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# Interplay between Sustainability and Financial Performance:

## A Mixed-Methods Analysis in the Automotive Industry

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# Abstract

This thesis explores the interplay between sustainability initiatives and financial performance in the automotive industry, a field of growing significance due to the industry's substantial environmental impact and economic influence.

The primary research question investigates how sustainability initiatives within the automotive industry impact companies' financial performance while simultaneously achieving environmental and social objectives.

The study employs a mixed-methods approach to analyze data from sustainability and financial reports of prominent automotive companies. This analysis is further supported by industry-specific case studies and interviews with experts. The study rigorously analyzes the range and scope of sustainability initiatives in the automotive sector, evaluating their immediate and indirect impacts on environmental and social results. Furthermore, it explores the relationship between these sustainability efforts and key financial performance metrics, such as revenue growth, profit margins, and stock price performance.

Preliminary findings suggest a complex relationship where sustainability initiatives, while fostering positive environmental and social impacts, also have nuanced effects on financial performance. The study uncovers patterns and insights on how automotive companies can strategically adopt sustainability practices to effectively manage and potentially improve both socio-environmental and financial results.

This research contributes to the academic field of corporate sustainability by providing a detailed analysis specific to the automotive industry. It offers practical implications for industry practitioners, policymakers, and stakeholders, emphasizing the need for a harmonized approach that integrates sustainability with financial performance considerations.

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# List of Abbreviations

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<b>Abbreviations</b>	<b>Meaning</b>
BVS	Book Value per Share
CER	Corporate Environmental Responsibility
CSR	Corporate Social Responsibility
DSY	Dividend per Share Yield %
DJSI	Dow Jones Sustainability Index
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
ECSR	Environmental Corporate Social Responsibility
EPS	Earnings Per Share
ERP2	Electronic Road Pricing
ESG	Environmental, Social, and Governance
ESGC	Environmental, Social, Governance, and ESG Controversies or Combined
EV	Electric Vehicle
FI	Financial Indicator
GSCM	Green Supply Chain Management
KPIs	Key Performance Indicators
LIB	Lithium-ion batteries
LSEG	London Stock Exchange Group
MAD	Median Absolute Deviation
MAE	Mean Absolute Error
MC	Company Market Capitalization
MNEs	multinational enterprises
NOPAT	Net Operating Profit After Taxes
NPM	Net Profit Margin
OEMs	Original Equipment Manufacturers
OLS	Ordinary Least Squares
RBV	Resource-Based View
RLM	Robust Linear Model
RMSE	Root Mean Square Error
ROA	Return On Assets
ROE	Return On Equity
ROI	Return on Investment
ROIC	Return on Invested Capital
ROTA	Return on Total Assets
SSCs	Sustainable Supply Chains
SSCM	Sustainable Supply Chain Management

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# 1. Introduction

## 1.1. Context and Background

In an era where environmental concerns and social responsibilities are increasingly at the forefront of corporate strategy, the automotive sector finds itself at a crucial and critical juncture. Historically marked by its substantial environmental footprint, this industry has seen a paradigm shift towards sustainability. The transition is motivated not solely by regulatory constraints, such as the European Union's ambitious objectives of achieving zero carbon dioxide emissions by 2035 (European Parliament, 2023), but also by changing consumer preferences, increased awareness, technological advancements, and the growing recognition of the long-term advantages driven by sustainable practices.

The aforementioned dynamics underscore the critical necessity for the industry to address its past environmental consequences in light of a future that necessitates more environmentally conscious practices (PwC, 2021; World Economic Forum, 2023).

In light of the prevailing pressures and opportunities, the automotive industry is currently undergoing a redefinition of its approach towards sustainability. Current trends, accelerated by both political choices and shifting consumer behaviours, signal an unprecedented upheaval toward sustainability. This disruption is characterised by a transition from viewing cars as mere status symbols to embracing shared mobility, underscoring a societal change toward valuing sustainability over traditional notions of luxury and ownership. Furthermore, the move towards electric vehicles (EVs) and the adoption of circular economy principles illustrate the auto sector's reaction to both environmental imperatives and market demands (McKinsey, 2022).

