FY 2004	1.85
FY 2005	-1.02
FY 2006	-1.72
FY 2007	0.73
FY 2008	0.95
FY 2009	-0.45
FY 2010	-0.96
FY 2011	-0.68
FY 2012	-0.06
FY 2013	1.69
FY 2014	1.75
FY 2015	2.53
FY 2016	0.55
FY 2017	-1.29
FY 2018	-2.12
FY 2019	-2.11
FY2020	-2.50

FY 2021	-3.78
FY 2022	-3.97
FY 2023	-5.78
ESG Score * 2004	-0.07
ESG Score * 2005	0.04
ESG Score * 2006	0.10
ESG Score * 2007	0.03
ESG Score * 2008	0.01
ESG Score * 2009	-0.03
ESG Score * 2010	0.00
ESG Score * 2011	0.01
ESG Score * 2012	0.00
ESG Score * 2013	-0.03
ESG Score * 2014	-0.03
ESG Score * 2015	-0.03
ESG Score * 2016	0.00
ESG Score * 2017	0.03
ESG Score * 2018	0.06
ESG Score * 2019	0.06
ESG Score * 2020	0.03
ESG Score * 2021	0.07
ESG Score * 2022	0.10
ESG Score * 2023	0.14

Figure 23

Correlation between ESG pillars and EBITDA per Share in the Real Estate Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Real Estate Industry. The points in orange are statistically significant at a 5% confidence level.

