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Firma (signature) 

A mia sorella, uno scricciolo dal cuore immenso.

Sempre pronta a spendersi per gli altri, spesso a discapito di sé stessa.

Non smettere mai di lottare.

Io sarò sempre al tuo fianco, ad un millimetro di cuore.

Il sole tornerà a splendere anche per noi.

G.

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Abstract

This thesis explores the connection of the presence and the educational backgrounds of Chief Sustainability Officers (CSOs) with ESG scores and greenwashing practices.

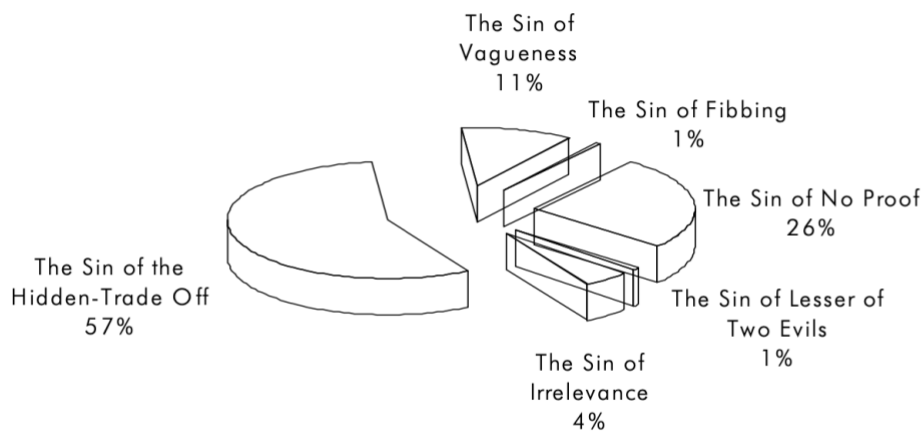
The study examines data from the S&P 500 companies over the last 24 years to determine how the presence of CSOs and their backgrounds are associated to both ESG scores and greenwashing propensity. The analysis employs regression analyses to investigate these associations. The results indicate a negative relationship between greenwashing and the presence of CSOs, suggesting that companies with a CSO may be less likely to engage in greenwashing practices. Moreover, there's a positive relationship between the presence of CSOs and the ESG Score, suggesting that the oversight of CSOs may enhance a company's score. Interestingly, this work assesses that there is a significant difference in a company's ESG score depending on the educational background of its CSO, and the impact of their education on greenwashing and ESG Score.

1. Introduction

In recent years, the concept of sustainability has gained more and more substantial relevance among consumers, companies, and all stakeholders, due to the severe climate changes and global warming. Even the adoption of small individual gestures can trigger a chain effect that can gradually positively influence great socio-cultural changes, from which the environment would be the first to benefit, and human beings, in general, would naturally follow. This framework stimulates in consumers a sense of responsibility toward the environment, pushing them to adopt sustainable activities to recover from the bad habits and wrong approaches of the past. Sustainability has become a priority, as individuals, companies, and society as a whole recognize the urgent need to address environmental challenges and implement meaningful change. This conglomerate of attention has changed the perception of the environmental crisis nowadays, forcing the states, universities and businesses to modify their traditional approach model and incorporate sustainability as a core value of their long-term planning strategies. For the sake of these changes, companies have been forced to pay more attention to their overall Environmental, Social, and Governance (ESG) performance, through regulator-enforced sustainable disclosure. When such mandatory and rapid changes are introduced, it always creates room for guidelines and regulations circumvention, which is inherent in the human nature of always finding the easiest and effortless path, even if ethically questionable. From this aspect, the sudden surge of innumerable green claims has incentivized companies to engage in greenwashing practices, misleading consumers and stakeholders about their actual sustainable commitment in order to face the fierce competitive pressure, at the expense of legitimate environmental innovation in the market (Dimitrieska et al., 2017). An interesting analysis of the greenwashing topic has been provided by TerraChoice (2007). They surveyed six category-leading box stores in North America, examining nearly 1018 consumer products recording 1753 claims on them, and testing against the current best environmental practices at the time, such as the International Organization for Standardization (ISO) and the US Environmental Protection Agency. They found that all but one made demonstrable or potentially misleading claims. Out of this survey result, they identified the “Six Sins of Greenwashing”, in [Figure 1](#).

Figure 1: Sins of Greenwashing by category

Sins Committed by Category



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Source: Terra Choice (November 2007), "The Six Sins of Greenwashing", A green paper, Terra Choice Environmental Marketing Inc.

Without delving into a deep analysis of greenwashing, which is covered in [section 2.2](#), the most frequently committed sin in their study is the Sin of the Hidden Trade-Off, which is not substantially false but is used to portray the product as greener than it actually is, by focusing on a single or an unreasonable set of environmental attributes, while ignoring other that pose a real a threat.

The sin of No Proof is the second most committed action, which consists of making sustainable claims about a product without providing evidence or easily accessible third-party certifications about it.

Finally, the third most represented action according to TerraChoice is the Sin of Vagueness, committed with 11% of environmental claims. This occurs every time a company provides claims which are too broad or poorly defined such that the real meaning is likely to be misunderstood by consumers. A common example is the Mobius loop label, which often makes it difficult to understand if the recycling concept refers to the whole product or only the packaging.

It is clear that the problem of greenwashing is not new, as the research of TerraChoice (2007) and Fliegelman et al., (2010), stated that most of the products examined were found guilty of

such practices. Actually is the result of a process that began more than 30 years ago from companies advertising toughing how sustainable their products were. However, the problem is that the phenomenon of greenwashing has increasingly taken place among the elusive strategies implemented by companies in recent years, as a deliberate and conscious attempt to mislead and distort the real activities hinging on the environment. Gelmini (2021), Head of News for Greenpeace, a well-known NGO, accordingly defined this process development period as the “golden age of greenwashing”.

To address these issues, many companies have started to appoint Chief Sustainability Officers at C-suite managerial levels, who are responsible for overseeing sustainability efforts within the company, whom we are going to discuss further in [section 2.1](#). Such a move is seen by the market and the stakeholders as a strong commitment towards sustainability, becoming a priority to embed in the strategic thinking of the organizations (Strand, 2013; Wiengarten et al., 2017; Thun and Zülch, 2023). The previous literature has mainly focused on the impact of CSOs on sustainability performance, showing some mixed results (Fu et al., 2020; Kanashiro & Rivera, 2019).

The present research aims to contribute to the ongoing debate by examining the potential role of Chief Sustainability Officers in influencing a company's Environmental, Social, and Governance scores and greenwashing practices, by focusing on the potential effect of the academic background of said officers. It can be hypothesized that companies with a CSO, especially one with a background in sustainability and related fields, are less likely to engage in greenwashing practices and more likely to achieve higher ESG scores.

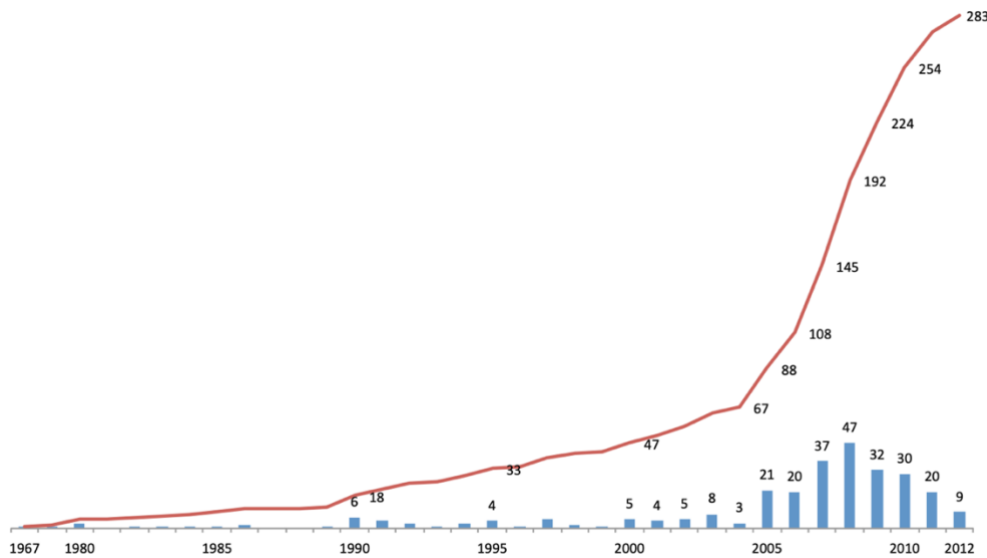
2. Literature review

2.1. Defining Chief Sustainability Officer

In recent years, also due to a global climate crisis now established, companies that have given a particular focus on sustainability have increased dramatically. As a means of fact, there is a rising need for specific professional figures in charge of dealing with sustainability, namely the Chief Sustainability Officer (CSO). One of the critical points in studying the CSO role is the lack of a detailed and standardized definition, harming the efficacy and fostering ambiguity for this position. From a review of the previous literature, the CSO is defined as a senior executive in the top management team (TMT) explicitly hired to manage the firm's corporate social responsibility (CSR) and performance (Matten & Moon, 2008). Similarly, Kanashiro and Rivera (2019) stated that a CSO is positioned at the top of the corporate hierarchy at the C-suite level, has the primary responsibility of overseeing the environmental strategy, and reports directly to the CEO or board of directors. Generally, CSOs execute and oversee the sustainability strategy of the firm, review business practices, analyze social needs, and propose strategies that integrate profit growth and sustainable development (Fu et al., 2020). They are responsible for relating with stakeholders and fostering a sustainable culture within the firms and across the employees, but despite these differences, they share a common core role in corporate social performance (Miller & Serafeim, 2014). Expanding on this, Deloitte (2024) explains that modernized CSOs are now core players in both influencing corporate strategy and the actual transformation of operations. They make sustainability not just an extra but an integral part of the enterprise's long-term thinking. Aligning sustainability with core business objectives, CSOs ensure that ESG factors are embedded in all aspects of operations, yielding innovation and providing a means to competitive differentiation. The race for sustainability and, consequently, the figure of CSO can be explained by the recent changing trend in the consumer and regulatory side. As a result of the UN COP26 climate-change conference in Glasgow, the governments are starting and are going to implement laws forcing the companies to integrate ESG reporting on traditional disclosure, impacting the investors that to anticipate and mitigate this regulatory shift risk are controlling for sustainability on their investment targets. This goes hand in hand with the changes in the consumers' behaviour as they are demanding more sustainable products, with the millennials being more attentive to ESG matters (Strategy& 2023). This positive appointment trend started years ago, as the total number of companies that hired a sustainability officer doubled between 1995 and 2003, and doubled again

between 2003 and 2008, up to more than 240 companies that have at least one person fully dedicated to sustainability in 2012 (Greenbiz, 2013), even if the absolute number of companies adding a full-time sustainability manager at the time was decreasing (Figure 2).

Figure 2: The number of companies adding a full-time sustainability manager is decreasing.



Source: GreenBiz, State of the Profession, 2013

A recent report on the CSOs from PwC (Strategy&,2023) stated that in recent years the number of Chief Sustainability Officer positions globally has grown rapidly, as the companies appointed about as many CSOs in 2020-21 (394) as in prior 8 years combined (414), a trend began in 2017 when issues such as climate, racial and gender equality and, then after, the pandemic started to influence investors and CEO decision-making. Thus, companies wanted to be prepared to face the next ESG challenges by building and establishing sustainability knowledge and expertise in their organization.

The creation of a dedicated leadership position for driving sustainable strategies is an indication of the significance of sustainability for companies. It also highlights the need for a comprehensive approach to sustainability, which requires the integration of social, environmental, and economic factors into business decision-making processes. By appointing a CSO, companies demonstrate their commitment to sustainability, and that they are better equipped to address the challenges and opportunities that arise from sustainable development, enhancing their reputation and improving their performance.

Another source of debate is about CSO's authority and responsibilities and how this evolves following the different phases of sustainable commitment that the company crosses. Miller and

Serafeim (2014) affirm that CSOs cover different roles according to different stages of a company's sustainability path, respectively Compliance, Efficiency, and Innovation stage. Their results suggest that most of the companies in the first stage do not have a formal CSO position, but rather have a figure to a lower level dedicated to sustainability. The authority level increases with the firm increasing its sustainable commitment through the stages, while its responsibilities decrease throughout the innovation stage due to decentralization and delegation of activities and decision rights. This underscores the evolving role of CSOs as catalysts for innovation. Deloitte (2024) further elaborates on the role of CSOs as innovation leaders. They are tasked with spearheading initiatives that drive the development of new sustainable products and business models. By fostering a culture that supports innovation and the adoption of advanced technologies, CSOs help companies not only meet regulatory requirements but also capitalize on emerging opportunities in the green economy. In this regard, according to the attention-based view of the firm, the CSO can be seen as an attention carrier that spreads the light on all corporate social-related issues (Fu et al., 2020). This point of view can help us understand why the CSO role is constantly evolving and what specific capabilities are required for top managers, such as listening and communication skills and adaptability to changes. On this topic, the report from Strategy& (2023) highlights the key trends in the CSO role to deal with strengthened stakeholder expectations. The "modern" CSO needs to be able to understand the company environment, what is going on in all the business functions and how ESG issues influence and shape every aspect of the organization. CSOs hence require not only a deep technical knowledge of sustainability issues but importantly strong strategic thinking and leadership abilities. They must be capable of driving cultural change across the company to overcome the complexities of the ESG landscape. Connecting to the theme of the CSO as an attention carrier (Fu et al., 2020), one of his main objectives should be to increase the salience of sustainability and ESG issues to make them a key topic to discuss by sitting on the executive board (Strategy& 2023). On this topic, it is interesting the Russell Reynolds Associates (RRA) 2022 survey, which finds that the reporting structure of a firm is the "primary differentiator of

an organization’s likelihood to meet their ESG targets”, based on a questionnaire to 56 global sustainability leaders, in [Figure 3](#).