Nevertheless, the pursuit of sustainability is intricate and diverse, encompassing more than only carbon emission reduction. The automobile industry is currently facing challenges related to wider Environmental, Social, and Governance (ESG) concerns, which embraces issues such as deforestation, waste management, habitat degradation, human rights, and supply chain diversity. These obstacles serve to underscore the interdependence of sustainability concerns and the potential for initiative weariness and inertia within organisations. Despite these challenges, there is a growing understanding that more sustainable business practices can coexist with and even enhance profitability. The recognition of this phenomenon is compelling organisations to re-evaluate their business models, strategies, and day-to-day activities in order to incorporate sustainability as a fundamental aspect of their operations (EY, 2023).

Moreover, the car industry's efforts to further improve its environmental sustainability have resulted in substantial advancements in reducing emissions. However, the industry continues to make a substantial contribution to worldwide CO<sub>2</sub> emissions, emphasising the necessity for ongoing and expedited endeavours toward decarbonisation. The adoption of EVs and the integration of circular economy concepts are pivotal measures in this trajectory. Nevertheless, these developments also introduce new obstacles and prospects for innovation within the sector. In order to achieve long-term success and resilience, it is necessary for organisations to integrate sustainability into all parts of their company operations as they navigate these transitions (McKinsey, 2022).

The industry has also faced criticism for greenwashing, underscoring the importance of genuine, impactful sustainability commitments. A comprehensive examination of the correlation between sustainability measures and financial performance is vital not just for the improvement of society but also for the long-term viability of the industry. A positive relationship between sustainable commitments and Key Performance Indicators (KPIs) could further encourage the industry's overall commitment to sustainable practices.

Sustainability initiatives, encompassing activities such as reducing carbon footprints, improving energy efficiency, implementing advanced worker safety measures, and engaging with the community, have become crucial components of contemporary automotive business strategies. These initiatives are not alone in altering the operational practices of firms but also exerting influence on their market perception and, potentially, their financial outcomes. Given the current state of the automobile sector, it is crucial to adopt a broader ESG agenda. The future success of the industry and its contribution to promoting a sustainable future for society as a whole will be determined by its capacity to adapt and evolve in light of these sustainability issues (EY, 2023; McKinsey, 2022; PwC, 2021; World Economic Forum, 2023).

## 1.2. Research Objective

The basis of this thesis is the belief that the automobile industry is currently at a crucial juncture when the adoption of sustainable practices has the potential to fundamentally transform its future economic environment. This research endeavours to elucidate the complex interplay between responsibility for the environment and financial viability, providing a comprehensive exploration that extends beyond mere compliance or marketing strategies to uncover the real economic substance of sustainability initiatives. The investigation is guided by several key objectives, each serving to deepen our understanding of how green practices are not just ethical imperatives but strategic business assets.

The primary focus of this thesis revolves around examining the correlations between financial performance and sustainability initiatives. Through rigorous analysis, it seeks to identify patterns, trends, and insights that could guide automotive companies in strategising their sustainability efforts for optimal financial and socio-environmental outcomes. This encompasses the examination of the potential of sustainability initiatives to facilitate market expansion, foster innovation, and generate competitive advantages that positively impact the financial performance of the organisation.

Furthermore, the study is committed to offering strategic perspectives and consolidating results into practical suggestions for automotive corporations. This entails advising on how to balance the trade-offs between initial investments in sustainability and the potential for long-term financial rewards, guiding companies on integrating green practices into their core business strategies in a manner that is both environmentally responsible and economically viable.

Lastly, by contributing to the academic field of corporate sustainability and offering practical implications for industry practitioners, policymakers, and stakeholders, this thesis aims to advocate for a harmonised approach to integrating sustainability within business operations. This statement emphasises the significance of perceiving financial performance and sustainability as interconnected aspects of a whole corporate strategy rather than as conflicting concerns.

The thesis aims to expand the conversation on corporate sustainability in the automotive industry by examining how environmental and social initiatives can be in line with financial goals. By illuminating the synergies between sustainability and economic prosperity, this research aims to inspire a shift in corporate paradigms, advocating for a future where the automotive industry leads the way in demonstrating that profitability and sustainability can go hand in hand.

### 1.3. Research Question

This thesis aims to address the critical research question:

*"To what extent do sustainability initiatives in the automotive industry influence the companies' financial performance and economic value?"*

By exploring this question, the study seeks to unravel the complex relationship between sustainability efforts and financial outcomes in the automotive sector.

By bridging the gap between environmental/social responsibility and financial performance, this study aims to contribute valuable insights to both the academic discourse and industry practices in the field of sustainable development in the automotive sector.

