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Sustainability and firm value: A multivariate regression analysis in the clothing industry

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Abstract: Firms, recognizing their Corporate Social Responsibility (CSR), are becoming catalysts for societal change by integrating Environmental, Social and Governance (ESG) criteria into their activities. The fashion industry exemplifies this effort, with an increasing number of companies embracing sustainability and ethical practices. In this context, our purpose is to provide a clear and comprehensive picture of the link between sustainability and business performance in the fashion industry. This work presents a Multivariate Regression Analysis, scrutinizing both external perspectives through stock prices and internal perspectives via profitability indices. Our aim is to discern the intricate relationship between sustainability practices and financial performance within the fashion industry, aligning ESG criteria with long-term economic success. Our regression analysis reveals a significant positive correlation between ESG scores and stock prices, indicating investor recognition of ESG performance as a crucial investment criterion. However, when focusing internally on profitability, the ESG score does not exhibit statistical significance, suggesting a yet-to-be-established connection between ESG policies and corporate profitability. This study underscores the evolving role of companies as sustainability promoters, emphasizing the crucial role of ESG performance in shaping investor perceptions. Nevertheless, it also highlights the need for further exploration into the intricate relationship between sustainable policies and corporate profitability. As businesses increasingly embrace sustainability, in fact, it could become paramount for informed decision-making and fostering ethical societal and environmental progress.

Keywords: sustainability; firm value; price; EBITDA; multivariate regression analysis

1. Introduction

In the last two decades, sustainability has become a central theme for businesses. There is increasing talk of a green world and the consequences that will be faced if a change in direction is not made regarding the excessive exploitation of natural resources. Wanting a more sustainable world does not only mean addressing ecological and environmental issues but making a genuine investment for the future, creating shared value aimed at improving the social and economic conditions of the entire community (Arduini et al., 2023).

From this perspective, it is crucial to pay attention to the activities of businesses which increasingly aim to pursue a purpose of general interest going beyond mere financial dimensions. This purpose includes the integrated and balanced achievement of positive economic, social, and environmental outcomes. It is evident how the sustainability theme has become closely connected to the economic world, especially in recent years, as there is a progressive departure from the traditional business vision focused solely on economic value creation (Cardoni et al., 2024). To date, indeed, there has been an embrace of a more sustainable vision, namely that of business ethics.

In the concrete management of companies, however, it is not always easy to coordinate the objective of a sustainable vision with production needs. The fashion industry, in this way, may be a good example of this convergence path.

Our study seeks to contribute to the ongoing debate, by providing new insights into the effects of ESG policies on fashion industry and filling the gap that exists in the academic literature. The fashion sector has faced the challenge of sustainability in a dichotomous way: On the one hand, high fashion is sensitive to social and environmental issues; on the other, fast fashion is the subject of criticism for some irresponsible behavior, as illustrated below. Despite this awareness, scholars have dedicated a very limited number of empirical research to the analysis of the existing relationship between sustainability and financial performance. Using a Multivariate Regression Analysis, we examine the impact of these policies from two angles: first, by analyzing how they influence a company's intrinsic value as perceived by investors through its price; and second, by assessing their effect on corporate profitability through internal profitability indices and metrics.

The UN Alliance for Sustainable Fashion highlights how the fashion industry is responsible for a significant share of global greenhouse gas emissions. Its share is estimated to be between 8% and 10% (Authors, link in Sitography). Additionally, it is responsible for 20% of global wastewater pollution. These data highlight the negative impact of the industry on air and water quality, as well as on climate change. Another critical aspect emphasized is the underutilization and lack of recycling of clothing. Every year, it is estimated that $500 billion is lost due to the non-reuse or recycling of clothing: 70% of fabrics are made from petroleum derivatives, and only 1% of these are recycled. This contributes to waste production and the depletion of natural resources. Data on the environmental impact of the fashion sector can be heterogeneous due to the vastness and complexity of the industry itself. As stated by the UN Alliance for Sustainable Fashion, 70% of the sector's greenhouse gas emissions come from the supply chain, namely the production phase.

Sustainability in fashion is not only about greenhouse gas emissions but is a much more complex issue that extends beyond "planet boundaries". According to a study by the London-based environmental consulting group The Eco Experts, the most polluting industries based on annual greenhouse gas emissions are, in order: energy, transportation, manufacturing and construction, agriculture, retail of food products, fashion, and technology (Authors, link in Sitography). The report denounces this sector as one of the planet's most polluting, despite the numerous efforts promoted by leading companies to be more sustainable. The sector, in fact, is characterized by an interesting paradox as the numerous scandals that have come to light contrast with the widespread adoption of the Social Accountability 8000 certification aimed at ensuring the well-being of workers.

On one hand, it is one of the sectors most affected by scandals that testify to insufficient support for workers and their fundamental rights. On the other hand, it is also the sector where the Social Accountability 8000 (SA8000) certification is most widely adopted (Authors, link in Sitography). The goal of the standard is to improve working conditions worldwide, ensure ethical sourcing of products and services by promoting ethical behavior along the entire chain, and guide businesses towards choosing suppliers with the same certification. It is a widespread standard that involves

5125 certified facilities, referring to 54 countries and 56 sectors. The SA8000 spurs companies to respect the fundamental rights of workers, offering a significant competitive advantage over competitors. However, on the flip side, there are companies that might undertake this process solely for economic and image-related reasons, as a response to potential tragedies or scandals they could be involved in. The difference is rather subtle and often challenging to discern; only through genuine and sincere commitment from companies is it possible to create a positive impact.

This ambivalent context has guided the study with the aim of better understanding the real impact of ESG policies on the activities of companies operating in this sector. It adopts a dual perspective: an external one through Multivariate Regression Analysis on the price, considering the intrinsic value of companies perceived by investors, and an internal one, through Multivariate Regression Analysis on profitability indices, considering internal accounting metrics of corporate profitability. Furthermore, the analysis will assess the importance of integrating ESG factors not only for companies but also for consumers, as the increasing awareness of sustainability issues is strengthening the fundamental prerequisite of corporate social responsibility, namely a strong social responsibility on the part of the consumer.