Figure 3: Ecosystem of the Empowered CSO: % of Empowered CSOs compared to CSOs with other reporting structures.



Source: RRA 2022 Sustainability Leaders Survey.

Precisely, when a CSO reports directly to the CEO, which they defined as “empowered”, is more likely to work in the perfect conditions to foster and influence cultural change across the organization, helping him to put a lens on sustainability projects with a higher authority. This, together with an alignment of skills, expertise and a common purpose of putting sustainability first from both CEO and CSO, would help the company to better reach the objectives and be up to 50% more likely to meet ESG targets (RRA, 2022).

Under this adaptability to changes, the figure of the CSO is often implemented to manage specific cases. As Strand (2014) found, CSO can be hired to face environmental crises for which its legitimacy is threatened. Kanashiro and Rivera (2019) conducted a study on the impact of CSO presence in industries that are known for being highly polluting, such as chemicals, machinery, and petroleum. These industries are typically under pressure to comply with regulations and rectify any environmental damage caused. According to Strand (2014), CSOs are hired as genuine agents to execute environmental strategies to help the company overcome critical situations. However, Kanashiro and Rivera (2019) have found that in some cases, the

hiring of CSOs harms environmental performance, indicating that they are hired only for appearance purposes. Deloitte (2024) underscores the responsibility of CSOs in preventing greenwashing by ensuring that all sustainability claims are transparent and verifiable. CSOs must oversee the accurate reporting of ESG performance and implement robust systems to track and validate sustainability data. This not only safeguards the company's reputation but also enhances the credibility and reliability of its ESG disclosures.

Generally, if supported by a positive corporate culture and clear authoritative mandates, the CSO can have a positive effect on the firm's sustainable development. Some studies have found that a CSO is associated with higher financial performance, higher return on assets, and higher carbon efficiency (Peters et al., 2009), through the enhancement of sustainability programs and practices within the company. These findings have been confirmed (Eccles et al., 2014) suggesting that companies showing such strong commitment to sustainability, by appointing a CSO, might outperform their competitors in terms of long-term stock and accounting performance. Moreover, a CSO on the management board tends to drive companies to have higher-quality sustainability reports, fostering transparency in disclosure (Thun & Zülch, 2022). This emphasizes the connection between the influence of the Chief Sustainability Officer and the financial success achieved through the implementation of sustainability strategies. It also underscores the CSO's role in ensuring the honesty of communication regarding corporate social responsibility (CSR). That's why the appointment of a CSO indicates to stakeholders the company's commitment to sustainability and the prioritization of environmental, social, and governance (ESG) factors in the decision-making process, which is crucial for long-term success. The mentioned concept reflects the stakeholder theory, which suggests that companies should fulfil the expectations of not only shareholders but also a wider range of stakeholders (Freeman, 1984). Furthermore, the Chief Sustainability Officer (CSO) plays a crucial role in driving revenue growth for companies by assisting in the development of sustainable products to meet the growing demand from consumers. These consumers are willing to pay higher prices for environmentally friendly alternatives. Specifically, the CSO can guide on improving cost efficiency by investing in renewable energy and implementing energy-saving measures to reduce carbon emissions. This can significantly improve the company's environmental performance and reputation. For instance, IKEA's initiatives in renewable energy and sustainable sourcing, driven by their CSO, have not only reduced the company's environmental impact but have also led to significant cost savings (Pagitsas, 2022). This demonstrates the

financial benefits of sustainable practices and the general presence of a CSO in the firm's top management firm.

2.2. Defining Greenwashing

Kanashiro and Rivera (2019) raised the issue that in some cases, Chief Sustainability Officers (CSOs) may actually harm environmental, social, and governance performance. This suggests that they might be hired solely to create a positive sustainable corporate image, demonstrating what is commonly referred to as greenwashing behaviour. Supporting this point of view, Ghitti et al. (2023), found that firms with a higher share of independent directors tend to greenwash more, highlighting the perplexities on the effectiveness of such directors and that some governance structures can sometimes facilitate rather than reduce deceptive practices. This issue could also arise from a lack of clarity in defining and identifying the specific roles of CSOs. Companies may merely adopt this professional figure as a trend, without possessing the necessary operational skills, solely to appear aligned with current environmental concerns and engage in greenwashing practices. Unfortunately, the increasing attention to sustainability from corporate stakeholders only creates more opportunities for greenwashing behaviours (Ghitti et al., 2023). Even though it is not easy to find a general and unequivocal definition, the Cambridge Dictionary defines greenwashing as *“behaviour or activities that make people believe that a company is doing more to protect the environment than it really is”*. This definition highlights the disconnection between a company's environmental claims and its actual environmental performance, leading to the perception of "green" activities not being genuinely implemented. Delmas and Burbano (2011) define the term as poor environmental performance and positive communication about this performance, while it can be seen as an opportunistic behaviour initiated by companies to benefit from the rising demand for green and sustainable products in the market (Investopedia, 2022). It is important to specify that greenwashing presents itself in multiple forms, in the sense that it can come from both corporate and product-service levels and can be differentiated between claim and executional greenwashing (De Freitas Netto et al., 2020; Delmas and Burbano, 2011). Claim greenwashing occurs when firms make misleading and exaggerated claims about the environmental benefits of their products or services through advertising or product labels, without any substantive sustainable practice, as could be advertising a product to be “100% sustainable” without any certification at support. Executional greenwashing instead, is the deliberate use of nature-

evoking elements in communication campaigns and marketing elements to generate a greener impression of environmentally friendly products.

Another form of greenwashing found in literature is selective disclosure, which Lyon and Maxwell (2011) defined as the disclosure of an incomplete and misleading negative relation, highlighting the positive information about social and environmental activities from a company while mitigating the side effects on the corporate image. Opong-Tawiah and Webster (2023) investigated the use of social media by the company, in this case, Twitter, about greenwashing. They found that deceptive sustainability communication tends to foster only in the short run financial performance and public perception since a claim can be initially seen as credible, but in the long term, it can cause reputational damage due to the reality been discovered. A psychological contribution to greenwashing and to the initial inability to discern credible from deceptive company claims may be due to the individual optimistic bias, which is the tendency to overestimate positive events and under-estimates the likelihood of negative events occurring (Delmas & Burbano, 2011).

The emerging literature has uncovered various dimensions and strategies of greenwashing that make it difficult to define and prevent. For example, "green silence" refers to companies strategically excluding information about negative environmental outcomes from their communications, and "green hushing" describes how firms understate or refrain from communicating positive sustainability accomplishments due to the fear of competitor imitation and criticism (Gatti et al., 2019). Additionally, "token environmentalism" has been defined as small or symbolic actions for sustainability that are not expected to make a real difference to environmental outcomes (Hickman et al., 2019). These evolving tactics reflect the more advanced methods companies are using to appear sustainable without significantly changing their environmental impact, out of fear of potential stakeholder backlash if discovered. In brief, we can summarize the greenwashing concept by referring to the act of making false or exaggerated claims about the environmental benefits of a product or service.

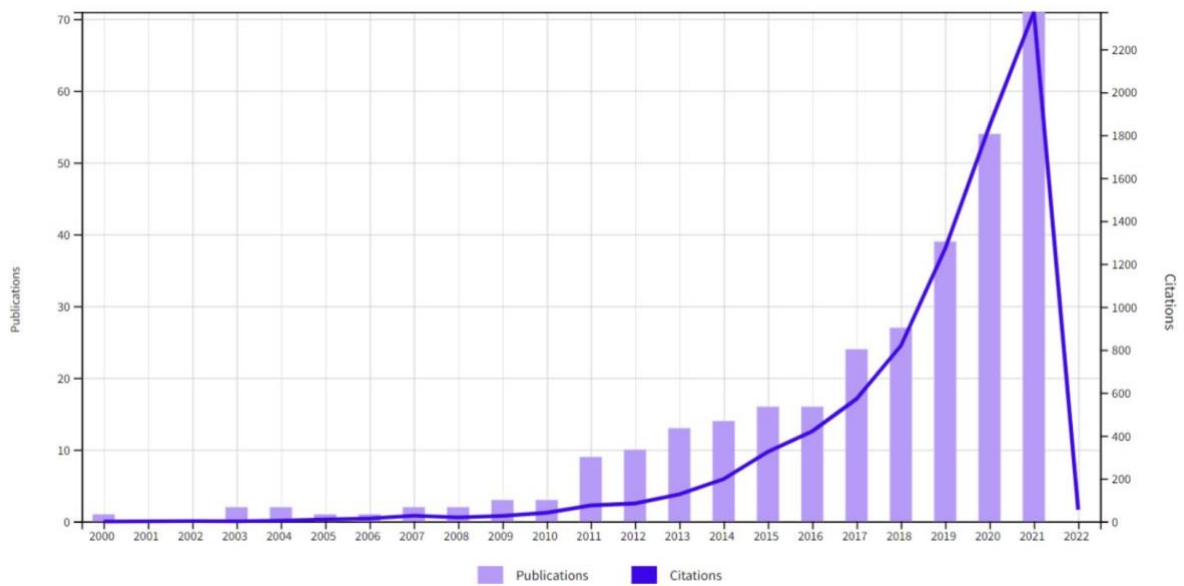
By the way, from the attribution theory perspective, pursuing such immoral behaviour can hinge on firms, as investors tend to be more sceptical and hesitant to invest in firms that are not deemed trustworthy (Kahraman & Kazançoğlu, 2019; Szabo & Webster, 2021). The growing recognition of sustainability concerns has led to an increased awareness among consumers and investors regarding greenwashing. According to a recent survey conducted by the International Consumer Protection and Enforcement Network (ICPEN) in 2021, it was revealed that as many as 40% of online green claims made by companies were found to be misleading. This

phenomenon has made it increasingly difficult for consumers to differentiate between genuine and exaggerated sustainability efforts.

Moreover, a survey conducted by the CFA Institute disclosed that part of the respondents takes the possibility of greenwashing into consideration when making investment decisions. This highlights the profound impact of greenwashing on investor confidence and the need for companies to provide transparent and credible information about their sustainability practices (ICPEN, 2021; CFA Institute, 2022). The findings indicate a growing demand for accurate and genuine sustainability claims to guide both consumers and investors in making informed decisions. The bottom line is that essentially greenwashing significantly hinges on corporate long-term performance and reputation, as in the case of the Volkswagen “Dieselgate” scandal, which led the company to substantial financial losses and brand trust damage, or in the more recent H&M’s “Conscious Collection” marked as sustainable, but then revealed to be misleading exaggerated claims, leading to accusations of greenwashing practices (Forbes, 2022).

Notwithstanding this, companies may engage in greenwashing as a cost-effective way to keep up with the sustainable trends of recent years. Some companies may prioritize greenwashing over the actual implementation of environmentally friendly practices because it provides a short-term green image at a lower cost (Delmas & Burbano, 2011; Becker-Olsen & Potucek, 2013; Ghitti et al., 2023). Supporting this view, Chen and Dagestani (2023) found that greenwashing might improve firm value by enhancing disclosure and reducing financial constraints, especially in heavily polluting industries. Nevertheless, these short-term gains implicate future long-term risks due to the increasing consumer and stakeholder focus on transparency and effective sustainability. This trend was already found in the research from TerraChoice Environmental Marketing (2007), where it is stated that the demand for green products drives the greenwashing occurrence and that is expected to continue to grow (Dahl, 2010). Another analysis of the overall growth trend from Santos et al. (2023) shows the evolution of greenwashing publications and citations until 2022, in [Figure 4](#).

Figure 4: Times Cited and Publications Over Time



Source: *A systematic literature review on greenwashing and its relationship to stakeholders: state of art and future research agenda*, Santos et al., 2023.

Looking at the graph, it is intuitive that most of the total publications occurred in the period 2017–2021, which reflects the increasing interest in greenwashing studies and the awareness of environmental issues and social practices from the firms and all the stakeholders.

Another current of thought sees greenwashing as a first step through sustainability (Basetti, 2020), as it could positively impact individual behaviour and encourage the adoption of sustainable consumption in the long term, according to a study from Stanford University’s *Psychological Science Journal*. This concept finds support from Bowen and Aragon Correa (2014), who embody “symbolic corporate environmentalism” in the greenwashing definition.

The paper from Galvas et al. (2023) agrees with this positive point of view, seeing greenwashing not merely as a harmful activity, but instead as a counterintuitive potential start to finally push companies towards effective sustainable practices. The authors sustain that greenwashing, even if initially harmful, raises awareness among consumer and stakeholders about sustainability and inadvertently educate the public to normalize green activities and set a baseline for environmental responsibility. Moreover, once companies are caught in such practices, they usually face close pressure from regulators and consumers to rectify their actions, as happened in the case of the “Dieselgate” scandal mentioned above, where the company had to make huge investments in sustainable technologies as an agreement and thus

encouraging potential continuous improvements to avoid future penalties, from which the company, in the end, gained a competitive advantage of other companies (Galvas et al., 2023).

From the regulatory perspective, implementing strict standards, enforcing transparency and accountability through penalties, as well as establishing guidelines on how companies must label and promote their product as green or sustainable, would prevent them from making vague or misleading statements. Some regulations in this direction include the Federal Trade Center “Green Guides”, which set in the United States specific criteria of clarity and evidence for environmental marketing claims (FTC, 2012); the EU Taxonomy Regulation, which sets a harmonized group of criteria applicable for all the companies operating within EU to determine whether an activity is environmental sustainable, in order to avoid regulatory arbitrage (European Commission, 2023); and the EU’s non-Financial Reporting Directive (NFRD) which mandates to large companies to disclose information on how they manage social and environmental challenges, fostering transparency and easiness in assessing the validity of green claims (European Commission, 2021).