### 1.4. Expected Contribution

This thesis is poised to contribute to both the academic landscape and practical realms of corporate sustainability, particularly within the automotive industry. By bridging the gap between sustainability initiatives and financial performance, it aims to shed light on a critically underexplored nexus, offering a comprehensive analysis that could redefine how automotive companies integrate environmental and social governance into their business strategies.

Academically, this study aims to enrich the existing body of sustainability studies by providing a focused exploration of the automobile industry, a domain where environmental impact and economic influence are profound yet complexly intertwined. The present research aims to expand upon the established theoretical framework based on Stakeholder and Agency Theories through an empirical examination of the intricate impacts of sustainability measures on several financial indicators. Through this, the thesis will contribute novel insights and data, potentially serving as a significant reference for future research in corporate sustainability practices and their economic implications.

On a practical level, the study is designed to offer relevant information to automotive industry practitioners, policymakers, and stakeholders. By identifying and analysing patterns, trends, and correlations between sustainability efforts and financial outcomes, the research aims to provide a roadmap for companies looking to enhance their sustainability practices in a way that aligns with their economic objectives. This has the potential to provide valuable insights for strategic decision-making, shape policy development, and impact stakeholder engagement initiatives, with a particular

focus on highlighting the significance of sustainability as a fundamental element of achieving business success.

Moreover, the thesis aims to promote the wider implementation of environmentally friendly practices in the sector by emphasising the ability of sustainability initiatives to enhance financial performance. This study aims to illustrate that allocating resources towards sustainability initiatives is not solely a matter of ethics or regulatory requirements but rather a strategic business choice that can yield competitive benefits, market distinctiveness, and financial expansion.

Ultimately, the expected contribution of this research is to foster a deeper understanding and appreciation of the symbiotic relationship between environmental stewardship and financial prosperity. By doing this, it seeks to stimulate a change in the perspective and importance that automotive companies, and possibly those in other industries, place on sustainability in their operational and strategic plans. Hopefully, this will foster a future where economic prosperity and environmental accountability are not only compatible but also mutually supportive goals.

## 1.5. Delimitation

This study, while comprehensive in its approach to exploring the relationship between sustainability initiatives and financial performance in the automotive industry, acknowledges certain delimitations that bound its scope and depth. The research primarily concentrates on the automotive sector, taking into account its substantial environmental impact and economic imprint. The utilisation of a sector-specific perspective, however advantageous for conducting a thorough examination, implies that the conclusions produced may not possess direct relevance to other industries characterised by distinct operational dynamics and sustainability obstacles.

In addition, the research is predominantly based on quantitative data obtained from sustainability and financial reports of automotive firms, complemented by qualitative perspectives from industry experts. This methodological choice, while robust, limits the exploration to data that is publicly available or can be obtained through direct engagement with industry stakeholders. Hence, the observations may not comprehensively encompass internal tactics or unreported sustainability measures that could also impact financial outcomes.

The study is limited by its temporal scope, which only examines recent patterns and data from the most recent five fiscal years. Although this guarantees the significance of the results, it may not encompass the enduring impacts of sustainability activities that occur over prolonged durations. Furthermore, the research's geographical scope, while extensive, may not adequately encompass all automobile markets, especially emerging economies that are experiencing rapid changes in sustainability and economic conditions.

By setting these delimitations, the study aims to provide a clear and focused analysis within its defined boundaries, acknowledging that the richness of the insights is contingent on the availability and scope of the data analysed. These boundaries also serve to emphasise potential avenues for future research, indicating the possibility of broadening the investigation into more sectors, examining the long-term impacts, or conducting a more detailed regional analysis.

## 1.6. Disposition

The disposition section of this thesis presents a structured and coherent layout to direct the reader through the research process, findings, and implications in a systematic and logical sequence. The paper begins with an abstract and acknowledgements, followed by a detailed introduction. The introduction establishes the context and the background for the study, explicitly defines the research objectives and questions, and discusses the expected contributions and constraints.

The thesis then delves into a comprehensive literature review, which discusses various aspects of corporate sustainability's impact on financial performance, the role of CSR, and the significance of sustainable supply chains within the automotive industry. The section concludes by synthesising the studied material, which serves as a strong basis for future chapters on theoretical framework and hypothesis creation.

The subsequent chapter, referred to as the methodology chapter, outlines the implementation of a mixed-methods research approach. This approach ensures the high quality of the research by discussing the concepts of validity, reliability, and replicability. Additionally, the chapter addresses the social and ethical aspects that are pertinent to the study. The study process is made transparent and reproducible by providing detailed descriptions of data-gathering methods and sampling methodologies.