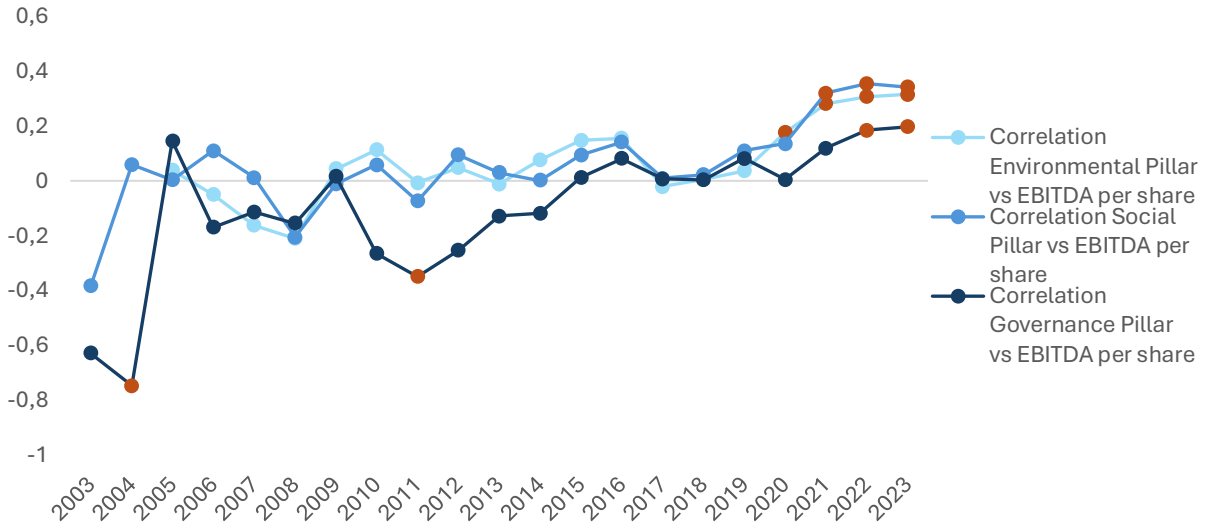

Table 8

Regression (1) results on the Real Estate Industry

This table shows the results of the results of regression (1) on the Real Estate Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	-0.25
FY 2004	-0.02
FY 2005	-5.59
FY 2006	337.40*
FY 2007	2.83
FY 2008	2.86
FY 2009	-5.03
FY 2010	-4.24
FY 2011	-3.78
FY 2012	-4.50
FY 2013	-4.18
FY 2014	-4.51
FY 2015	-5.55
FY 2016	-6.37
FY 2017	-2.33
FY 2018	-4.70
FY 2019	-7.76
FY2020	-15.00
FY 2021	-8.99
FY 2022	-9.66
FY 2023	-9.50
ESG Score * 2004	0.02
ESG Score * 2005	0.33
ESG Score * 2006	-4.19
ESG Score * 2007	0.13
ESG Score * 2008	0.08
ESG Score * 2009	0.26
ESG Score * 2010	0.24
ESG Score * 2011	0.22
ESG Score * 2012	0.24
ESG Score * 2013	0.24
ESG Score * 2014	0.25
ESG Score * 2015	0.27
ESG Score * 2016	0.28
ESG Score * 2017	0.23
ESG Score * 2018	0.26
ESG Score * 2019	0.29
ESG Score * 2020	0.36
ESG Score * 2021	0.29
ESG Score * 2022	0.30
ESG Score * 2023	0.30

Figure 24

Correlation between ESG pillars and EBITDA per Share in the Technology Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Technology Industry. The points in orange are statistically significant at a 5% confidence level.

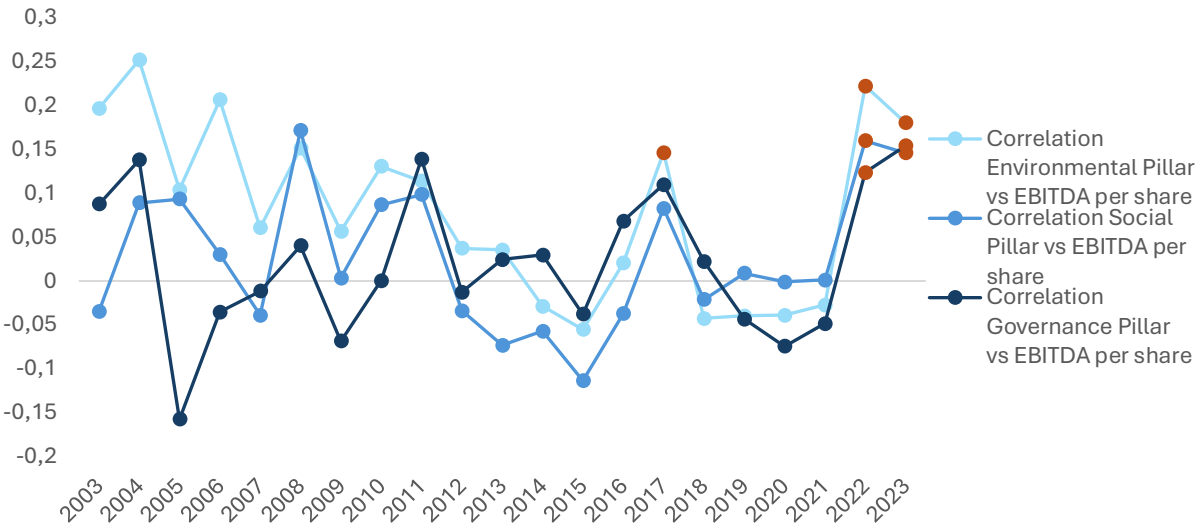

Table 9

Regression (1) results on the Technology Industry

This table shows the results of the results of regression (1) on the Technology Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	0.03
FY 2004	-0.17
FY 2005	0.77
FY 2006	0.95
FY 2007	1.76
FY 2008	0.10
FY 2009	1.48
FY 2010	1.40
FY 2011	0.93
FY 2012	2.42
FY 2013	2.65
FY 2014	2.57
FY 2015	4.07
FY 2016	2.36
FY 2017	0.24
FY 2018	45.26
FY 2019	57.74
FY2020	48.13
FY 2021	18.70