Considering this context, we set two *RQs* with the aim to better drive the literature review and the empirical research:
- *RQ1*: How does the integration of ESG policies impact the corporate value and financial performance of companies in the fashion industry?
- *RQ2*: What is the impact of ESG score on price and profitability indexes, such as EBITDA margin, ROE and ROA in fashion industry companies?

2. Literature review

2.1. The path of sustainability as a corporate competitive factor

Studying the impact resulting from the adoption of ESG policies on financial and corporate performance, to date, is central to assessing how sustainability in a company is a source of competitive advantage (Friede et al., 2015; Halbritter and Dorfleitner, 2015; Van Duuren et al., 2016). Indeed, attention to ESG issues is steadily growing because of the increase in structured disclosure based on sustainable and ethical criteria. The path of sustainability, while seeing a notable peak in expression today, has its roots at the end of the last century. The long journey of sustainability began with Brundtland's 1987 report to the World Commission on Environment and Development, "Our Common Future". This report informed the international community of the need to reconcile economic development with environmental protection and defined the need for sustainable development: "In the final analysis, I decided to accept the challenge. The challenge of facing the future, and of safeguarding the interests of coming generations. For it was abundantly clear: we needed a mandate for change" (Brundtland, 1987).

The clear international push toward sustainability also extended to corporate and manufacturing realities. In these years, the impetus toward sustainability gained further momentum, with an increasing number of companies committed to integrating sustainable practices into their operations, recognizing the long-term benefits of sustainability, not only in terms of positive impact on the environment, but also in

terms of operational efficiency and resource management (Berke and Conroy, 2000). Cleaner and more sustainable technologies have become accessible, encouraging innovation and transformation of production processes. According to Berke and Conroy (2000), in this context, sustainability has become not only an ethical imperative but also a key element in corporate competitiveness, with companies increasingly understanding that operating sustainably is essential to their own long-term survival and success (Brammer and Millington, 2008).

As defined by Elkington (1998), sustainability is not always easy to measure and evaluate. However, this cannot be separated from being considered an essential factor to be integrated into corporate strategies and policies. For the first time, based on what has been stated, a concrete interest has been established with respect to not only profit making, but contextually, care towards sustainability and ethical practices. The model of the 3Ps: Planet, people and profit, becomes relevant for any profit-oriented entity, as it constitutes a new crucial element for investors (Elkington, 1998).

In the 2000s, however, one of the main problems related to sustainability assessment was the lack of uniform global standards and clear indicators for measuring the environmental and social impact of corporate activities (Berg et al., 2022). According to the prestigious study "Aggregate Confusion" by Berg et al. (2022), this lack of uniformity made it difficult for companies and investors to meaningfully compare sustainable performance and assess the real positive or negative impact of an organization on the environment and society. Indeed, in the absence of defined standards, some companies could present their efforts in a misleading or confusing way, making it difficult for consumers and investors to discern between actual sustainable practices and "greenwashing", or misleading or exaggerated communication of environmental initiatives to enhance corporate image. Despite these advances, the challenge of sustainability assessment remained complex, as companies operated in diverse contexts and environmental and social issues were inherently complex. Thus, the need for a comprehensive and standardized approach to sustainability assessment was a critical issue during this historical period.

In this scenario, the acronym ESG was born, and it has taken on a global political connotation and, simultaneously, an important status due to the increasingly significant growth of sustainability and Non-Financial Reporting. In fact, the term ESG was first used in the report "Who Cares Wins—Connecting Financial Markets to a Changing World" made by the UN (UN, 2004). For the first time, the issue of sustainability assessment took shape, and a contextual awareness began to be gained about how sustainability needs financial indicators directed at effective and efficient measurement, which had been absent until then. The goal of ESG metrics, in fact, is to offer a specific assessment paradigm for the three corporate areas: Environmental (E), Social (S) and Governance (G), to offer a clear and orderly assessment view, for the benefit of all stakeholders (Lopes et al., 2017).

To date, the evaluation of sustainability is more relevant than ever, above all, in the European context. In Europe over the past decade, the topic of sustainability has attracted the efforts of legislators to establish norms and standards for its definition (Baumüller and Grbenic, 2021). In 2014, Directive 2014/95/EU, also known as the Non-Financial Reporting Directive (NFRD), represented an important milestone in the European regulatory-accounting environment (Biondi et al., 2020). Indeed, for the first

time, sustainability was also interpreted from an accounting perspective. A few years later, the 2022/2464/EU—Corporate Sustainability Reporting Directive (CSRD), replaced the previous NFRD by establishing more stringent qualitative and quantitative requirements for sustainability reporting and, also, introducing a new European Sustainability Reporting Standard issued by the European Financial Reporting Advisory Group (EU Parliament, 2022). Among the main efforts of the European Union, in line with the new green taxonomy, is the timely definition of the three ESG pillars (Beerbaum, 2021). Specifically:

- Environmental (E): Mitigation of and adaptation to climate change, water and marine resources, resource use and circular economy, pollution, biodiversity and ecosystem protection;

- Social (S): Equal opportunities for all (including gender equality), working conditions (including safe employment, wages and social dialogue) and respect for human rights and fundamental liberties;

- Governance (G): Equal opportunity for all (including gender equality and equal pay for equal work, training and skills development, employment and inclusion of people with disabilities), the role of the company's BoD, business ethics and corporate culture (including anti-corruption), relations with the public administration, relations with business partners and internal control/risk management systems.

The consideration is an example of how the quantitative nature of sustainability is relevant today. It is an expression of what is currently expressed by ESG indicators and is based on fundamental concepts expressed through clearly defined objectives. Explicit reference is made to the 17 Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda, which aim to design a better future for the benefit of new generations. As mentioned earlier, sustainability assessment is now a central issue, and new models and methods of measurement are being introduced for it. While the SDGs qualitatively define the goals of action, ESG indicators provide metrics for measurement. These indicators are not an end in themselves but are the basis for a rating value expressed by the judgment of a third-party company. Therefore, ESG indicators, along with ratings, are an important element in investors' preference for one investment choice over another (Abate et al., 2021; Antocic, 2021).