In any case, the general scientific consensus leans towards a negative view of greenwashing. Over time, more and more companies are starting to engage in greenwashing practices, but this is a counterproductive trend that can damage their reputation and undermine consumer trust, which is why it is crucial to study how to mitigate it and what are the aspects that can influence it (Delmas & Burbano, 2011; Lyon & Montgomery, 2015; Braga et al., 2019). Consumers are becoming more aware and sensitive towards greenwashing, and while there can be some beneficial aspects in the short term, it can be counterproductive in the long run with companies facing potential backlash if they don’t back up their claims with actual sustainable actions and behaviours (Yıldırım, 2023).

3. Data gathering and sample composition

This section outlines the dataset and the methodology used in our analysis. The sample for this study on December 1st, 2023, comprises the first 500 U.S. public companies from the S&P 500, by company market capitalization, which represents the sum of market value for all relevant issued level share types (Refinitiv Eikon). The research process began with an in-depth analysis of key professional figures in top management positions, who held a significant role in ensuring the sustainability of their respective organization, namely, we looked for CSO positions in the respective companies. The work started by searching for the role definition, designation and terminology used to identify this position from the previously existing literature. The present study is built on a robust foundation of scholarly papers, including those by Fu et al. (2020), Kanashiro and Rivera (2019), and Miller and Serafeim (2014), which have provided valuable insights into the distinct roles and responsibilities of Chief Sustainability Officers (CSOs) and the associated terminology. Fu et al. (2020) have identified several alternative titles for individuals who can perform the role of a CSO, including “Chief Ethics Officer”, “Chief Environmental Officer”, or any executive in charge of sustainability, corporate responsibility, or corporate citizenship. Similarly, Kanashiro and Rivera (2019) have noted that common titles for CSOs include “Vice President of Global Sustainability”, “Vice President of Social Responsibility”, “Vice President of Sustainability, Safety, and Engineering”, and “Vice President of Environmental Safety and Health”. Miller and Serafeim (2014) have also highlighted that individuals with a primary responsibility for sustainability in an organization, even if their title is not CSO, such as vice presidents or directors, can be considered CSOs.

For the purposes of this study, we have considered all such individuals to be Chief Sustainability Officers, based on the definitions provided above. We began by gathering data for both the positions and the people who hold them. The information was primarily gathered from LinkedIn profiles and cross-checked against the company's websites, press releases, annual reports, and media articles from BusinessWire, NAEM (National Association for Environmental Management), GreenBiz, The ConferenceBoard, Aspen Institute, and World Economic Forum, [Appendix 1](#). For companies with more than one figure within the given definition of CSO, and for which we could not immediately identify the most important hierarchically, we made it using the database of The Org, the world's biggest network of public organisational charts, from where we've been able to identify the sustainability figure at the highest hierarchical level. The dataset obtained from this work indicates that appointing a Chief Sustainability Officer (CSO) is a prevalent practice among companies in the S&P 500. Specifically, it has been found that approximately 88% of companies have filled this position, which suggests that there is a

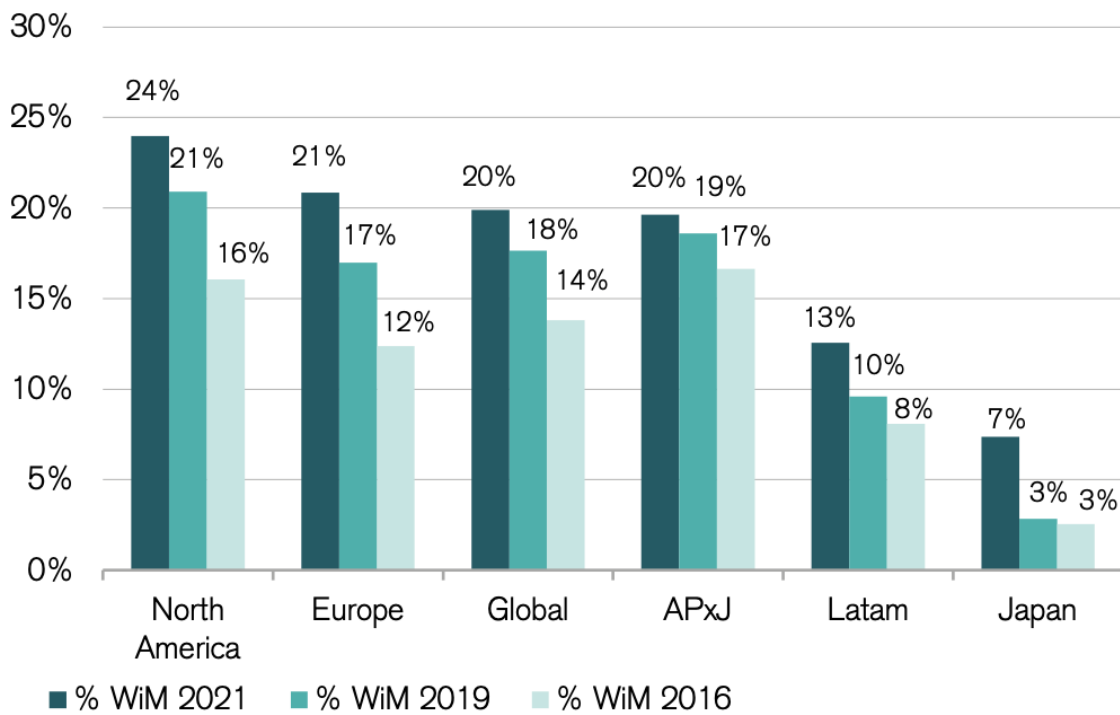
growing awareness of the importance of sustainability in the business world, a result that is consistent with the literature reviewed.

In addition to these data, the year of recruitment, their gender, previous work experience and more importantly, their academic background have been analyzed. The year of appointment variable enables us to measure the time each CSO has held their position. This provides insight into their expected performance since individuals with more experience in the role and within the specific company may be able to manage sustainability strategies effectively and efficiently. This is due to their accumulated knowledge and experience, allowing them to benefit from a shorter learning curve.

Next, we looked for gender diversity representation in the roles, since in the literature the general understanding is that women are more inclined to sustainability issues, more specifically women who hold the necessary capabilities may be more likely to consider overall societal well-being without focusing narrowly on shareholders' interest (Altunbas et al., 2021). Post et al. (2011) show that firms whose board composition has more female directors receive higher environmental scores. The Boston Consulting Group forecast shows that women will hold about 25% of the green jobs by 2030, decreasing its share from 29% in 2021 (BCG, 2021). A report from Credit Suisse (2021) shows that companies with a greater share of women in management tend to score better in terms of overall ESG rankings than companies that do not and there is a growing trend of appointments of women in such positions, as we can see from Figure 5.

Ghitti et al. (2023) found that there is a positive relation between greenwashing and female presence on the board, and we want to see if there are some changes in this relationship by considering women's presence in C-suite level management positions within our sample.

Figure 5: Percentage of women in managerial positions by region. APxJ stands for Asia Pacific except Japan.



Source: Credit Suisse Research, CS Gender 300

Zang (2023) found that female-led firms do engage in fewer environmentally responsible activities but are not less likely to greenwash, indeed he has observed that female-led companies are more prone to engage in greenwashing practices in situations where they have limited access to credit, particularly in the context of less developed countries or light industries.

The work experience information helps us determine if the CSOs were hired from within the company or externally, with internal figures being more familiar with the culture, general understanding of the business, and having credibility with the leader as for the tenure variable. This allows us to see also if the manager had some previous experience in the sustainability subject or if he comes from a different and unrelated background. More important is the relevance of the educational and academic background variable, as it says undoubtedly if the actual CSO have the specific and requested formal capabilities to correctly perform their roles. We searched for this information directly from their LinkedIn profiles and the official websites of the companies, collecting data for the Bachelor of Arts (B.A.), Master of Science (MSc), Doctor of Philosophy (PhD) and Doctoral Degree (J.D.). As it's easy to expect, there were a vast number of different degrees, even within the same field of study. By this, for simplicity, clarity, readability, and significance of the data, we have opted for aggregation of data on two levels, a larger and a narrower one, using the 2020 CIP (Classification of Instructional

Programs). CIP has been developed by the U.S. Department of Education's National Center for Education Statistics (NCES) and provides a taxonomy scheme to track the various fields of study and programs. Through the first 2 digits of the code, which identifies the 50 major group fields (Figure 6), we created the broad level of aggregation.

Figure 6: First level of field of study aggregation.

CIPFamily	CIPTitle
01	AGRICULTURAL/ANIMAL/PLANT/VETERINARY SCIENCE AND RELATED FIELDS.
03	NATURAL RESOURCES AND CONSERVATION.
04	ARCHITECTURE AND RELATED SERVICES.
05	AREA, ETHNIC, CULTURAL, GENDER, AND GROUP STUDIES.
09	COMMUNICATION, JOURNALISM, AND RELATED PROGRAMS.
10	COMMUNICATIONS TECHNOLOGIES/TECHNICIANS AND SUPPORT SERVICES.
11	COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES.
12	CULINARY, ENTERTAINMENT, AND PERSONAL SERVICES.
13	EDUCATION.
14	ENGINEERING.
15	ENGINEERING/ENGINEERING-RELATED TECHNOLOGIES/TECHNICIANS.
16	FOREIGN LANGUAGES, LITERATURES, AND LINGUISTICS.
19	FAMILY AND CONSUMER SCIENCES/HUMAN SCIENCES.
21	RESERVED.
22	LEGAL PROFESSIONS AND STUDIES.
23	ENGLISH LANGUAGE AND LITERATURE/LETTERS.
24	LIBERAL ARTS AND SCIENCES, GENERAL STUDIES AND HUMANITIES.
25	LIBRARY SCIENCE.
26	BIOLOGICAL AND BIOMEDICAL SCIENCES.
27	MATHEMATICS AND STATISTICS.
28	MILITARY SCIENCE, LEADERSHIP AND OPERATIONAL ART.
29	MILITARY TECHNOLOGIES AND APPLIED SCIENCES.
30	MULTI/INTERDISCIPLINARY STUDIES.
31	PARKS, RECREATION, LEISURE, FITNESS, AND KINESIOLOGY.
32	BASIC SKILLS AND DEVELOPMENTAL/REMEDIATIONAL EDUCATION.
33	CITIZENSHIP ACTIVITIES.
34	HEALTH-RELATED KNOWLEDGE AND SKILLS.
35	INTERPERSONAL AND SOCIAL SKILLS.
36	LEISURE AND RECREATIONAL ACTIVITIES.
37	PERSONAL AWARENESS AND SELF-IMPROVEMENT.
38	PHILOSOPHY AND RELIGIOUS STUDIES.
39	THEOLOGY AND RELIGIOUS VOCATIONS.
40	PHYSICAL SCIENCES.
41	SCIENCE TECHNOLOGIES/TECHNICIANS.
42	PSYCHOLOGY.
43	HOMELAND SECURITY, LAW ENFORCEMENT, FIREFIGHTING AND RELATED PROTECTIVE SERVICES.
44	PUBLIC ADMINISTRATION AND SOCIAL SERVICE PROFESSIONS.
45	SOCIAL SCIENCES.
46	CONSTRUCTION TRADES.
47	MECHANIC AND REPAIR TECHNOLOGIES/TECHNICIANS.
48	PRECISION PRODUCTION.
49	TRANSPORTATION AND MATERIALS MOVING.
50	VISUAL AND PERFORMING ARTS.
51	HEALTH PROFESSIONS AND RELATED PROGRAMS.
52	BUSINESS, MANAGEMENT, MARKETING, AND RELATED SUPPORT SERVICES.
53	HIGH SCHOOL/SECONDARY DIPLOMAS AND CERTIFICATES.
54	HISTORY.
55	RESERVED.
60	HEALTH PROFESSIONS RESIDENCY/FELLOWSHIP PROGRAMS.
61	MEDICAL RESIDENCY/FELLOWSHIP PROGRAMS.

Source: CIP 2020 NCES

We then further categorized this range by identifying 5 main fields of study, namely STEM; Natural resources and Conservation (Natural); Social Science; Business, Management, Marketing, And Related Support Services (Business); and Others.

Respectively, “STEM” stands for science, technology, engineering, and mathematics, and we use this category to group in fields such as Engineering, Biological and Biomedical Sciences, Mathematics and Statistics and Physical Sciences contained in the first level of aggregation. “Social Sciences” includes fields such as International Affairs, Sociology, Economics, Political Science, Government and Anthropology. “Business” refers to all the fields like Business Administration, Marketing, Management, Project management, Organizational Leadership, Business Economics, Finance, Entrepreneurship and Sales; while “Others” intends all other

fields of study that don't fall inside any of the previous macro area, such as Law and Legal studies. Said this, for the empirical analysis we decided to work only on B.A. and MSc since a small minority of the CSOs in the sample have a PhD or a JD.

The financial data were retrieved from Refintiv Eikon for 24 fiscal years, from 2000 to 2023. We took into consideration total assets; total debt; total liabilities; total debt percentage of total equity; company market cap; cash and cash equivalents; property, plant and equipment; earnings before interest and taxes; ESG Score and ESG Combined Score. From this data, we calculated the control variables to use henceforth, respectively ROA, Leverage, Market-to-Book ratio, Tangibility and Cash Holdings.