FY 2022	-4.29
FY 2023	-8.16
ESG Score * 2004	0.01
ESG Score * 2005	-0.03
ESG Score * 2006	-0.03
ESG Score * 2007	-0.03
ESG Score * 2008	0.00
ESG Score * 2009	-0.03
ESG Score * 2010	-0.02
ESG Score * 2011	-0.01
ESG Score * 2012	-0.04
ESG Score * 2013	-0.04
ESG Score * 2014	-0.04
ESG Score * 2015	-0.06
ESG Score * 2016	-0.03
ESG Score * 2017	0.01
ESG Score * 2018	0.03
ESG Score * 2019	-0.67
ESG Score * 2020	-0.76
ESG Score * 2021	-0.26
ESG Score * 2022	0.10
ESG Score * 2023	0.17

Figure 25

Correlation between ESG pillars and EBITDA per Share in the Utilities Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Utilities Industry. The points in orange are statistically significant at a 5% confidence level.

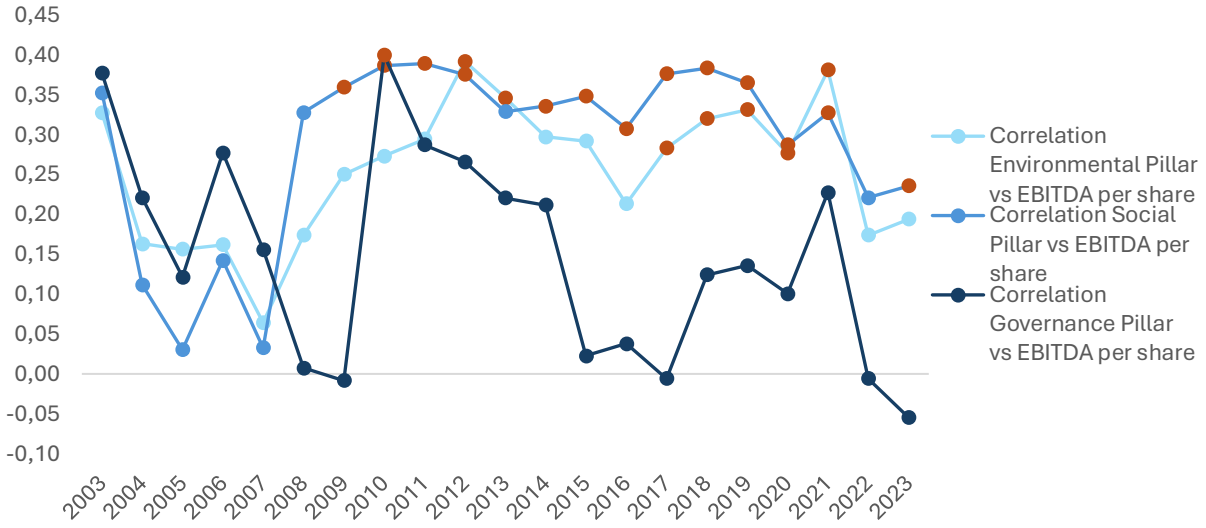

Table 10

Regression (1) results on the Utilities Industry

This table shows the results of the results of regression (1) on the Utilities Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	0.09
FY 2004	1.65
FY 2005	1.94
FY 2006	1.41
FY 2007	2.95
FY 2008	0.87
FY 2009	0.16
FY 2010	-0.56
FY 2011	-0.40
FY 2012	-0.92
FY 2013	-0.49
FY 2014	-0.54
FY 2015	0.97
FY 2016	1.65
FY 2017	1.41
FY 2018	0.19
FY 2019	0.04
FY2020	0.47
FY 2021	-1.46
FY 2022	1.20
FY 2023	1.47
ESG Score * 2004	-0.05
ESG Score * 2005	-0.06
ESG Score * 2006	-0.03
ESG Score * 2007	-0.07
ESG Score * 2008	-0.02
ESG Score * 2009	-0.02
ESG Score * 2010	-0.01
ESG Score * 2011	-0.01
ESG Score * 2012	-0.01
ESG Score * 2013	-0.01
ESG Score * 2014	0.00
ESG Score * 2015	-0.03
ESG Score * 2016	-0.05
ESG Score * 2017	-0.04
ESG Score * 2018	-0.03
ESG Score * 2019	-0.03
ESG Score * 2020	-0.03
ESG Score * 2021	0.02
ESG Score * 2022	-0.03
ESG Score * 2023	-0.03

Figure 26

Correlation between ESG pillars and EBITDA per Share in the Financials Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Financials Industry. The points in orange are statistically significant at a 5% confidence level.