The relationship between sustainability and financial performance has been the subject of numerous studies, which have explored the link between the adoption of ESG policies and corporate results (Alareeni et al., 2020; Eccles et al., 2014; Flammer, 2015; Friede et al., 2015; Khan et al., 2016). Friede et al. (2015) conducted a meta-analysis of over 2000 empirical studies, finding consistent evidence that ESG practices lead to better financial outcomes. These results are supported by evidence indicating that ESG policies can reduce corporate risks, improve reputation and stimulate innovation, thus contributing to an improvement in financial performance (Khan et al., 2016). Moreover, studies like that of Flammer (2015) have shown that the announcement of a commitment to sustainable practices by companies is followed by a significant increase in stock value, suggesting that the market reacts positively to news related to sustainability efforts. These results highlight not only a direct link between sustainability and financial performance, but also, how the market's perception of ESG practices positively influences the valuation of companies. Despite

the evidence of a positive link, some studies have raised issues regarding the variation in results depending on the sector, geography and the ESG evaluation methodology used. For example, Eccles et al. (2014) found that companies with high ESG performance outperform their peers in the long term, but such results can vary significantly depending on the operational context and the strategies for implementing sustainability practices.

Indeed, investors are increasingly inclined to consider the benefits, including economic benefits, of a medium and long-term "sustainable" approach. The topic of the link between ESG criteria and economic-financial performance, however, is characterized by methodological difficulties regarding the measurement of companies' ESG performance (Krüger, 2015). With respect to the most used indicators, in line with the literature reviewed, we seek clarity in the next subsection (2.2).

2.2. ESG performance measurement

In accordance with the literature reviewed, we are witnessing a shift in the valuation of company performance and business worth; nowadays companies are increasingly judged as systems that aim to meet the needs of all stakeholders (Friedman and Miles, 2006). The adoption of the stakeholder approach represents an important paradigm shift as it marks the overcoming of the traditional "business" view focused on mere profit while overlooking social responsibility.

The integration of ESG factors into traditional valuation methods is, in fact, a response to growing investor and stakeholder awareness of the importance of corporate sustainability. This integration is motivated by the recognition of the ability of ESG factors to influence financial performance over the long term. For this reason, they must be considered when assessing the value of a company (Baumüller and Grbenic, 2021).

Considering current sociocultural changes, the valuation of a company's economic capital cannot only reflect market magnitudes (multiples) and/or values contained by Discounted Cash Flow (DCF) forecast plans, but also ESG performance, which can be considered a premium to be added to traditional valuation metrics, reflecting recognition of the value generated by sustainable and responsible management. Integrating ESG performance into the valuation of business, in fact, can allow for a more complete and accurate assessment of corporate value (Damodaran, 2012); however, it is important to ensure that reliable ESG data are available and that appropriate metrics are defined to achieve an accurate valuation. In DCF, a common approach to incorporate ESG factors is to adjust the company's future cash flows (Bos, 2014). According to Bos (2014), if a company has a low ESG rating, a higher discount rate can be applied to reflect the higher risk associated with ESG issues. This results in a lower valuation through DCF for the company. In the multiples method, on the other hand, a company with good sustainability performance may benefit from an additional premium to the multiple used for valuation. This premium reflects the value placed on the company's positive ESG profile and can lead to a higher valuation. Incorporating these aspects into the company valuation helps to promote more sustainable and responsible management that considers the interests of all stakeholders and not just short-term financial value.

The topic of the influence of ESG pillars on business value was also analyzed in the literature from an empirical perspective. In accordance with Cardoni et al. (2024), interest in the concept of sustainable value has significantly grown within the academic landscape. Moreover, sustainable value emphasizes the importance of integrating short, medium and long-term goals, as opposed to an exclusive focus on the short term. The drivers of sustainability have also evolved, becoming more inclusive and considering issues related to the triple bottom line concept, rather than being limited to only environmental concerns of the early 2000s (Cardoni et al., 2024). In accordance with this thesis, we underline how some studies have linked sustainability and performance, using financial indicators; particularly, some authors have shown positive correlation between the assessment of economic capital and sustainability from an empirical perspective (Altahtamouni et al., 2022; Hamdan and Alareeni, 2020; Jain et al., 2014; Manescu, 2011).

In general terms, ESG indicators would also have a direct impact on corporate profitability, as evidenced by numerous studies that correlate the latter with the ability of the companies examined to generate wealth (Manescu, 2011). In this sense, another useful indicator that makes it meaningful report evident is the Return on Asset (ROA). According to the study by Jain et al. (2014), ROA is significantly higher in all entities that pay attention to sustainability, compared to those that do not integrate it into their strategy. Moreover, the Return on Equity (ROE) is certainly among the most significant indicators supporting sustainable growth, as it is one of the most important influential variables measuring the value of asset turnover (Altahtamouni et al., 2022). According to the study by Altahtamouni et al. (2022), the results showed that sustainability has a huge impact on the ROE indicator because sustainable growth, with reference to Saudi banks, is closely related to their profitability and efficiency.

Hamdan and Alareeni (2020), by studying the companies that make up the SandP 500 index with a multifactor regression model, shows that non-financial ESG reporting is positively correlated with companies' operational, financial, and market performance (ROA and ROE). The analysis conducted is an example of a portfolio analysis to study the relationship between sustainability and economic performance. In the study, the authors consider the SandP 500, an index representing the 500 largest publicly traded companies in the USA, creating two separate portfolios: A high-pollution portfolio and a low-pollution portfolio. Next, the authors analyze the returns of these two portfolios over time to assess whether there are significant differences in performance between the two groups of companies. The results of the analysis show that investors who choose to invest in low-pollution companies achieve the same or even better returns than investors who choose higher-pollution companies (Hamdan and Alareeni, 2020). In cross-sectional/panel data studies, in fact, data from a sample of firms at a given point in time (or over time) are analyzed. This type of study evaluates the relationship between ESG performance and firm financial performance and considers various factors that may influence firm size and/or industry.

The evidence reported in this section agrees that companies that pay attention to sustainability and ethics can perform better financially than those that neglect these aspects. This empirical evidence, therefore, challenge the idea that attention to environmental and social issues conflicts with profit creation, overcoming the theory that requires the company to focus exclusively on maximizing profits for shareholders

while considering any other aspect deviant. The increase in economic value, then, could be traced to the increase in reputation and improved quality of business processes that results from integrating sustainability principles into business strategies.