4. Introduction to Regression Analysis

In this chapter, we delve into the analysis of the factors influencing greenwashing behaviour and ESG performance among firms. By employing regression models, we want to discover if the education of the Chief Sustainability Officer, the financial measures and gender diversity impact a firm's tendency to engage in greenwashing practices or enhance its ESG Score.

4.1. Dependent variable

For the regression analysis, we selected two output variables: Greenwashing (GW) and ESG Combined Score (ESG_c).

We defined our main dependent variable, Greenwashing (GW), following the methodology of Ghitti et al. (2023), whose aim was to assess the difference between the intention of being green and the effectiveness of companies' actions towards sustainability, namely they wanted to study the divergence between ex-ante intention and ex-post activities. They developed a system of proxy for greenwashing based on three different levels. The first set of proxies is made by working on the heterogeneity of different ESG score providers, precisely the authors measured the difference between ESG ratings that more focus on preliminary commitment versus ratings focused on post-performance activities.

The second group of proxies is based on the counter position of companies with high ex-ante rating and their actual environmental violations so that a company is considered to be greenwashing active if there are any inconsistencies between these two ratings.

The third and last proxy for greenwashing is constructed on the ESG disagreement across rating providers, which is mostly due to a lack of a general understanding of the scope and measurement of ESG performance. Here the assumption is that the larger the ESG disagreement the higher the propensity to greenwash (Ghitti et al., 2023; Amravov et al., 2022). The data for this variable were available only for the period from 2012 to 2017.

We also consider the ESG Combined Score from Refinitiv Eikon, which provides an overall company score based on reported information in the environmental, social, and corporate governance pillars (ESG Score). This score includes an ESG Controversies overlay, which offers a comprehensive view including, but not solely defined by, controversies, rather than making direct adjustments to the score. Analyzing these two variables allows for a clear understanding of the relationship between genuine ESG performance and greenwashing. It helps to determine whether firms with higher ESG scores are less likely to engage in

greenwashing, or if there are discrepancies between their reported performance and actual practices.

4.2. Independent and control variables

As independent variables, instead of the governance characteristics commonly used in the existing literature, we wanted to test the effect of the CSO's presence on the ESG Score and Greenwashing variable and the CSO's educational background. By using the stricter aggregation method mentioned in the Data gathering and sample composition section, we created a dummy variable for each field of study, "STEM", "Natural", "Social Science" and "Business", both at B.A. and MSc level, without considering "Other" as it would be difficult to interpret eventual results. More precisely, the dummy "BASTEM" takes a value of one if the CSO has a bachelor's degree in STEM and zero otherwise, and so on for all the other variables.

In the empirical analysis, we control also for the financial factors that the literature commonly relates to greenwashing (Iliev and Roth, 2023; Ghitti et al.,2023; Delmas & Burbano Delmas & Burbano, 2011). The variable we decided to use are Return on Asset (ROA), computed as the company's earnings before interest and taxes (EBIT) and total asset; Leverage (LEV) as total debt on total asset; Market-to-book ratio (MB) computed as company market cap on total asset minus total liabilities; Tangibility (TANG), calculated as Property, Plant and Equipment-Accumulated Depreciation & Impairment (PP&E), which represents the total value of expense related to the fixed assets still carried on the books of the company, divided by total asset; Cash Holdings (CH) given by Cash and Cash Equivalents on total assets.

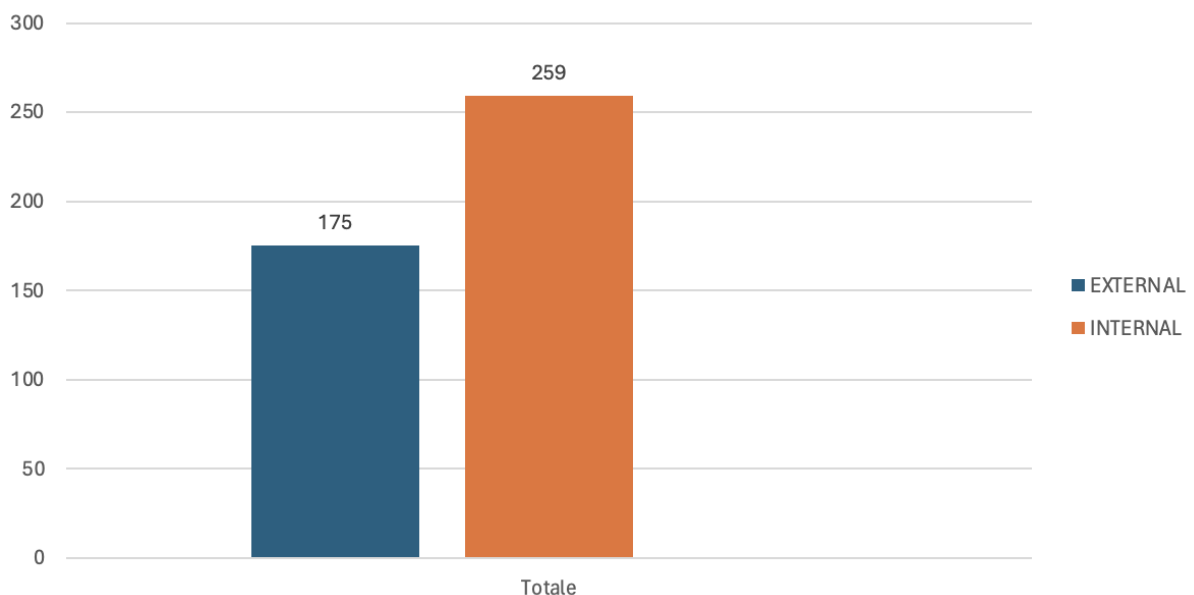
We control also for any potential positive or negative effect of gender on greenwashing, following the previous literature (Ghitti et al.,2023; Zang, 2023), by including a dummy for the female representation (Gender_Female), taking a value of one if the CSO is a female and zero otherwise. In addition, we considered the impact of time and the industry's fixed effect to control for time-specific and industry-specific factors. This will provide a more reliable analysis of the relationship between the educational background of CSOs and the tendency to engage in greenwashing across companies in the S&P 500. There are time-varying factors such as macroeconomic conditions, regulatory changes, and shifts in sustainability awareness that may influence greenwashing behaviour. Therefore, incorporating time-fixed effects ensures that any observed effects are not solely driven by temporal patterns. Additionally, given the diverse industries represented within the S&P 500, companies may exhibit varying characteristics, competitive dynamics, and sustainability pressures that may influence greenwashing behaviour. By including industry-fixed effect, we can account for these industry-specific factors that are

beyond the control of CSOs and capture the variation in greenwashing propensity within each industry over time.

4.3. Descriptive analysis

Our initial dataset revealed that only 12% of the companies we analyzed lacked a CSO-embedded figure, pointing towards a positive hiring trend and highlighting the need for high-level positions to oversee sustainability issues and strategy development. Looking at the CSO's previous working experience, we can see in [Figure 7](#) that almost 60% of them have been internally hired, which is consistent with the findings in the Strategy& (2023) analysis mentioned above, where out of a sample of 858 CSOs, 52% of them have been hired from inside the company. This information implies that a significant proportion of companies may value more internal talent and seek to cultivate leadership from within when it comes to sustainability roles, possibly recognizing the importance of aligning sustainability strategies with the existing organizational context, facilitating a smoother integration.

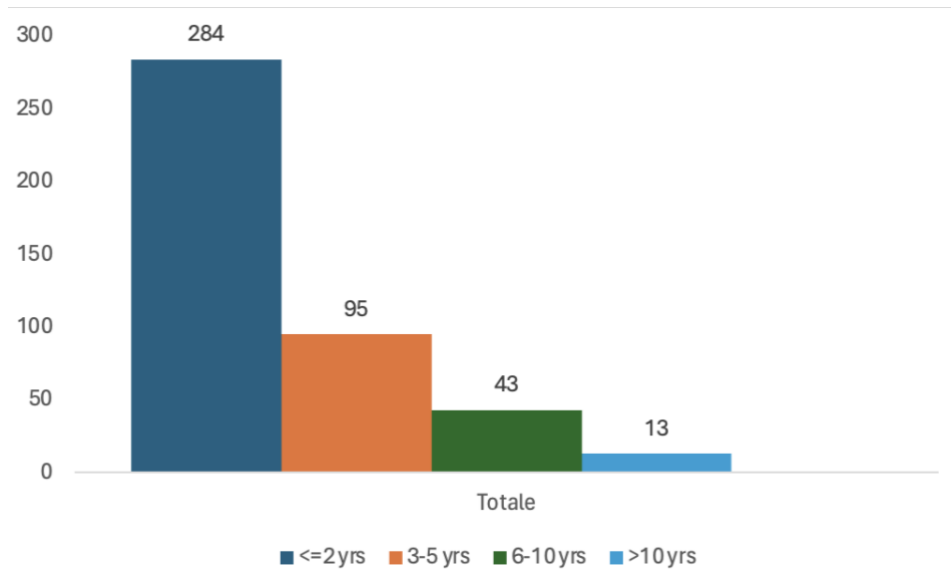
Figure 7: Internally and Externally hired CSO.



Source: Personal elaboration of research data.

By analyzing the tenure of the CSOs, [Figure 8](#), most of our sample were newly appointed, indicating that around 65% of the companies that have a CSO only recently decided to dedicate a specific role to sustainability, perhaps in response to the pandemic and the climate crisis.

Figure 8: CSOs by tenure range.



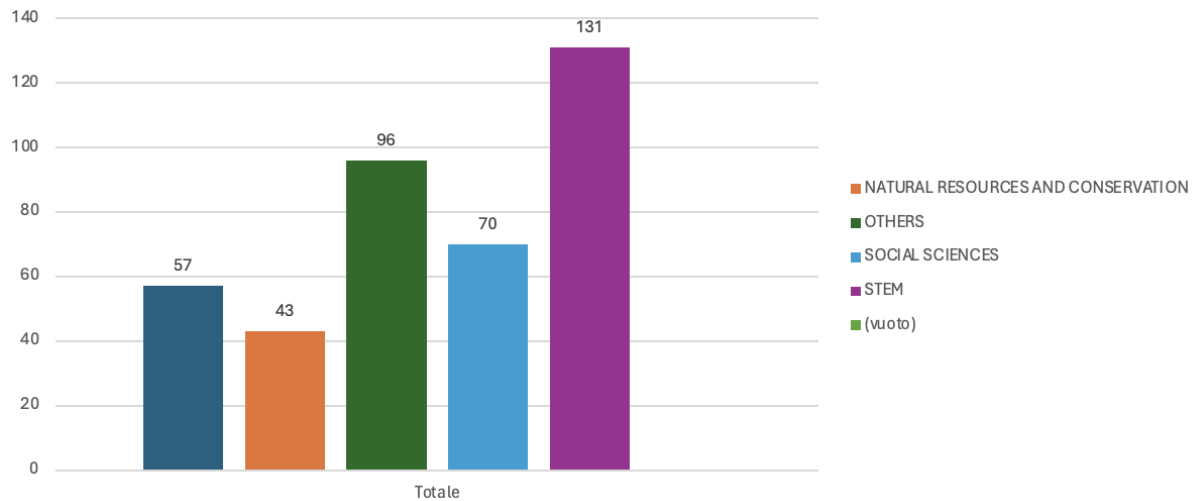
Source: Personal elaboration of research data.

It's worth noting that this result does not account for companies that may already have a CSO and either decided to change the professional figure or had the CSO step down from their role.

The literature on this topic shows some mixed results. Studying the CEO longevity in the corporate position they found that tenure is a crucial factor influencing strategic and business decisions (Khan et al., 2020). Long-tenure CEOs accumulate firms-specific skills, and expertise and build stronger connections with the organization's culture, thus driving CSR intestine and improving business long time prosperity (Godos-Diez et al., 2019). On the other hand, Oh et al. (2018) found that high-tenure CEOs may take companies to a lack of flexibility, harming the stakeholder interest and reducing CSR involvement. Moreover, Khan et al. (2020) found that increasing CEO tenure might end up in a negative influence on the social and environmental performance of a company. Ghardallou (2022) instead, found that there is a positive relationship between executives' tenure and both CSR and firm performances, demonstrating that longer tenure CEOs are more able to engage in such activities positively influencing financial performance.

More interestingly, we can have a look at the field of study distribution in our sample data, which for simplicity, is represented only through the second narrower level of aggregation, respectively both for B.A. (Figure 9) and MSc fields of study (Figure 10).

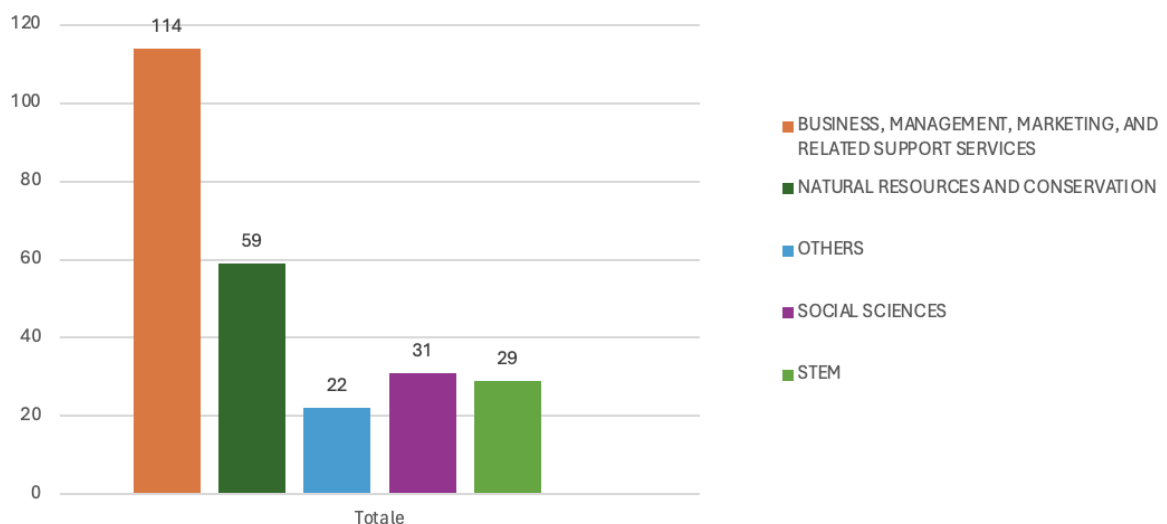
Figure 9: Distribution of B.A. field of study at a narrow level of aggregation.