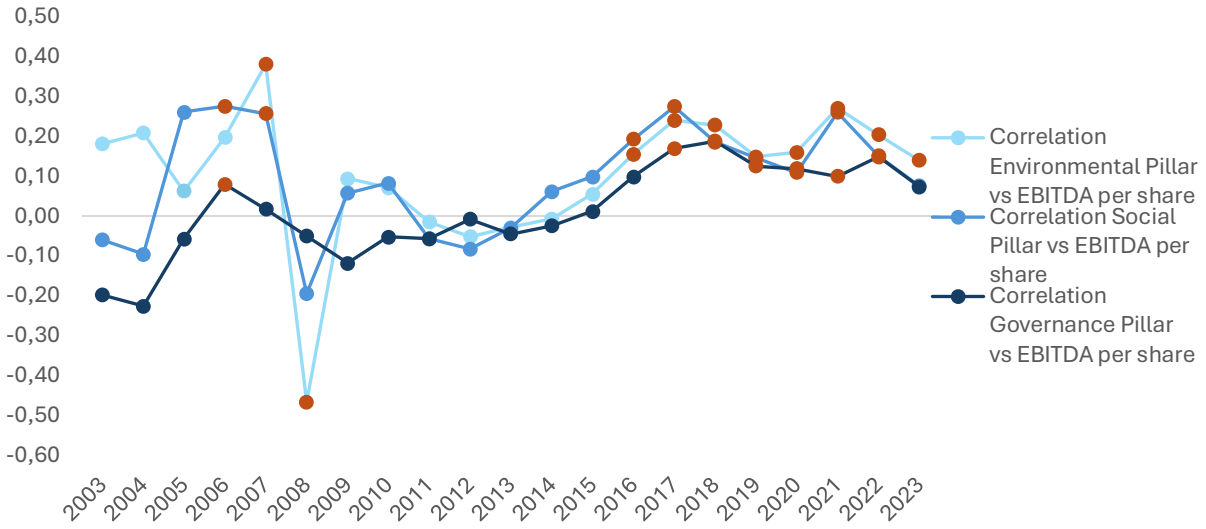

Table 11

Regression (1) results on the Financials Industry

This table shows the results of the results of regression (1) on the Financials Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	-0.17
FY 2004	4.72
FY 2005	-13.04
FY 2006	-24.44*
FY 2007	-24.62*
FY 2008	13.32
FY 2009	-7.18
FY 2010	-8.85
FY 2011	-4.09
FY 2012	-6.94
FY 2013	-6.29
FY 2014	-7.08
FY 2015	-9.43
FY 2016	-12.20
FY 2017	-13.69*
FY 2018	-15.23*
FY 2019	-13.94*
FY2020	-13.80*
FY 2021	-14.79*
FY 2022	-14.25*
FY 2023	-12.68

ESG Score * 2004	-0.10
ESG Score * 2005	0.40
ESG Score * 2006	0.76*
ESG Score * 2007	0.65*
ESG Score * 2008	-0.79*
ESG Score * 2009	0.15
ESG Score * 2010	0.19
ESG Score * 2011	0.10
ESG Score * 2012	0.14
ESG Score * 2013	0.15
ESG Score * 2014	0.18
ESG Score * 2015	0.22
ESG Score * 2016	0.26
ESG Score * 2017	0.29
ESG Score * 2018	0.32
ESG Score * 2019	0.32
ESG Score * 2020	0.31
ESG Score * 2021	0.36
ESG Score * 2022	0.33
ESG Score * 2023	0.29

Figure 27

Correlation between ESG pillars and EBITDA per Share in the Healthcare Industry

The Figure represents the correlation between EBITDA per Share and each one of the ESG Pillars in the Healthcare Industry. The points in orange are statistically significant at a 5% confidence level.