2.3. ESG in the clothing industry

ESG factors, in accordance with the analyzed literature, are also a relevant evaluation element in the fashion industry and, in particular, the apparel industry (Aich et al., 2021; Castro and Gradillas Garcia, 2022; Escrig-Olmedo et al., 2017; López Sarabia et al., 2021; Liu et al., 2023; Yu et al., 2023; Zioło et al., 2023). Indeed, on the one hand, this sector experiences innumerable challenges inherent to sustainability and ethics related to research and use of materials (organic and eco-friendly), reduction of carbon footprint in the production chain, use of energy and water resources, and, finally, in social responsibility (both inside and outside the company) (Yu et al., 2023). On the other hand, at the same time, the apparel industry is subject to exacting demands in sustainable environmental choices and ethical procedures from consumers and investors (Liu et al., 2023).

Based on the above, awareness of the environmental and social impact in the apparel industry is prompting many companies to review their practices. Thus, researching and adopting sustainable materials, reducing carbon emissions, and implementing ethical practices are becoming not only a necessity to remain competitive, but also a way to meet the growing expectations of consumers and investors (Aich et al., 2021; Escrig-Olmedo et al., 2017). In addition to this, for an industry known for rapid change and large-scale production, the integration of ESG values represents a challenge, but also an opportunity to redefine the concept of fashion, transforming it into a more responsible and conscious sector (Shakil, 2022).

Over the past two decades, the integration of ESG factors has favored making the fashion world more environmentally conscious and more respectful of human rights (Castro and Gradillas Garcia, 2022). Companies are focusing on creating transparent and ethical supply chains, ensuring that every step, from raw material sourcing to production and distribution, meets ethical and environmental standards. In parallel, social responsibility implies ensuring fair labor practices throughout the supply chain, including fair wages, safe working conditions and respect for workers' rights. Fashion brands, more so than others, are increasingly under the lens in terms of their focus on employees to foster diversity and inclusion (Castro and Gradillas Garcia, 2022). This affects not only their workforce, but also their advertising and marketing strategies, promoting diversity and breaking clear legacy stereotypes of the past (López Sarabia et al., 2021).

This evolution in the fashion world represents a significant shift, as attention to ESG factors not only improves the environmental impact of the industry, but also the lives of those involved throughout the supply chain. Transparency becomes a currency of exchange, and increasingly informed consumers can make informed choices. Moreover, the emphasis on diversity and inclusion not only reflects the right social direction, but can also lead to a more diverse and creative market (Chowdhury et al., 2022). A fashion industry that embraces diversity not only in its internal practices, but

also, in its external representation contributes to building a more inclusive and receptive society (Chowdhury et al., 2022).

Assessing economic capital in fashion by incorporating ESG criteria involves a broad and sustainable perspective on business performance (Liu et al., 2023; Zioło et al., 2023). This involves, as stated, operational efficiency, sustainable supply chain management, and innovation in materials and processes. On the social side, on the other hand, it would involve creating value through CSR, ensuring safe working conditions and respect for human rights (López Sarabia et al., 2021). Indeed, economic capital includes not only financial aspects, but also those related to brand, reputation, intellectual property and other intangible assets that contribute to the overall value of a company (Liu et al., 2023; Zioło et al., 2023). In the fashion context, where brand value can be crucial, the valuation of economic capital takes several factors into account (Zioło et al., 2023). Brand reputation, customer loyalty, innovation in design and production, and market presence are all considered in the assessment. In addition, the increasing focus on sustainability and social responsibility can influence the perception of a company's economic value in the fashion industry (Escrig-Olmedo et al., 2017). Indeed, companies that successfully integrate sustainable and ethical practices can enjoy a competitive advantage that can be reflected in the valuation of their economic capital.

Integrating ESG factors into the assessment of economic capital can present some challenges. First, quantifying aspects related to the environment, sustainability, and social responsibility can be complex (López Sarabia et al., 2021). Many of these factors are intangible and not always measurable accurately in traditional financial terms. In addition, there is often a lack of uniform standards and clear metrics for assessing ESG impacts (Arduini and Beck, 2023). According to Cardoni et al. (2024), this can make it difficult to compare companies and create a standardized valuation of business value that fairly accounts for these factors.

In conclusion, integrating ESG assessments into the evaluation of economic capital in fashion not only reflects a commitment to sustainability, but can also lead to long-term benefits. A positively ESG-rated company could attract sustainable investors, increase consumer confidence, and mitigate risks related to environmental and social issues. It is crucial at this point to understand what relationship exists between ESG scores and performance in the clothing industry. We explicate this objective in our Empirical Analysis (Section 4), making the assumptions indicated in the Methodology section (Section 3) with reference to the statistical tools used.

3. Methodology

The focus of the paper is to investigate the relationship between ESG scores and the business performance of companies operating within the clothing industry. To ensure this, we applied a powerful statistical study consisting of two multivariate regression analyses.

Our purpose, in accordance with the literature reviewed, is to provide a dual reading of the sample under analysis (Bodla and Verma, 2006; Husain and Sunardi, 2020; Ionescu et al., 2019; Lo and Lys, 2000). Indeed, on the one hand, we focused on an external perspective by performing a Multivariate Regression Analysis on price,

considered a proxy of business value (sub-section 3.1). Next, we focused on an internal perspective by applying a Multivariate Regression Analysis on profitability ratios (sub-section 3.2). For clarity of explanation, we leave room for the definition of the sample, and the database selected, in section 4 (Empirical Analysis). Section 4, in fact, will be divided in: Composition of the Sample (sub-section 4.1), Database (sub-section 4.2) and Correlation, Multicollinearity and Heteroschedasticity study (sub-section 4.3). This division let us show our Results in section 5.

3.1. Multivariate regression analysis on price

The first part of the empirical study is a multivariate price regression analysis that is based on Ohlson's model (Lo and Lys, 2000; Ohlson, 1995). This model, widely used in international literature, argues that the market value of firms can be determined by a linear combination of the book value of equity (book value) and net income (earnings) (Barth and Clinch, 2009; Silvestri and Veltri, 2012).

In the analysis conducted, to assess the relevance of ESG scores, Ohlson's model was extended through the inclusion of a third variable (ESG score) to test the value relevance of environmental, social, and governance performance. The development of this model, although applied to a new field of analysis, has already been widely used in international literature (Ionescu et al., 2019; Lisin et al., 2022; Son and Lee, 2019).