Source: Personal elaboration.

Amongst the various fields of study pursued by CSOs' bachelors, the most dominant is STEM. The second most prevalent field is "Other", followed by "Social Science" and "Business".

Figure 10: Distribution of MSc field of study at a narrow level of aggregation.



Source: Personal elaboration.

Instead among the master's sample, the most represented field is "Business", then followed by "Natural" and "Social Science".

Although it is a bit surprising and counterintuitive to find the “Natural” and sustainability-related fields aren’t the most represented in both degree programs, assuming that the individuals have both degrees, this choice may be due to the desire by the CSOs to create a kind of solid academic base, based on general knowledge of Engineering, Business and Economics and Law, and then to specialize in sustainability issues. This can be seen also from the perspective of interdisciplinary studies background, as having a well-rounded education with a diverse range of knowledge, can help the CSO address problems from different perspectives and create innovative solutions. Moreover, many executive courses allow top-level professionals to continue to form and specialize themselves during their careers, which are not included in this study but can provide a starting point for future research. On the other hand, the above distribution can be interpreted as a greenwashing behaviour of companies, which recruit or place in positions of importance for sustainability issues, people who do not have a sufficiently qualified background, at least on paper. We will further see if there is any related effect on greenwashing and ESG score from any of these variables.

In literature, the general agreement is that personal background shapes the level of environmental awareness, a manager’s educational level influences the decision-making process and varies according to the knowledge acquired based on the discipline of studies (Hambrick & Mason, 1984; Fernandez-Gago et al., 2018). Based on the field of studies, there are contrasting points of view on which is the best one to better engage in sustainability practices. A study from Huang (2013), found that CEO business-related education has a fostering impact on the firm’s corporate social performance, particularly the author found a positive correlation between educational background and CSR for CEOs holding an MBA. Furthermore, it was found that economic undergraduates do not have the right capabilities to follow a CSR strategy, instead, they would negatively impact that performance (Frank & Schulze, 2000). Another current of thought identifies in human or social science background, the correct degree fields to enhance good activities in favour of a positive social impact and environmental norms (Rivera & De Leon, 2005; Frank & Schulze, 2000). Concerning scientific-based and engineering degrees, in literature we find a general agreement of a positive influence of such CEOs’ background on ESG performance, due to deep knowledge of technologies and innovation in research and development (Garcia-Blandon et al., 2019; Huang, 2013).

In Table 1, we show the descriptive statistics of the variables used for our research. The number of observations for each variable varies a lot since the financial variable (LEV, ROA, CASH, MB, TANG) spans the period 2000-2023, while the “GW” variable collected through the Ghitti

et al. (2023) paper is available only for the period 2012-2017. Similarly, all the dummies on educational background and gender refer to the date of the collection of the data (2023), while for ESG the data are mostly available from 2002.

Looking at the data below, we can say that there's evidence of a positive tendency of greenwashing behaviour among a segment of the companies analyzed, with the greenwashing mean being significantly positive, even if a substantial part does not, as shown by the 25th percentile value of zero, hence implying a mixed tendency. The minimum value is -52.680, and the maximum is 86.110, suggesting that some entities may significantly underreport or overstate their green credentials. The ESG Scores signal a strong tendency toward environmental, social and governance practices and assessments, even if the ESG Combined score is slightly lower, suggesting that there are for sure some entities that are overstating their credentials. Another aspect that comes is the prevalence of females in CSO positions, being slightly more than half of the sample and general profitability of the entities, showing a positive ROA. From the dummy on education, we can say that 25,4% of our sample have a CSO with a bachelor's degree in STEM and that 23% have a master's degree in business.

Table 1: Descriptive Statistics

Variable	μ	σ	Min	p25	p50	p75	Max	N
GW	13,588	23,940	-52,680	0,000	9,320	32,620	86,110	1891
ESG Score	51,613	20,456	0,000	35,589	52,818	68,653	95,162	8474
ESG Combined Score	47,730	18,709	0,599	33,637	47,230	62,441	92,723	8344
BASTEM	0,254	0,435	0				1	12000
BANATURALRESOURCES	0,086	0,280	0				1	12000
BASOCIALSCIENCES	0,140	0,347	0				1	12000
BABUSINESS	0,114	0,318	0				1	12000
BAOTHERS	0,200	0,400	0				1	12000
MScSTEM	0,054	0,226	0				1	12000
MScNATURALRESOURCES	0,118	0,322	0				1	12000
MScSOCIALSCIENCES	0,062	0,241	0				1	12000
MScBUSINESS	0,230	0,421	0				1	12000
MScOTHERS	0,048	0,214	0				1	12000
Gender_Female	0,508	0,500	0				1	12000
Gender_Male	0,376	0,484	0				1	12000
CSO_Presence	0,878	0,327	0				1	12000
ROA	0,099	0,132	-2,674	0,045	0,087	0,146	2,574	11003
Leverage	0,288	0,232	0	0,143	0,262	0,391	3,892	10522
MB	3,632	96,385	-7393,373	1,684	2,847	5,112	3421,521	10610
Tangibility	0,204	0,187	0	0,072	0,156	0,285	2,731	9726
Cash Holdings	0,089	0,103	0	0,019	0,054	0,121	0,964	10864

This table reports the summary statistics for the variables used in this study. *GW* is a variable defined using a set of proxies developed from Ghitt et al., (2023). *ESG Combined Score* is an overall company score based on the reported information in the environmental, social and corporate governance pillars (*ESG Score*) with an *ESG Controversies* overlay from Refinitiv Eikon. *BASTEM* is a dummy that takes the value of 1 if the CSO has a Bachelor's in STEM and 0 otherwise. *BANATURALRESOURCES* is a dummy that takes the value of 1 if the CSO has a Bachelor's in natural resources and 0 otherwise. *BASOCIALSCIENCES* is a dummy that takes the value of 1 if the CSO has a bachelor's in social science and 0 otherwise. *BABUSINESS* is a dummy that takes the value of 1 if the CSO has a bachelor's in business and 0 otherwise. *BAOTHERS* is a dummy that takes the value of 1 if the CSO has a Bachelor's in other fields out of the above mentioned and 0 otherwise. *MScSTEM* is a dummy that takes the value of 1 if the CSO has a Master's in STEM and 0 otherwise. *MScNATURALRESOURCES* is a dummy that takes the value of 1 if the CSO has a Master's in Natural Resources and 0 otherwise. *MScSOCIALSCIENCE* is a dummy that takes the value of 1 if the CSO has a Master's in Social Science and 0 otherwise. *MScBUSINESS* is a dummy that takes the value of 1 if the CSO has a Master's in Business and 0 otherwise. *MScOTHERS* is a dummy that takes the value of 1 if the CSO has a Master's in other fields out of the above-mentioned and 0 otherwise. *Gender_Female* is a dummy that takes the value of 1 if the CSO is a female and 0 otherwise. *Return on Asset (ROA)*, is the company's earnings before interest and taxes (*EBIT*) and total assets; *Leverage (LEV)* is total debt on total assets; *Market-to-book ratio (MB)* is company market cap on total assets minus total liabilities; *Tangibility (TANG)*, is Property, Plant and Equipment- Accumulated Depreciation & Impairment (*PP&E*), divided by total asset; *Cash Holdings (CH)* given by Cash and Cash Equivalents on total assets.

5. Empirical result

Given the importance of our two output variables, Greenwashing and ESG Combined Score, we will separately analyze the result obtained by having a look at the summary statistics and the regression. The set of variables is tested with firm-year panel data and Ordinary Least Square (OLS) models, including time and industry fixed effects, according to the literature's standards (Ghitti et. al., 2023; Dyck et al., 2019).

5.1. CSO presence effect on the dependent variables

In this section, we will focus on the first aim of this thesis, namely to study if there are any significant effects on greenwashing behaviour and ESG Score concerning the presence of a Chief Sustainability Officer in the S&P 500 companies. Our findings, suggests that having a CSO do have an impact on both the dependent variables. More precisely, the presence of a CSO is negatively associated with greenwashing behaviour in all GW models (1 to 4), as indicated by the highly significant coefficients. This means that companies with a CSO may be less likely to engage in greenwashing activities, due to their role of controlling and monitoring sustainability initiatives and new regulatory trends. Conversely, we find that CSO presence is positively associated with the ESG Score, suggesting that the oversight of a CSO may increase the company's overall ESG ratings. The results are intuitive and consistent with the general understanding that a top management figure in sustainability should enhance the environmentally friendly reputation of the firm, not only by preventing greenwashing but also by defending the company from eventual controversy and consequently by trying to increase the ESG initiatives and ratings for the companies. By looking at [Table 2](#) and [Table 3](#), in each column, there is a different regression model for both greenwashing and ESG Combined Score. In "GW(1)" and "ESG_c (1)" we examine only the relationship with the CSO presence; in the second "(2)" model we add financial and gender control variables to the analysis; in the third and fourth model "(3-4)", while including the variables from the second model, we adjust the regressions respectively for time and industry fixed effect, allowing us to increase the model fit by increasing the R-Squared values.

From the greenwashing variable point of view, [Table 2](#), the CSO presence reduces the likelihood that companies will take action to mislead consumers and stakeholders about the real sustainability situation. By evaluating the effect of the control variables, we can say that ROA, Market-to-Book ratio, and Cash Holdings are not significantly related to greenwashing behaviour in our dataset, with p-values above the significance levels. By contrast, the

relationship with Tangibility is positive and highly significant in all models, with the coefficients ranging from 10.6988 to 11.7049, all with p-values < 0.01.

Table 2: Regression of CSO Presence on Greenwashing

Variables	GW (1)	p-value		GW (2)	p-value		GW (3)	p-value		GW (4)	p-value	
CSO_Presence	-5,7990	0,0019	***	-7,6734	0,0003	***	-8,1732	<0,0001	***	-7,7404	<0,0001	***
ROA				-0,7695	0,9187		-0,6471	0,9250		2,9289	0,6937	
MB				0,0046	0,4022		-0,0056	0,2682		-0,0055	0,2649	
LEV				-1,6180	0,6365		-5,9715	0,0573	*	-0,9632	0,7800	
TANG				10,6988	0,0012	***	11,7049	<0,0001	***	11,0142	0,0026	***
CH				-9,9281	0,1589		-9,0501	0,1587		-3,4570	0,6062	
Gender Female				-1,4325	0,2319		-1,3505	0,2160		-0,8857	0,4227	
Constant	18,8290	<0,0001	***	20,7271	<0,0001	***	27,4808	<0,0001	***	18,7868	0,0655	*
Time FE	No			No			Yes			Yes		
Industry FE	No			No			No			Yes		
Observations	1891			1605			1605			1605		
R- squared	0,0051			0,0171			0,1867			0,1788		
Adjusted R- squared	0,0046			0,0128			0,1811			0,1715		

Source: Personal elaboration.

This indicates that companies with more tangible assets are related to higher levels of greenwashing. Instead, there is no evidence of an association between Leverage and greenwashing, except for model GW (3), where by including time fixed effect the coefficient is -5.97146 with a p-value of 0.0573, suggesting a marginally significant negative association with greenwashing. This result is in contrast with the previous evidence (Nawaiseh, 2015; Brammer & Pavelin, 2006), where leverage is seen to hurt the company budget dedicated to implementing green projects, hence increasing the probability of greenwashing. Under this model, there isn't any statistically significant effect of the CSO on the likelihood of taking greenwashing actions. Moreover, we can see that the R-squared values increase across the models, meaning that including controls, industry, and more interestingly time-fixed effect, helps to explain the variance in Greenwashing.

The ESG Combined score, in [Table 3](#), is positively associated with the presence of a CSO in all four models, meaning that having a sustainability director may enhance the company's ESG performance. Interestingly, Tangibility has a strong and positive association with ESG in all models, indicating that companies with more tangible assets tend to have higher scores. This is in contrast with the results obtained above, where it seems to increase the propensity of the firms to greenwash. Usually, a heavy presence of tangible assets correlates with capital-

intensive industries with a larger environmental footprint, where companies face stricter regulatory pressure to comply with ESG standards, requiring them to invest in sustainable and social initiatives to mitigate their impact (Bouslah et al., 2011; Clarkson et al., 2011).