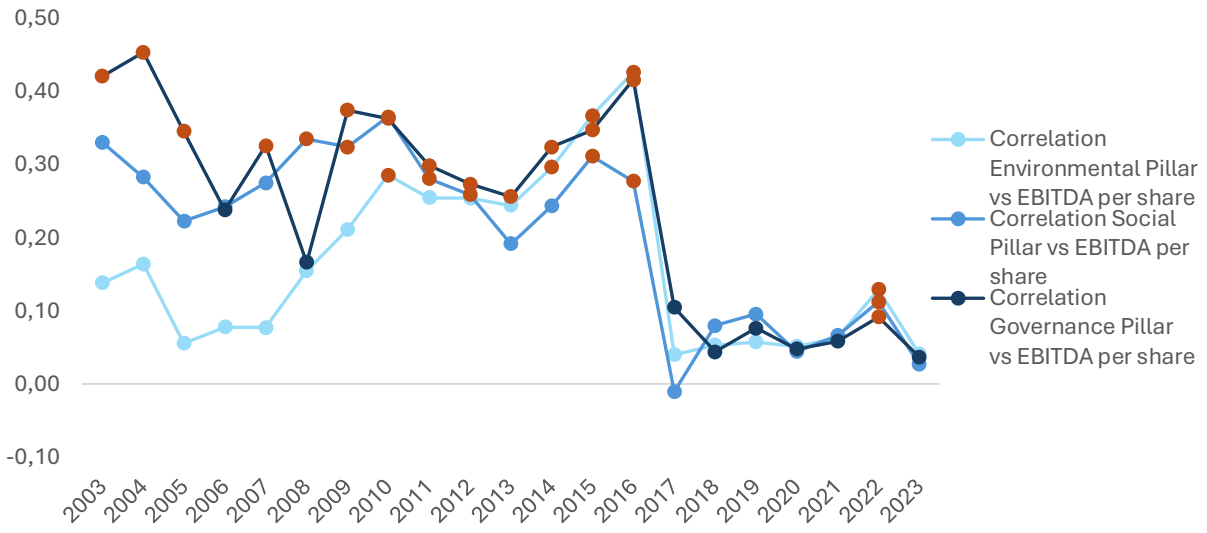

Table 12

Regression (1) results on the Healthcare Industry

This table shows the results of the results of regression (1) on the Healthcare Industry. The significance is indicated with an * for a 5% confidence level.

EBITDA Per Share	Coefficient
ESG Score	0.09
FY 2004	0.79
FY 2005	2.22
FY 2006	2.21
FY 2007	1.67
FY 2008	2.24
FY 2009	1.82
FY 2010	1.75
FY 2011	2.95
FY 2012	3.79
FY 2013	3.97
FY 2014	3.67
FY 2015	1.39
FY 2016	-1.43
FY 2017	-230.05
FY 2018	-166.04
FY 2019	-81.00
FY2020	-67.55
FY 2021	-45.65
FY 2022	-20.48
FY 2023	-45.20
ESG Score * 2004	-0.01
ESG Score * 2005	-0.04
ESG Score * 2006	-0.04
ESG Score * 2007	-0.01
ESG Score * 2008	-0.02
ESG Score * 2009	0.00
ESG Score * 2010	0.00
ESG Score * 2011	-0.01
ESG Score * 2012	-0.02
ESG Score * 2013	-0.02
ESG Score * 2014	0.00
ESG Score * 2015	0.04
ESG Score * 2016	0.09
ESG Score * 2017	4.12
ESG Score * 2018	2.90
ESG Score * 2019	1.58
ESG Score * 2020	1.15
ESG Score * 2021	0.83
ESG Score * 2022	0.36
ESG Score * 2023	0.77