To make Ohlson's model applicable to our study, with the aim of mitigating the scale effect caused by the different sizes of the companies analyzed, we began by normalizing the variables included in the model by standardization per share (Latane and Jones, 1977; Patell, 1976). According to Patell (1976), standardization per share consists of dividing each variable by the number of shares outstanding to obtain unit values per share. This approach helps to neutralize the effect of firm size and allows for more meaningful comparisons between companies, enabling a more accurate assessment of the effect of variables on market value (Latane and Jones, 1977).

Based on the above, we report below the formula we applied for the statistical study:

$$Price_{i,t+1} = \alpha + \beta_1 BVPS_{i,t} + \beta_2 EPS_{i,t} + \beta_3 ESG_{i,t} + \beta_4 Size + \varepsilon_{i,t} \qquad (1)$$

where: $Price_{i,t+1}$ = the share price of company i in $t + 1$, corresponding to a date posthumous the approval of the financial statements for all companies in the sample (06.05.2023); α = the constant (intercept), which corresponds to the market component that is independent from the regressors; $\beta_1, \beta_2, \beta_3, \beta_4$ = the angular coefficients of the BVPS, EPS, ESC score and the control variable size; $BVPS_{i,t}$ = the book value of equity per share (book value per share) of company i in t, corresponding to the balance sheet closing date; $EPS_{i,t}$ = the book value of net income per share (earnings per share) of company i in t, corresponding to the balance sheet closing date; $ESG_{i,t}$ = ESG score of company i in t, corresponding to the balance sheet closing date; $Size$ = dimensional type control variable (size) related to the value of total assets transformed to logarithmic base; $\varepsilon_{i,t}$ = the error term.

Before proceeding with the regression analysis, it is good practice to conduct a descriptive study of the chosen variables. This type of analysis, shown in **Table 1**, provides an overview of the characteristics of the variables and helps to understand

their distribution, providing crucial support for the interpretation of the relationships resulting from the statistical regressions.

Table 1. Descriptive statistics variables (price regression).

	Price (06.05.2023)	Eps	Bvps	Total Asset (Eur/000)	Esg Score
Average	68.03	3.3	23.41	61,524.13	53.87
Median	16.28	1.54	10.74	1	53.22
Standard Deviation	216.23	6.1	53.37	19	18.46
Kurtosis	52.63	12.35	36.05	−39	0.93
Asymmetry	6.76	3.27	5.64	6	0.08
Min.	−0.06	5.59	0	44	15.94
Max.	1918.38	32.12	422.93	134,646,000	91.89
N°	108	108	108	108	108

The analyzed sample has an average market price level of 68.03 euros per share, reaching a peak value of 1918.8 euros. The Standard Deviation of 216.23 indicates significant variability in stock prices within the dataset compared to the mean. Using the kurtosis index allows for measuring the thickness of the tails of a distribution. The kurtosis and skewness indicate a distribution of values that deviates from a symmetric normal distribution, highlighting instead a leptokurtic distribution with a long tail towards positive values, a strongly right-skewed distribution of share price values.

Regarding the EPS, the standard deviation of 6.10 suggests that values in the dataset are relatively dispersed around the mean of 3.30, unlike BVPS values whose greater variability is emphasized by a standard deviation of 53.37. The kurtosis and skewness indicate a distribution of values for both variables that deviates from normal towards a right-skewed distribution, with a longer tail towards positive values.

Similar considerations can be made for the total assets of the companies, showing considerable variability and a non-normal right-skewed distribution. Finally, from the analysis of ESG scores, it is evident that values in the dataset are distributed quite widely around the mean of 53.87. According to Refinitiv, this value indicates a relatively good ESG performance and a transparency level above the average in publicly reporting relevant ESG data. The negative kurtosis value suggests a slightly flatter curve than normal. However, it is important to note that the skewness of 0.08 is relatively small, indicating only a slight deviation to the right from symmetry. Furthermore, the similarity between the mean and median suggests a relatively stable distribution of ESG scores without extreme values significantly influencing the measure of central tendency.

3.2. Multivariate regression analysis on profitability ratios

In the second part of the study, however, a multivariate regression analysis was conducted on the profitability indices. Again, we applied a statistical model already used in the international academic literature (Bodla and Verma, 2006; Husain and Sunardi, 2020). In this model, we alternately chose EBITDA margin, ROE and ROA as dependent variables, while the ESG score as well as control variables such as

Market Capitalization (Mkt. Cap.), Debt Equity ratio (D/E) and Asset Turnover were used for the independent variables.

$$ROE_{it} = \beta_0 + \beta_1 DebtRatio_{it} + \beta_2 MarketCap_{it} + \beta_3 AssetTurnover_{it} + \beta_4 ESGScore_{it} \qquad (2)$$

$$EBITDA\ margin_{it} = \beta_0 + \beta_1 DebtRatio_{it} + \beta_2 MarketCap_{it} + \beta_3 AssetTurnover_{it} + \beta_4 ESGScore_{it} \qquad (3)$$

The selection of these variables is supported by several research studies, including that conducted by Alareeni and Hamdan (2020). The scholars have shown that by incorporating these control variables into the analysis, it is possible to consider and isolate the effect of the ESG score on the financial performance of companies (Alareeni and Hamdan, 2020).

In particular, the size of the company may influence its ability to generate income and address industry-specific challenges. The degree of debt, on the other hand, may reflect the company's ability to manage its debt and financial obligations. Finally, asset turnover can indicate the company's operational efficiency and its ability to make optimal use of available resources. This contributes to a more accurate assessment of the impact and importance of ESG criteria on the company and its performance.

The regression analysis is preceded by a descriptive study of the selected variables (**Table 2**), which provides a meaningful picture of the magnitudes considered and fundamental support for the interpretation of the results obtained from the statistical analyses.

Table 2. Descriptive statistics variables (profitability indices regression).