Table 3: Regression of CSO presence on ESG Combined score

Variables	ESG c (1)	p-value		ESG c (2)	p-value		ESG c (3)	p-value		ESG c (4)	p-value	
CSO_Presence	6,9784	<0,0001	***	5,8646	<0,0001	***	6,5623	<0,0001	***	6,2482	<0,0001	***
ROA				-0,7688	0,7607		4,0923	0,0634	*	8,2768	0,0003	***
MB				0,0011	0,7057		-3.86976e-00,9877			0,0007	0,7896	
LEV				4,3257	0,0001	***	-3,3318	0,0007	***	-4,6821	<0,0001	***
TANG				8,7505	<0,0001	***	11,3905	<0,0001	***	11,8855	<0,0001	***
CH				-0,5160	0,8351		-10,6570	<0,0001	***	-5,9313	0,0078	***
Gender Female				-0,4769	0,2741		0,9657	0,0108	**	-1,1958	0,0015	***
Constant	41,5525	<0,0001	***	40,4869	<0,0001	***	51,2964	<0,0001	***	31,3086	<0,0001	***
Time FE	No			No			Yes			Yes		
Industry FE	No			No			No			Yes		
Observations	8344			7185			7185			7185		
R- squared	0,0141			0,0230			0,2663			0,3057		
Adjusted R- squared	0,0140			0,0220			0,2634			0,3016		

Source: Personal elaboration

Regarding profitability, ROA shows mixed results as it is not significant in greenwashing models, while it has a weak positive association with ESG, meaning that if we account for the time-fixed effect ROA could have a positive influence. This result is intuitive as companies with higher ROA have better resource efficiency and consequently more financial potential to eventually invest in ESG initiatives and sustainable practices (Giese et al., 2019). Conversely, Cash Holdings (CH) show a significant and negative relationship in models 3 and 4, meaning that high cash reserves can be associated with lower ESG Scores. One of the possible explanations for this result can be the different resource utilization, as a firm with consistent cash holdings might decide to hold it for strategic acquisition, to increase its flexibility in case of crisis and not necessarily allocate it to ESG practices (Opler et al., 1999). From market perception, the substantial cash of the companies may be interpreted as an opportunistic behaviour to not efficiently deploying resources to enhance long-term ESG values, but only to gain short-term advantage (Harford et al., 2008), hence pushing the investor's scepticism and leading to lower ESG scores. Leverage shows some mixed relationship with ESG, depending on the models. It has a significant positive association in models 2 and 3, but a significant negative association in model 4 with industry fixed effects, which suggests that industry-specific factors might influence the relationship between leverage and ESG performance.

Companies with a higher level of debt might be more constrained to disclose environmental performance information, and since there is a growing interest from ESG-focused investors, showing robust performance helps the companies secure better financial terms, reducing the cost of capital (Eliwa et al., 2021; Ioannou and Serafeim, 2017). Ultimately, gender in this case shows some statistically significant results, different from the greenwashing models. The impact of female leadership on ESG performance is not consistent across different models. In some cases, it shows a light positive association, suggesting that having female leaders could improve ESG performance (model 3). This aligns with the broader trend of female leadership being linked to higher corporate social responsibility. However, in other cases (model 4), there is a negative association when accounting for time and industry effects, indicating potential contextual or sector-specific nuances. Even in this case, the fit of the various models improves when time and industry-fixed effects are included in the analysis. Model 4 explains approximately 30% of the variability in ESG Combined Scores. It's important to note that the adjusted R-squared values show that the mentioned models are less effective at explaining Greenwashing behaviour. This suggests that there are other factors influencing Greenwashing that are not accounted for in the current models.

5.2. Educational Background Effect on ESG Combined Score

In this section, we wanted to study if there are any significant effects of the educational background of the company's CSOs on the ESG scores. We started our analysis firstly by having a look at how the ESG mean varies between different degree specializations, in [Table 4](#).

Table 4: Descriptive statistics of ESG per different degree

Variable	μ	σ	N
ESG	51,61	20,46	8474
ESG BA Stem	50,87	20,98	2050
ESG BA Natural	51,56	19,26	707
ESG BA Social Science	53,33	20,36	1189
ESG BA Business	52,61	19,33	954
ESG BA Others	52,78	20,71	1733
ESG MSc Stem	50,77	20,04	484
ESG MSc Natural	50,09	20,39	942
ESG MSc Social Scienc	53,28	21,10	523
ESG MSc Business	52,72	19,96	1896
ESG MSc Others	59,90	18,51	419
ESG_c	47,73	18,71	8344
ESG_c BA Stem	49,79	18,79	2133
ESG_c BA Natural	47,20	17,78	695
ESG_c BA Social Scien	44,90	18,46	1218
ESG_c BA Business	50,33	19,28	939
ESG_c BA Others	49,21	18,76	1733
ESG_c MSc Stem	49,27	19,48	458
ESG_c MSc Natural	47,58	18,02	857
ESG_c MSc Social Scie	45,54	16,74	535
ESG_c MSc Business	49,44	19,17	1998
ESG_c MSc Others	51,65	17,91	432

Source: Personal elaboration

As expected, the ESG values vary significantly across different educational backgrounds and levels of study. The first thing we can notice, without considering in our reasoning the values for the degree category "Others", is that the highest ESG values based on the study specialization, differ between ESG and ESG combined. In fact, for the simple ESG score, the highest values are given by CSOs with a degree in Social Science and Business, while for ESG Combined we see that this comes from the degrees in Business and Stem. Surprisingly, the degree in Natural Resources seems to not drive up the ESG values as we would expect.

To better understand the differences in values, we pursued a T-test, in [Table 5](#) below, which provides insights into how the educational background of a company's Chief Sustainability Officer (CSO) influences the company's ESG scores at both Bachelor's and Master's levels. Our focus will be particularly on the ESG Combined score, as it represents a more comprehensive measure of a company's overall ESG performance and the results are more

interesting. The first test is between bachelor degrees in Business and Natural, where there is a difference of 3.13 at a 1% significance level, meaning that the CSOs with Bachelor's degrees in Business significantly outperform those with degrees in Natural Sciences in ESG combined scores. This can be due to a broader integration of social responsibility and corporate governance topics in the Business degree education compared to Natural Science, which is more environmentally focused. This positive difference in favour of a Business background of the CSOs is confirmed also for the MSc, even if with a lower effect.

Table 5: T-test on ESG mean values based on degree specialization

Variable	ESG	p-value	ESG_c	p-value		
BA						
Business - Stem	1,74	0,030136035 **	0,54	0,466612177		
Business - Natural	1,05	0,271611116	3,13	0,000820459 ***		
Business - Social Science	-0,72	0,40553938	5,42	4,04844E-11 ***		
MSc						
MSc Business - Stem	1,94	0,056139662 *	0,17	0,864216894		
MSc Business - Natural	2,63	0,001035124 ***	1,86	0,015615608 **	Significance Level	
MSc Business - Social Science	-0,56	0,574322014	3,90	1,88795E-05 ***	***	1%
					**	5%
					*	10%
BA						
Stem - Natural	-0,69	0,443297809	2,59	0,001409923 ***		
Business - Natural	1,05	0,271611116	3,13	0,000820459 ***		
Social Science - Natural	1,77	0,061488282 *	-2,30	0,00810199 ***		
MSc						
Stem - Natural	0,69	0,544099972	1,69	0,115665034		
Business - Natural	2,63	0,001035124 ***	1,86	0,015615608 **		
Social Science - Natural	3,19	0,004632225 ***	-2,04	0,035229018 **		

Source: Personal elaboration

The comparison between Business and Social Science backgrounds reveals significant variations in ESG values. Companies with CSOs holding a bachelor's degree in business achieve an ESG score that is on average more than 5 points higher than those with a CSO degree in Social Sciences. Business education may equip graduates with better tools for implementing ESG strategies, emphasizing a more practical and strategic approach compared to Social Science. This might mean that Social Sciences may not sufficiently cover governance or environmental strategies despite its emphasis on societal and ethical issues (Epstein et al., 2017; Aguinis & Glavas, 2012). This difference persists at the master's level, suggesting that Social Sciences may lack important topics needed for strong ESG performance.

An unexpected finding occurs in the comparison between STEM and Natural backgrounds. STEM graduates unexpectedly achieve significantly higher ESG scores compared to Natural Sciences graduates. However, this result is not confirmed at the master's degree level as the difference is not statistically significant. On average, a background in Natural Sciences is associated with higher ESG values at both bachelor and master levels compared to a background

in Social Sciences, indicating that a deep focus on sustainability and environmental issues may positively contribute to ESG performance.

The analysis using t-tests of the ESG combined score has shown significant differences based on the CSO's educational background. Business and STEM education consistently yield higher values compared to other backgrounds at both levels of studies, suggesting that companies, where the CSO has a degree in Business or STEM, may achieve higher average ESG scores than competitors with CSOs from different educational backgrounds. Moreover, a background in Natural Sciences seems to slightly lower the ESG score compared to the overall mean ESG value of all the companies in the dataset, which is surprising and counterintuitive. Additionally, CSOs with an education in Social Science appear to have the worst impact on ESG combined values compared to all the other backgrounds analyzed.

After having analyzed the difference between the averages of ESG values, based on the different degrees we chose to control for, we decided to perform some regression analysis to study precisely the effect of each of them on the ESG dependent variable. In each column below, we present the OLS estimation results for the ESG Combined score, respectively 4 regarding the Bachelor's degree in [Table 6](#), and 4 for the Master's degree in [Table 7](#), for a total of eight regressions. Each follows this approach:

- the first regression considers only the independent variable for each degree, respectively for B.A. (ESG_c (1)) and M.S.c (ESG_c (5)).
- the second regression involves the analysis of the financial and gender control variables, both for B.A. (ESG_c (2)) and for M.S.c (ESG_c (6)).
- the third and fourth regression incorporate time (ESG_c (3); ESG_c (7)) and fixed effects (ESG_c (4); ESG_c(8)).

Table 6: ESG Combined score and B.A. Educational Background of CSO

Variables	ESG_c (1)	p-value		ESG_c (2)	p-value		ESG_c (3)	p-value		ESG_c (4)	p-value	
B.A. Stem	2,9552	<0,0001	***	1,5510	0,0056	***	1,5899	0,0011	***	0,9261	0,0616	*
B.A.Natural Resources	0,3663	0,6370		0,4475	0,6028		-0,3803	0,6112		-0,1110	0,8819	
B.A.Social Science	-1,9292	0,0020	***	-1,3258	0,0530	*	-1,7083	0,0042	***	-1,1819	0,0451	**
B.A. Business	3,4953	<0,0001	***	3,0933	<0,0001	***	3,1572	<0,0001	***	3,1107	<0,0001	***
ROA				-1,3044	0,6069		3,6152	0,1030		6,9395	0,0022	***
MB				0,0010	0,7418		-0,0002	0,9325		-0,0008	0,7539	
LEV				3,7152	0,0010	***	-3,9826	<0,0001	***	-5,4093	0,0001	***
TANG				8,8211	<0,0001	***	11,4247	<0,0001	***	11,8780	<0,0001	***
CH				0,6735	0,7875		-9,1737	<0,0001	***	-5,4171	0,0160	**
Gender Female				-0,1440	0,7449		-0,5548	0,1495		-0,8993	0,0182	**
Constant	46,8319	<0,0001	***	45,1462	<0,0001	***	56,8384	<0,0001	***	38,5642	<0,0001	***
Time FE	No			No			Yes			Yes		
Industry FE	No			No			No			Yes		
Observations	8344,0000			7185,0000			7185,0000			7185,0000		
R- squared	0,0096			0,0176			0,2598			0,2990		
Adjusted R- squared	0,0091			0,0162			0,2566			0,2945		

Source: Personal elaboration

The main point to consider is that both B.A. and MSc degrees in Natural Resources do not significantly impact ESG, which is concerning. It's important to note that this category of degree is very broad and covers a wide range of subjects, as we've seen with the CIP classification, including environmental science, ecology, agriculture, and forestry. This breadth means that graduates may pursue various career paths, some of which may not directly involve or prioritize corporate ESG strategies. Additionally, some careers may focus more on environmental conservation or policy work without emphasising business or managerial skills, which might not always directly translate into managing corporate roles that influence ESG performance (Epstein et al., 2017). This result sheds light on the importance of integrating business-oriented skills and a holistic understanding of ESG dimensions into natural resources curricula for those aspiring to influence corporate ESG outcomes at a corporate level. On the other hand, there is strong evidence to suggest that having a B.A. STEM degree is associated with a higher ESG Combined Score compared to the reference group, and this relationship is unlikely to be due to random chance. The coefficient of 2.96 in model 1 indicates the estimated change in the score when the independent variable (having a B.A. STEM degree) is increased by one unit, holding all other variables constant. The rationale behind this positive effect might be the analytical and problem-solving approach given by STEM education, as well as a long-term perspective and

planning, which helps to align CSOs' capabilities to the goals of sustainable business practices. The effect persists across the models for the bachelor, even if it slightly decreases its significance level when accounting for time and industry fixed effect. Instead, the master in STEM doesn't seem to have the same strength, especially if we add control variables and fixed effects to the regression, with the coefficient dropping and losing significance and suggesting that financial and gender variables might moderate the degree's influence, as we can see from [Table 7](#).

Moreover, our results show that holding a B.A. in Social Science is significantly linked to a lower ESG score. This association remains consistent even after accounting for control variables and industry-fixed effects, although the negative impact is slightly reduced. This pattern is also observed at the master's level, where the control and time-fixed effects further intensify the negative relationship with ESG.