	Ebitda Margin	Roe	Roa	Total Asset (Eur/000)	Asset Turnover	D/E Ratio	Esg Score
Average	0.15	27.89	6.75	11,667,488	1.14	0.47	53.87
Median	0.14	22.32	6.24	937	1.16	0.19	53.22
Standard Deviation	0.1	80.77	9.97	40,720,226	0.39	1.34	18.46
Kurtosis	0.6	57.93	9.34	43	0.98	−21.8	0.93
Asymmetry	0.67	−6.13	1.48	6	0.46	4.22	0.08
Min.	−0.04	−216.27	50.27	19	0.29	−0.73	15.94
Max.	0.48	740	32.88	342,164,677	2.56	9.09	91.89
N°	108	108	108	108	108	108	108

The standard deviation of 9.97 for ROA suggests that values in the dataset are relatively dispersed around the mean of 6.24, unlike ROE values whose greater variability is emphasized by a standard deviation of 80.77 (**Table 2**). The distribution of ROE appears to be leptokurtic with significant positive skewness characterized by a right-tail, while ROA exhibits negative skewness with a left-tailed distribution. The tendency of data to vary around the mean decreases in the analysis of EBITDA, defined by a distribution that deviates from normality, being positively skewed and tending towards leptokurtic.

Finally, as previously stated, the analysis of ESG scores in the dataset suggests that the companies considered generally have a good ESG performance, highlighted by the mean of 53.87. The distribution tends to be platykurtic with slight positive skewness.

4. Empirical analysis

Based on the premises given in the Methodology (Section 3) of this study, we present the static survey we conducted. For clarity of exposition, we decided to divide this section into three sub-sections. In 4.1, we focus on the definition of the sample. In sub-section 4.2 we set our database. Next, in 4.3, we present the statistical study conducted.

4.1. Composition of the sample

The sample analyzed consists of 108 listed companies operating in the apparel industry, relating to the following countries: U.S. (58), U.K. (13), Italy (11), Germany (5), Canada (4), Switzerland (4), France (4), Sweden (3), Denmark (2), Finland (2), Belgium (1) and Spain (1). Our selection derived from a macro-sample of 266 companies, classified by Thomson Reuters as operating in the sectors: "Apparel and Accessories", "Apparel and Accessories Retailers", "Footwear" and "Textiles and Leather Goods", from which companies that did not have the data under analysis, such as ESG scores, were excluded.

The decision to include in the sample companies from a variety of countries presents a unique opportunity to capture the diversity of ESG practices and policies within the apparel industry. This approach allows for a comprehensive exploration of how cultural and regulatory differences influence the adoption of sustainable strategies. Therefore, the geographical variety of the sample can be seen as a strength, offering the chance to identify emerging trends and best practices in sustainability in Europe.

4.2. Database

The main focus of this study revolves around ESG scores, derived from Datastream, an economic/financial database given by Refinitiv, considered one of the most important internationally. It is crucial to emphasize that sustainability assessment and ESG ratings can vary among different agencies and data providers, potentially impacting empirical analysis. To mitigate the heterogeneity and inconsistency of sustainability ratings, one of the most reliable rating agencies in the industry, Refinitiv -Thomson Reuters, was utilized as a solid benchmark for ESG analysis. Economic and financial data, on the other hand, originate from Orbis, a database by Bureau van Dijk. Orbis is an extremely comprehensive database providing detailed financial information on over 450 million companies and entities worldwide. Beyond delivering comparable and reliable information, Orbis meticulously collects, processes, and standardizes a vast amount of data from over 170 international information providers and hundreds of other internal sources. The period of extraction and processing of our data refers to June—September 2023.

4.3. Correlation, multicollinearity and heteroschedasticity

To allow the multiple regression model to be used, the independent variables must be uncorrelated with each other; correlation tests of the variables used were conducted to confirm this assumption (**Tables 3** and **4**).

Table 3. Correlation tests (price regression).

	PRICE (06.05.2023)	**BVPS (log.)**	**Size (log.)**	**EPS**	**ESG Score**
Price	1				
BVPS (log.)	0.79	1			
Size (log.)	0.58	0.43	1		
EPS	0.68	0.57	0.5	1	
ESG Score (log.)	0.38	0.18	57	0.31	1

Table 4. Correlation tests (profitability indexes regression).

	EBITDA	**ROE**	**ROA**	**D/E Ratio**	**MKT. CAP. (log.)**	**Asset Turnover**	**ESG Score (log.)**
EBITDA	1						
ROE	0.25	1					
ROA	0.54	0.63	1				
D/E Ratio	−0.12	0.39	−0.09	1			
MKT. CAP. (log.)	0.56	0.06	0.28	−0.14	1		
Asset Turnover	−0.38	0.33	0.32	0.07	−0.26	1	
ESG Score (log.)	0.34	0.09	0.24	−0.05	0.6	−0.08	1

In general, the results indicate the absence of significant levels of correlation that could compromise the validity of the analysis. The results in **Table 4** emphasize a positive relationship between the ESG score and the three different dependent variables, accompanied by three different intensities. The correlation appears to be stronger between the ESG score and EBITDA. Moreover, the results indicate the absence of significant levels of correlation that could undermine the validity of the analysis.

Conducting multicollinearity tests definitively averted the presence of the high-intensity correlation between the independent variables in the regression models, presenting variance inflation factor (VIF) values below 5. Low values of VIF indicate that there are no serious problems of multicollinearity among the independent variables in regression models, suggesting, therefore, the absence of significant multicollinearity. In general terms, VIF measures how much the variance of an estimated regression coefficient increases when predictors are correlated. A VIF of 5, or less, is often considered acceptable and indicates that the variance of a coefficient is only 5 times larger than it would be if the variable were uncorrelated with the other predictors. The 1/VIF measure, known as "Tolerance", is often used to examine multicollinearity in regression models. Tolerance is calculated as the inverse of the VIF for each independent variable. This transformation is done to provide an intuitive indication: the lower the Tolerance value, the greater the presence of multicollinearity. If the Tolerance is close to 1, it indicates that the independent variable has low multicollinearity with the other variables because the VIF is low. On the other hand, if the Tolerance is close to 0, it suggests that the variable is strongly correlated with at least one of the other independent variables. For all these reasons our test (**Table 5**) gives us the opportunity to go ahead in the study.

Table 5. Multicollinearity test.

Price regression	VIF	1/VIF
BVPS	1.57	0.64
Assets (log.)	1.89	0.53
EPS	1.69	0.59
ESG SCORE (log.)	1.51	0.66
Average (VIF)	1.67	-
EBITDA regression		
D/E RATIO	1.02	0.98
MKT. CAP. (log.)	1.71	0.58
Asset Turnover	1.09	0.92
ESG SCORE (log.)	1.58	0.63
Average (VIF)	1.35	-

Next, we set our study on the homoschedasticity test. The Breusch-Pagan test is one of the methods available to address the problem of heteroschedasticity in regression models (**Table 6**). In cases where homoschedasticity is not satisfied, corrections can be made to the models or robust techniques can be used to account for this feature. This study corresponds to a statistical test used in econometrics to check homoschedasticity in the residuals of a regression model. Homoschedasticity refers to the situation in which the variance of the residuals is constant across all observations in the sample. In other words, it indicates that the variability of the errors is uniform throughout the range of the independent variables. If the coefficient of determination (R^2) of the regression of the squared residuals is statistically significant, the hypothesis is rejected indicating the presence of heteroschedasticity.

Table 6. Breusch-Pagan test.

	Price	EBITDA
R Multiple	0.8644	0.6154
R^2	0.7471	0.3787
Adj. R^2	0.7373	0.3546
Standard Error	0.3777	0.0763
N°	108	108

The regression model explains approximately 74.7% of the variance in the dependent variable, highlighting its strong predictive power on the trend of the dependent variable. In multiple regression, it is important to also consider the value of the adjusted R^2 coefficient, which considers the number of independent variables included in the model. This coefficient penalizes the inclusion of non-significant or redundant variables in the model, providing a more conservative estimate of the actual goodness of fit of the model, avoiding overestimating the importance of independent variables. The value of the adjusted R^2 does not deviate significantly from that provided by R^2, confirming the adequacy of the model used.

The application of the Breusch-Pagan test in the regression on profitability indices, however, highlighted the presence of heteroscedasticity in the regression model of ROE and ROA, preventing the continuation of the analysis due to a non-constant variance of errors in the model. The homoscedasticity requirement is, instead, satisfied in the regression with the EBITDA margin, allowing the analysis to proceed as the variability of errors remains constant and does not depend on the value of independent variables. Regarding the second part of the study, due to the lack of the fundamental homoscedasticity requirement for the regression models of ROE and ROA, the analysis focuses exclusively on the relationship between EBITDA margin and the four independent variables (ESG score, debt equity ratio, asset turnover and market capitalization). The main objective is to determine the relationship and quantify the effect that independent variables have on the variable of interest. The independent variables in the model explain approximately 37.87% of the variation in the dependent variable, as indicated by the R^2 coefficient. In the absence of a significant difference between this coefficient and the adjusted R^2, the model can be considered reliable.

5. Results

The focal point of the first study is represented by a multiple regression analysis aimed at studying the relationship between the per-share price of the companies in the sample and the four independent variables (BVPS, EPS, ESG score and Equity).

As evident from **Table 7**, the BVPS, the logarithm of Assets, EPS and the logarithm of ESG score are all significant factors influencing, with varying impacts, the stock price. The very low significance value of BVPS (P-Value = 0.00) suggests an extremely significant impact on the stock price. The same can be said for EPS, albeit with a less intense impact (P-Value = 0.0003). The control variable, Size, represented by the natural logarithm of assets, has a significant coefficient (P-Value = 0.038), confirming the need to include this variable in the model to statistically account for the high variability in sample observations. The analysis also confirms the positive association between stock price and the significance of the variable under study, namely the ESG score, with a P-Value = 0.056. The empirical analysis supports the importance of ESG performance in influencing stock prices, suggesting a positive relationship between the variable and the company's economic value.

To determine the effect of each independent variable on EBITDA (**Table 7**), it is necessary to assess the significance of the regression coefficients. Market capitalization (P-Value = 0.00001) shows very low significance values, proving to be the most relevant variable in the model, characterized by a positive relationship with EBITDA margin. In contrast, the variable under study, ESG score, exhibits a positive relationship with the dependent variable but is not statistically significant (P-Value = 0.7167) in modeling EBITDA. It is reasonable to assert, therefore, that market capitalization is statistically significant in modeling EBITDA, given the very low associated P-Value, indicating a very low probability of obtaining such a result if the variable had no effect on the dependent variable (EBITDA). Moreover, as the relationship with EBITDA is positive, it implies that an increase in market capitalization is associated with an increase in EBITDA. On the other hand, the ESG

score shows a positive relationship with EBITDA margin, but the associated *P*-Value is high (0.7167), indicating that this relationship may be due to chance and is not statistically significant. In other words, there is not enough evidence to reject the null hypothesis that the ESG score does not have a significant effect on EBITDA.

Table 7. Regression Statistics on Price and EBITDA.

	DV = Price	*P*-Value	DV = EBITDA	*P*-Value
	(1)		(2)	
ESG SCORE (log.)	**0.5251 (1.9321)**	**0.0561**	**0.0205 (0.3639)**	**0.7167**
BVPS	0.6231 (9.2039)	0.00	-	-
Assets (log.)	0.1495 (2.1016)	0.038	-	-
EPS	0.0294 (3.7789)	0.0003	-	-
D/E RATIO	-	-	−0.0023 (−0.4192)	0.676
MKT. CAP. (log.)	-	-	0.0501 (4.6187)	0.00
Asset Turnover	-	-	−0.0625 (−3.1776)	0.002
Intercept	−1.3064 (−3.0216)	-	0.0318 (0.3815)	-
R^2	0.7471	-	0.3787	-
Adj. R^2	0.7373	-	0.3546	-
Standard Error	0.3777	-	0.0763	-
N°	108	-	108	-

In conclusion, the use of the EBITDA variable in our study is intentional and aimed at providing an objective perspective on the economic performance of the companies analyzed. We are aware that companies' economic margins can be influenced by the accounting policies adopted. However, we believe that the EBITDA margin represents the best compromise between the need for completeness and the objectivity of the data. Unlike other financial metrics, EBITDA is not influenced by the effects of amortization and depreciation, thus allowing a more direct and clear comparison between the operational performances of different companies. This methodological choice supports the objective of isolating the pure operational effects on the company's economic value, eliminating distortions related to financing decisions or accounting policies.