Table 7: ESG Combined score and M.S.c Educational Background of CSO

Variables	ESG_c (5)	p-value		ESG_c (6)	p-value		ESG_c (7)	p-value		ESG_c (8)	p-value	
M.S.c Sem	2,1713	0,0178	**	0,9323	0,3388		1,6000	0,0590	*	-0,0900	0,9156	
M.S.c Natural Resources	0,4815	0,4892		0,0005	0,9995		-0,8260	0,2093		-0,0365	0,9561	
M.S.c Social Sciences	-1,5556	0,0686	*	-2,0857	0,0245	**	-2,0132	0,0125	**	-1,4537	0,0693	*
M.S.c Buiness	2,3416	<0,0001	***	1,2321	0,0219	**	1,9593	<0,0001	***	1,2682	0,0065	***
ROA				-0,7584	0,7652		4,3056	0,0525	*	7,3979	0,0012	***
MB				0,0014	0,6291		0,0003	0,9073		-0,0003	0,8901	
LEV				3,8824	0,0006	***	-3,9384	<0,0001	***	-4,9831	<0,0001	***
TANG				9,4093	<0,0001	***	12,1044	<0,0001	***	12,3190	<0,0001	***
CH				-0,2199	0,9302		-9,6202	<0,0001	***	-5,8961	0,0090	***
Gender Female				-0,3108	0,4791		-0,8134	0,0332	**	-1,0539	0,0055	***
Constant	47,1000	<0,0001	***	45,2410	<0,0001	***	57,0002	<0,0001	***	37,6321	<0,0001	***
Time FE	No			No			Yes			Yes		
Industry FE	No			No			No			Yes		
Observations	8344			7185			7185			7185		
R-squared	0,0039			0,0150			0,2580			0,2968		
Adjusted R-squared	0,0034			0,0136			0,2548			0,2923		

Source: Personal elaboration

Notably, the study provides strong evidence that a degree in Business is strongly and positively correlated with ESG scores across all models, resulting in an average increase of approximately 3 points. While this effect is somewhat reduced for individuals with a master's degree, it remains

statistically significant. However, including control and fixed effects weakens this positive association. The consistent positive impact across all models indicates that graduates with a business degree are more likely to be preferred for leading ESG initiatives at a corporate level compared to individuals with different educational backgrounds.

Upon examining the control variable, we observed that the Return on Assets (ROA) for both B.A. (2,3,4) and MSc (6,7,8) models initially shows a negative and non-significant impact but becomes positive and significant when time and industry effects are taken into account. This suggests that more profitable companies may be better able to allocate resources to ESG activities over time.

Regarding Leverage, it initially exhibits a positive and significant effect but becomes negative and significant when fixed effects are introduced. This could indicate that companies relying more on debt financing initially might invest more in ESG initiatives to attract investors and reduce financial risk. However, considering time and industry effects, a high debt ratio may limit these investments and make it difficult for them to allocate funds to implement green projects, thereby influencing the overall ESG score.

We also observed interesting relationships with two other variables: tangibility and cash holdings. Tangibility has a strong and positive effect on ESG, with the coefficient consistently increasing and being highly significant across all the models, even when fixed effects are added. This robust positive relationship highlights the link between a company's physical asset presence and its commitment to ESG practices, reflecting a higher environmental and social responsibility. On the other hand, cash holdings, initially positive but not significant, turn negative when time and fixed effects are added. This change may indicate a conservative cash management policy that does not prioritize ESG investment.

Additionally, when fixed effects are considered, gender shows some negative effects on ESG scores. As predictable, the more variables are included in the regression, the better the model fit and its comprehensiveness in understanding the ESG combined variance.

In summary, the analysis of the regression models underscores the complex interplay between the educational background of Chief Sustainability Officers, the financial characteristics of firms, and the industry context in shaping a company's ESG performance. The key finding is that CSOs with degrees in STEM and Business, particularly at the bachelor level, consistently enhance a company's ESG ratings, while degrees in Social Science tend to have a slight

negative impact. Notably, a degree in Natural Resources, at both the bachelor's and master's levels, does not significantly affect the dependent variable.

5.3. Educational Background Effect on Greenwashing

In this last empirical section, we will delve into the analysis of the educational background dummy variables and greenwashing (GW), while sequentially adding, as for ESG Combined score, financial and gender control variables, time and industry-fixed effect to observe their impact on the dependent variable. This study aims to understand if there are any statistically significant dependencies of the education of the Chief Sustainability Officer to affect the propensity of greenwashing of the respective firms. As we can see from [Table 8](#) below, the results are contrasting. It is noteworthy that the bachelor's degrees (GW 1 to 4) we analyzed do not appear to have a significant impact on greenwashing in any of the models we studied.

Table 8: B.A. Educational Background Effect on Greenwashing

Variables	GW	p-value	GW (1)	p-value	GW(2)	p-value	GW(3)	p-value	GW(4)	p-value				
B.A. Stem			0,189167	0,8922	-1,37271	0,3763	-1,58253	0,2634	-0,760454	0,6088				
B.A.Natural Resources			-0,262158	0,9028	0,500396	0,8361	0,541426	0,8061	1,2282	0,589				
B.A.Social Science			-0,362361	0,8271	0,932693	0,6185	0,988182	0,5631	1,8638	0,283				
B.A. Business			0,778043	0,6721	-0,108172	0,9573	-0,129955	0,9438	-0,913996	0,6258				
ROA					-1,78355	0,814	-1,75779	0,7995	2,37307	0,7511				
MB					-0,005082	0,3592	-0,006045	0,2321	-0,005815	0,2453				
LEV					-0,730868	0,8339	-5,02232	0,1168	0,352417	0,92				
TANG					10,2844	0,0025	***	11,3307	0,0003	***	10,9223	0,0035	***	
CH					-10,8289	0,1271		-10,0099	0,1221		-4,38886	0,516		
Gender Female					-1,61397	0,1862		-1,54339	0,1657		-1,17002	0,2968		
CSO_Presence	-5,799	<0,0019	***											
Constant	18,829	<0,0001	***	13,5245	<0,0001	***	14,0608	<0,0001	***	20,3273	<0,0001	***	9,17038	0,3679
Time FE	No			No			No		Yes		Yes			
Industry FE	No			No			No		No		Yes			
Observations	1891			1891			1605		1605		1605			
R- squared	0,005107			0,000177			0,009937		0,178757		0,205052			
Adjusted R- squared	0,00458			-0,001943			0,003726		0,171526		0,190415			

Source: Personal elaboration

This indicates that simply having an undergraduate education may not be adequate to influence deceptive environmental practices. A bachelor's education generally offers a comprehensive understanding of subjects without emphasizing practical applications and analytical skills, which may not empower a manager to directly impact corporate policy, including complex

issues related to greenwashing. It is important to mention that our analysis examined the effects of bachelor's and master's degrees separately, without considering any potential impact of holding both degrees. In our examination of bachelor's models, we observed a strong positive effect of Tangibility on greenwashing, suggesting that companies with more tangible assets could be more inclined to engage in deceptive activities. This relationship remained significant even when we considered time and fixed effects also at the master's level, implying that companies with higher levels of tangibility are more susceptible to greenwashing over time and across industries. This finding supports our previous discoveries, where we identified a positive effect of tangibility on overall environmental, social, and governance performance. It is plausible that companies with substantial tangible assets are more sensitive to poor ESG ratings, prompting them to engage in deceptive activities to enhance their perceived sustainability. Studies have indicated that firms with significant tangible assets, especially those operating in environmentally sensitive sectors with stringent disclosure and reporting requirements, may be more prone to reputational damage and thus more likely to engage in greenwashing behaviours to mitigate sustainability-related risks (Yang et al., 2020; Delmas & Burbano, 2011).

In our analysis, we found that the impact of master's degrees, [Table 9](#) (models GW 5 to 8), on greenwashing behaviour, differs significantly from that of bachelor's degrees (models GW 1 to 4). It appears that the educational backgrounds of Chief Sustainability Officers have a noteworthy influence on their likelihood of engaging in greenwashing. We observed that all degree levels, albeit to varying extents, are negatively correlated with the propensity for greenwashing. Specifically, a master's degree in STEM significantly reduces the likelihood of engaging in misleading practices. This effect becomes even more pronounced when we incorporate control variables and fixed effects into our models, thus confirming a substantial deterrent effect. The coefficient in model 8, which includes fixed effects, indicates that for every unit increase in the number of master's degree holders in STEM, the greenwashing score is expected to decrease by approximately -7.33 points across different industry sectors and over time. STEM fields typically emphasize a methodical approach to problem-solving, equipping CSOs with the ability to critically evaluate a firm's sustainability practices and identify inconsistencies and deceptive behaviours associated with greenwashing.

In contrast to the previous regressions on ESG scores presented in [Table 6](#) and [Table 7](#), we found that a STEM degree has an opposite effect on the dependent variables under analysis, but these effects are interrelated. If a STEM background helps a CSO reduce the likelihood of greenwashing, it consequently leads to an increase in the ESG (Environmental, Social, and Governance) score. Interestingly, the significance of the result was higher for a bachelor's

degree concerning the combined ESG score, compared to the master's degree, as opposed to the results we obtained for greenwashing behaviour.

Table 9: M.S.c educational background effect on Greenwashing

Variables	GW(5)	p-value		GW(6)	p-value		GW(7)	p-value		GW(8)	p-value	
M.S.c Stem	-4,2987	0,0938	*	-7,0378	0,0113	**	-7,1067	0,0050	***	-7,3345	0,0046	***
M.S.c Natural Resources	-2,8790	0,1088		-3,9808	0,0460	**	-4,1771	0,0216	**	-4,6164	0,0128	**
M.S.c Social Sciences	-4,7062	0,0500	*	-4,3663	0,0915	*	-4,5434	0,0539	*	-3,2465	0,1781	
M.S.c Business	-3,3294	0,0134	**	-4,3996	0,0028	***	-4,5588	0,0007	***	-3,8461	0,0046	***
ROA				-2,8633	0,7047		-2,8688	0,6770		0,9666	0,8969	
MB				-0,0052	0,3481		-0,0061	0,2218		-0,0061	0,2182	
LEV				-0,2447	0,9431		-4,4902	0,1536		0,1038	0,9760	
TANG				9,8584	0,0027	***	10,7878	0,0003	***	10,1162	0,0056	***
CH				-7,4409	0,3021		-6,4203	0,3284		-1,5440	0,8211	
Gender Female				-1,6153	0,1787		-1,5472	0,1574		-1,1499	0,2996	
Constant	15,2133	<0,0001	***	15,7716	<0,0001	***	22,0155	<0,0001	***	15,2178	0,1336	
Time FE	No			No			Yes			Yes		
Industry FE	No			No			No			Yes		
Observations	1891			1605			1605			1605		
R- squared	0,0056			0,0184			0,1875			0,2121		
Adjusted R- squared	0,0035			0,0123			0,1804			0,1976		

Source: Personal elaboration

The analysis of other educational backgrounds at the master's level, such as Natural Resources, Social Sciences, and Business, also shows significant negative effects on greenwashing as mentioned above, but the impact is not as strong or consistent as for STEM degrees. Differently from all the previous analyses, here a degree in Natural Resources finally shows some interesting results at a master's level. A CSO holding such a degree might deter greenwashing practices, an effect that holds especially when the model is more complete, although with a medium significance level. This aligns with the field's emphasis on sustainability subjects and responsible environmental management, making these CSOs well-committed to positively influencing the organizational culture towards authentic and long-term sustainable practices, and thus reducing the tendency to greenwash (Bensal & Densjardine, 2014; Arjaliès & Mundy, 2013).

As for a master's Business degree, significantly reduces greenwashing in companies, holding strong across all the model's specifications. Being this field composed of a broad type of courses, emphasizing ethical leadership and strategic management, is likely to understand that CSOs may be better able to understand the market dynamics and the risk associated with

greenwashing so that they can potentially have the necessary capabilities to steer the organizations away from risky deceptive practices.

In conclusion, the effect of a CSO holding a master's degree in Social Sciences on reducing greenwashing is less pronounced with respect to the other fields of study and becomes statistically insignificant when industry effects are included in the model. Nonetheless, there is a marginally significant trend that suggests a slight inclination to mitigate greenwashing activities. Such education, which includes areas such as sociology, psychology and political science, equips CSOs with insights to address the societal dimension of sustainability, which is crucial in building brand transparency and stakeholder trust and reducing greenwashing. Such practices can have an enormous impact on consumers' and investors' confidence in green products and claims (Delmas & Burbano, 2011).

6. Conclusion and Managerial Implications

This thesis examines the impact of having a Chief Sustainability Officer on the ESG Combined score and Greenwashing propensity of companies in the S&P 500. Furthermore, it delves into the specific effects of CSOs' different educational backgrounds on the dependent variables, aiming to identify any significant differences based on their academic backgrounds.

The key results of the study concerning the CSO presence in the company are:

- A strongly significant and negative relationship between the presence of a CSO and greenwashing behaviours, implying that companies holding a sustainability position at the C-suite managerial level are less likely to be involved in deceptive environmental behaviours. This suggests that CSOs are primarily responsible for fostering transparency and accountability within organizations, ensuring that corporate actions align with credible sustainability commitments, thus reducing the likelihood of greenwashing practices. (Miller & Serafeim, 2014; Delmas & Burbano, 2011). On the other hand, Lyon and Maxwell (2011) posit that the CSO presence alone does not necessarily deter greenwashing, if not backed up with the threat of external audits which can increase the risk of potential exposure for deceptive environmental claims. Moreover, according to Kanashiro & Rivera (2019), CSOs may be appointed for symbolic reasons in certain industries or to signal to stakeholders and peers their commitment to sustainability and avoid potential backlash, often resulting in limited authority which hinges on their effectiveness in reducing greenwashing. We found no statistically significant effect of having a female CSO in the company, which contradicts the previous findings by Chen and Dagestani (2023). They found that the moderating role of female directors, rather than executive gender, is positively associated with sustainability; hence, the likelihood of greenwashing decreases with greater involvement of females on the board of directors. Future-oriented CEOs should appoint CSOs in order to build on a long-term sustainable strategy which, with robust policies and reporting systems, may help the company to overcome superficial greenwashing activities.
- A statistically significant positive effect of CSO on ESG score, highlighting the critical role in enhancing the overall sustainability performance of the companies. The gender shows some contradictory results, as it shows both a slightly positive and negative relation with ESG, generally in line with the results from Ghitti et al. (2023), which demonstrate a positive relationship with greenwashing, thus not reducing such practices.