6. Conclusion

This study provides a contribution to the ongoing debate regarding the relationship between sustainability practices and financial development in the clothing sector. Specifically, our study highlights how the integration of ESG policies can have a positive impact on the value and economic performance of companies, enriching empirically a discourse already addressed in the literature (Aich et al., 2021; Castro

and Gradillas Garcia, 2022; Escrig-Olmedo et al., 2017; López Sarabia et al., 2021; Liu et al., 2023; Yu et al., 2023; Zioło et al., 2023). The fashion sector, characterized by a dichotomy in the approach to sustainability, sees on one side luxury inclined to actively respond to environmental and social issues, while on the other, fast fashion is often at the center of criticism for its unethical practices (Liu et al., 2023; Yu et al., 2023). Despite the growing awareness of these aspects, it is observed that empirical studies aimed at exploring the relationship between sustainability and financial performance remain limited.

In line with the cited literature, such as the study by Ameer and Othman (2012), which identifies a positive correlation between sustainability practices and corporate financial performance, our research emphasizes the importance of adopting ESG criteria as a key factor for success in the fashion industry. This contributes to enriching the current discussion, offering an updated perspective on the transformative role of sustainable and ethical practices within the clothing sector.

The study, in fact, delves into the impact of sustainability on business performance in the clothing sector. According to *RQ1* the integration of ESG policies is identified as a significant influencer on corporate value and financial performance within the fashion industry. Existing literature underscores the pivotal role of ESG factors in evaluating companies, particularly within the apparel sector, where challenges related to sustainability and ethics abound, spanning material research, carbon footprint reduction, responsible energy and water resource use and social responsibility.

Driven by an increasing awareness of environmental and social impacts, companies in the fashion industry are actively embracing sustainable practices, such as employing eco-friendly materials, reducing carbon emissions, and adopting ethical procedures. These practices are not only seen as essential for maintaining competitiveness but also as a response to the rising expectations of both consumers and investors. The integration of ESG values, while posing challenges, provides an opportunity for the fashion industry to redefine itself as a more responsible and conscious sector. Over the past two decades, the infusion of ESG factors has played a transformative role in rendering the fashion industry more environmentally conscious and respectful of human rights. Companies are now prioritizing the creation of transparent and ethical supply chains, emphasizing fair labor practices, safe working conditions, and a commitment to diversity and inclusion. This evolution, catalyzed by attention to ESG factors, not only enhances environmental impact but positively affects individuals throughout the supply chain, fostering a more inclusive and creative market.

Assessing business value in the fashion industry with the incorporation of ESG criteria demands a holistic perspective, considering operational efficiency, sustainable supply chain management, innovation and social responsibility. The value of the business in this context encompasses financial aspects, brand reputation, customer loyalty, innovation and market presence. Successfully integrating sustainable and ethical practices not only provides companies with a competitive advantage but also influences the perception of economic value in the fashion industry. However, challenges in quantifying intangible aspects and the lack of uniform standards for measuring ESG impacts present complexities in this integration.

Despite challenges, the incorporation of ESG assessments reflects a commitment to sustainability and can yield long-term benefits, including attracting sustainable investors, increasing consumer confidence, and mitigating risks related to environmental and social issues. Understanding the nuanced relationship between ESG scores and performance in the clothing industry emerges as a crucial consideration.

Shifting focus to RQ^2, empirical analysis in **Table 7** examines the financial dynamics of fashion industry companies, specifically exploring the impact of key variables: BVPS, EPS, ESG scores and EBITDA.

Concerning stock prices, BVPS and EPS emerge as highly significant influencers, underscoring their relevance in determining stock prices. The inclusion of the natural logarithm of assets as a control variable further highlights its statistical significance. Despite a less statistically significant P-Value (0.056), the positive association between stock prices and the ESG score aligns with broader empirical trends, suggesting a positive relationship between a company's ESG performance and its stock prices.

Turning to EBITDA, market capitalization emerges as the most relevant variable, displaying very low significance values and a positive relationship with EBITDA margin. This emphasizes the financial impact of market capitalization on EBITDA, suggesting a correlation wherein an increase in market capitalization corresponds to an increase in EBITDA. However, the ESG score, despite exhibiting a positive relationship with EBITDA margin, lacks statistical significance, prompting further scrutiny to ascertain the robustness of this relationship.

In conclusion, the findings underscore the financial relevance of BVPS, EPS, and market capitalization in shaping stock prices and EBITDA in the fashion industry. The positive yet less statistically significant association between ESG scores and stock prices indicates an evolving trend where investors increasingly consider ESG performance in their assessments of a company's economic value. However, further examination is imperative to determine the statistical significance of the relationship between ESG scores and EBITDA, highlighting the intricate interplay between sustainability practices and financial metrics in the fashion industry. Integrating ESG considerations into comprehensive financial analyses is emphasized as a pivotal step forward.

We are aware that this study on the implications of sustainability in the apparel industry has some limitations. While it offers valuable perspectives on the correlation between ESG factors and corporate performance, it is essential to critically consider certain aspects. The correlative, rather than causal, nature of the identified relationships requires further investigation. The quality and consistency of the data, along with the subjectivity of ESG scores and the lack of uniform standards, could offer different results depending on the databases used. The temporality of the analysis, sector specificity and challenges in quantifying intangibles add complexities that could be overcome through in-depth, comparative study across multiple databases. This, in our view, could be an excellent starting point for future research in this field.

Future studies could overcome these limitations through comparative analysis across multiple databases, exploring the link between ESG and various financial measures, such as ROA, to better understand the interaction between sustainability

and financial performance. The issue raised in the methodological part regarding ROA, and how assets can foster better sustainable performance, indicates a promising direction for future research. Further investigations might also examine how specific sustainable practices within supply chain management directly affect the financial performance of companies in the fashion industry.

7. Sitography

https://unfashionalliance.org/—UN Alliance for Sustainable Fashion
https://www.theecoexperts.co.uk/—The Eco Experts
https://sa-intl.org/—SA8000 Summary Statistics
https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf—Environmental, Social and Governance Scores from Refinitiv 2022

Author contributions: Conceptualization, SA and TB and AM; methodology, SA and TB; software, TB and AM; validation, SA and TB and AM; formal analysis, SA and TB; investigation, SA and TB and AM; resources, SA and TB and AM; data curation, AM; writing—original draft preparation, SA and TB; writing—review and editing, SA and TB; visualization, TB; supervision, SA; project administration, SA; funding acquisition, SA. All authors have read and agreed to the published version of the manuscript.

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