Our result aligns with the findings of Fu et al. (2020), who discuss the positive impact of a CSO in enhancing CSR performance and reducing instances of corporate social irresponsibility, supporting his strategic role in integrating sustainability in the decision-making process. Similarly, Kanashiro & Rivera (2019) observed that the presence of a CSO is related to better environmental practices and transparency. CSOs have a critical role in committing the organization's objectives toward sustainability promotion, thus positively influencing the ESG ratings (Miller & Serafeim, 2014). By the way, some literature results do not completely support our result, posing that the impact of a CSO can be limited by a lack of substantial authority or resistance to changes from the organization, mitigating their effectiveness in improving ESG (Peters et al., 2019) or that the impact resulting is not as strong as we found in companies where sustainability is not a long term strategy priority (Strand, 2013). To overcome these potential drawbacks impacting the effectiveness of a CSO operation, the company should allow them to sit on the board of directors and hopefully have a direct reporting connection with the CEO and all the top managers so that to help shed the light on sustainability issues and accordingly embed them with the right formal authority to operate and take decision-making (Strategy&, 2023; RRA, 2022).

Moving our focus on the analysis of the impact of the different studies background of CSO on the dependent variables, our main findings are:

- At the bachelor level, referred to as GW (1,2,3,4) in our models, surprisingly we do not find any statistically significant effect of the CSO background on the greenwashing propensity, even by adding control variables and fixed effect to the regressions. It could be that the educational focus of such a degree level is not enough to accomplish the complexity of greenwashing-related issues. Contrastingly, at the master's level, we found that all the fields of studies under examination had a negative impact on the greenwashing variable. Compared to the other an MSc degree in Social Sciences shows a significantly weaker effect on deterring greenwashing and loses significance when the regression model accounts for fixed effects. Instead, both STEM and Business backgrounds have the most substantial effect on deterring misleading practices, with coefficients indicating respectively about -7 and -4 points reduction of greenwashing activities with the complete regressions models. Indeed, a master's degree in Natural resources negatively affects greenwashing propensity. To our knowledge, no previous works have focused on the effect of a specific CSO study background on greenwashing and ESG performance, they are limited to a differentiation between higher and lower

levels of education, namely between bachelor's and master's levels or above. Notwithstanding this, our findings are in line with Ghardallou (2022), which investigated 34 Saudi publicly traded companies from 2015 to 2020 and found that CEOs with an MBA degree are more likely to disclose Corporate environmental performance and that engineering or science-based degrees enhance the positive relation between CSR and corporate profitability.

- Turning to the ESG Combined score, we found that obtaining a bachelor's degree in STEM or Business is strongly correlated to higher ESG scores, which are consistent with the results found in the previous demonstrating the positive relationship between such degrees and CSR activities (Garcia et al., 2019; Meyer, 2015; Huang, 2013). Surprisingly, having a degree in Natural Resources does not seem to have any statistically significant effect, while a degree in Social Science shows a negative relationship, thereby reducing a company's ESG rating. These findings are in contrast with the above-mentioned literature, which instead found a positive relationship between Social Science degrees and CSR activities (Rivera & De Leon, 2005; Frank & Schulze, 2000). This trend is confirmed also at the master's degree level, even if the effect is less pronounced than it is for the bachelor. Our results are generally aligned with the previous research affirming that an executive's education positively affects the company's environmental performance and drives environmental innovation (Zhou et al., 2021). By the way slightly differ from the findings of Cho et al. (2019), who analyzed 49 companies in the textile and apparel industries in Korea, demonstrating that the higher the level of CEOs' education, the higher the environmental performance of the company, whereas we found a stronger and robust result at bachelor level education. It is noteworthy to say that the results from the mentioned previous literature focus on the role of the CEO and not on the CSO.

Concluding, there are multiple managerial implications. Firstly, companies should keep in mind that consumers, investors and other stakeholders are more and more knowledgeable and able to distinguish credible sustainability activities from deceptive and misleading claims. Thus they might consider making effective environmentally sustainable commitments with long-term planning, as greenwashing practises have a severe long-term backlash on financial performance and corporate trust image.

Based on the findings of this thesis, we can firmly say that companies that haven't done it yet should appoint a Chief Sustainability Officer given the demonstrated propensity to increase the firm's ESG score and decrease the greenwashing behaviour. The CSO should be granted

effective formal authority for decision-making concerning sustainability, by allowing him to sit on the board of directors as well as have a direct reporting line with the CEO and top managers, ensuring alignment on the trajectory toward better environmental performance. Companies should moreover evaluate the background of the candidates, prioritizing the ones with degrees in STEM and Business fields, as we showed that these are the most appropriate degrees to enhance the corporate ESG performance and reduce the greenwashing propensity. Based on our research findings, we found that Business is indeed the field which exhibits the strongest performance when compared to other fields. The results demonstrate its highest absolute performance and display the most robust statistical significance across various models, encompassing both bachelor's and master's levels of education. Furthermore, companies should invest in the continuous formation of the CSO and of all the top managers, allowing them to keep up with the constantly evolving market environment and sustainability management strategies. Implementing an effective reporting system, regulatory compliance and third-party audits, together with the appointment of a skilled and well-prepared CSO, would allow companies to make a strong and credible commitment toward sustainability, thereby conquering consumer and other stakeholder trust.

Appendix 1

In [Figure 11](#) and [Figure 12](#), we can see an example of the data we gathered to identify the managers in charge of sustainability for each company composing the S&P 500: This involved utilizing LinkedIn personal profiles and cross-checking with the company's website and other sources of information, as we explained above in the section [Data gathering and sample composition](#).

Figure 11: Example of CSO selection for Walmart from personal LinkedIn Profile

The image shows a LinkedIn profile for Kathleen McLaughlin. On the left is a dark blue sidebar with contact and skills information. The main content area is white and contains her name, title, location, a summary of her work at Walmart, and a list of her professional experiences and education.

Contact
www.linkedin.com/in/kathleenforgood (LinkedIn)
www.walmartfoundation.com (Company)

Top Skills
Management Consulting
Business Strategy
Strategy

Kathleen McLaughlin

Chief Sustainability Officer at Walmart and President of the Walmart Foundation
Bentonville, Arkansas, United States

Summary

At Walmart, we're using our strengths to create economic opportunity for individuals and foster inclusive economic development, enhance the sustainability of food, apparel and general merchandise supply chains and strengthen the resilience of local communities. Last year, in addition to business initiatives investing in people and businesses in supply chains, we surpassed over \$1.4 billion in giving worldwide, including \$1 billion of food donations. I'm proud to be a part of this important work.

Experience

Walmart Foundation
10 years 3 months
President
October 2013 - Present (10 years 3 months)
Bentonville, AR

Chief Sustainability Officer
October 2013 - Present (10 years 3 months)
Bentonville, AR

McKinsey & Company
Director
July 1990 - October 2013 (23 years 4 months)

Education

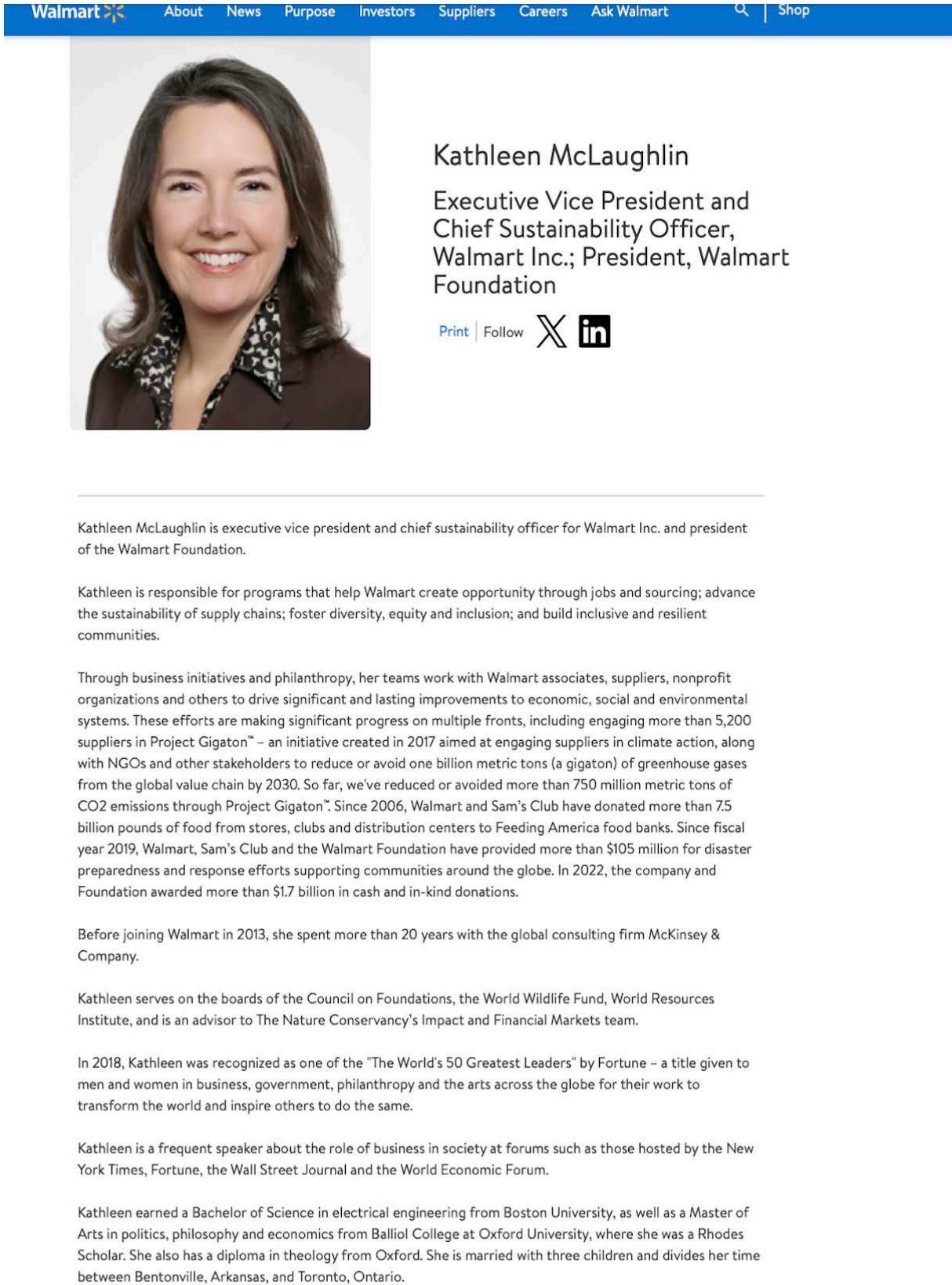
University of Oxford
Diploma, Theology · (1989 - 1990)

University of Oxford
B.A./M.A., Politics, Philosophy, and Economics · (1987 - 1989)

Boston University
Bachelor of Science (B.Sc.), Electrical engineering · (1983 - 1987)

Source: LinkedIn

Figure 12: Personal biography on Walmart Company's site



Walmart About News Purpose Investors Suppliers Careers Ask Walmart | Shop

Kathleen McLaughlin
Executive Vice President and
Chief Sustainability Officer,
Walmart Inc.; President, Walmart
Foundation

Print | Follow X in

Kathleen McLaughlin is executive vice president and chief sustainability officer for Walmart Inc. and president of the Walmart Foundation.

Kathleen is responsible for programs that help Walmart create opportunity through jobs and sourcing; advance the sustainability of supply chains; foster diversity, equity and inclusion; and build inclusive and resilient communities.

Through business initiatives and philanthropy, her teams work with Walmart associates, suppliers, nonprofit organizations and others to drive significant and lasting improvements to economic, social and environmental systems. These efforts are making significant progress on multiple fronts, including engaging more than 5,200 suppliers in Project Gigaton™ – an initiative created in 2017 aimed at engaging suppliers in climate action, along with NGOs and other stakeholders to reduce or avoid one billion metric tons (a gigaton) of greenhouse gases from the global value chain by 2030. So far, we've reduced or avoided more than 750 million metric tons of CO2 emissions through Project Gigaton™. Since 2006, Walmart and Sam's Club have donated more than 7.5 billion pounds of food from stores, clubs and distribution centers to Feeding America food banks. Since fiscal year 2019, Walmart, Sam's Club and the Walmart Foundation have provided more than \$105 million for disaster preparedness and response efforts supporting communities around the globe. In 2022, the company and Foundation awarded more than \$1.7 billion in cash and in-kind donations.

Before joining Walmart in 2013, she spent more than 20 years with the global consulting firm McKinsey & Company.

Kathleen serves on the boards of the Council on Foundations, the World Wildlife Fund, World Resources Institute, and is an advisor to The Nature Conservancy's Impact and Financial Markets team.

In 2018, Kathleen was recognized as one of the "The World's 50 Greatest Leaders" by Fortune – a title given to men and women in business, government, philanthropy and the arts across the globe for their work to transform the world and inspire others to do the same.

Kathleen is a frequent speaker about the role of business in society at forums such as those hosted by the New York Times, Fortune, the Wall Street Journal and the World Economic Forum.

Kathleen earned a Bachelor of Science in electrical engineering from Boston University, as well as a Master of Arts in politics, philosophy and economics from Balliol College at Oxford University, where she was a Rhodes Scholar. She also has a diploma in theology from Oxford. She is married with three children and divides her time between Bentonville, Arkansas, and Toronto, Ontario.

Source 1: Walmart's website

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