The chapters on quantitative and qualitative research provide a comprehensive analysis of the data and explain the findings in a detailed manner. The quantitative section discusses data cleaning processes, uses correlation matrices for variable selection, and applies various statistical techniques such as the Robust Linear Model (RLM) to explore the data. The qualitative section enhances the comprehension of the quantitative findings by offering profound insights through story blocks and thorough interviews. The discussion chapter interprets and integrates all findings, discussing practical implications, acknowledging limitations, and suggesting avenues for future research. This leads to the concluding chapter, which summarises the research, reiterates the significance of the findings, and reflects on the broader implications of the study.

This systematic method in the arrangement guarantees that the thesis is inclusive and logical and promotes a deep comprehension of the intricate connections between corporate sustainability practices and financial success in the automobile industry.

## 2. Literature Review

As environmental consciousness among consumers and governmental bodies heightens, firms are facing mounting pressure to embrace sustainable practices. This evolving landscape has elevated stakeholder expectations, compelling companies to integrate sustainability into their everyday operations. Over time, a substantial body of scholarly literature has emerged to scrutinise the linkage between sustainability practices and the ramifications that such implementations have on firms' financial performance. The following thematic literature review endeavours to delineate the current state of research concerning the influence of corporate sustainability initiatives on overall organisational performance. Subsequently, it will examine the effects that such initiatives have brought to the automotive industry with a more granular focus. Finally, the review will introduce the theoretical frameworks underpinning this inquiry and elaborate on the practical applications within

our research scope. Prior to embarking on this review, it is necessary to define certain concepts within our research ambit to clarify the meaning of such notions.

Sustainability is a concept frequently invoked in contemporary discourse. Academics mostly stick to the definition given by the World Commission on Environment and Development (1987), which defines sustainability as development that satisfies current demands without jeopardising the capacity of future generations to satisfy their own needs.

Other terms necessitating clarification are Corporate Social Responsibility (CSR), Environmental corporate social responsibility (ECSR), and Corporate Environmental Responsibility (CER), which are often mentioned by scholars in their research scope. CSR is an umbrella term that can be defined as a governance mechanism that aims to integrate ethical, social, and environmental factors into the company operations as well as address stakeholder relationships and expectations in order to achieve social, environmental, and economic objectives. It encompasses voluntary measures that transcend legal requisites imposed by the government. These efforts are intended to establish credibility, improve business conditions, and favourably impact society and the environment. CSR should be understood as a dynamic concept that can change and evolve based on societal expectations (Moir, 2001). ECSR and CER have similar connotations as CSR, although they have a more focused approach to environmental concerns.

## 2.1. The Influence on the Company's Performance Indicators

The greatest issue underpinning this research lies in the lack of consensus within the scientific community as to the relationship between CSR or sustainable initiatives and company performance. Just to name a few examples, some scholars like Nakamura (2011) and Zhang & Ouyang (2021) suggest a positive relation between those two variables, while others like de Souza Cunha & Samanez (2013) and Jaggi & Freedman (1992) affirm the opposite. Other researchers have found non-linear relationships (Pekovic et al., 2018), while others found inconclusive (Elsayed & Paton, 2005; Khalid et al., 2023) or mixed results (D. Li et al., 2017; Khan et al., 2021). This lack of clear results can be explained by the absence of a theoretical foundation that can explain the link, methodological inconsistencies, and contextual factors like the regulatory environment in which businesses operate and the type of industry observed may all be used to explain these inconsistent results (Wong et al., 2018). Several scholars, exemplified by Murray et al. (2006), argue that establishing a definitive relationship between green initiatives and corporate financial performance presents several challenges due to the complexities inherent in measuring the consequences of environmental initiatives on profitability and establishing a causal link between them.

One extensively explored area in this context pertains to the impact of corporate social responsibility (CSR) and sustainability initiatives on firms' profitability. This impact is often assessed using specific KPIs such as Return On Assets (ROA), Tobin's Q, Return On Equity (ROE), and Return On Investment (ROI), which are widely employed to ascertain the influence of CSR on corporate financial performance (Clarkson et al., 2013). Research in this domain varies significantly in terms of the scope of sustainability subjects, industry focus, and methodological approaches applied. Consequently, findings across studies often diverge and may even appear contradictory.

For instance, Velte (2017) conducted a study on the financial ramifications of environmental and social governance (ESG) on German companies and identified a positive association between ROA and ESG; however, no significant impact was observed on Tobin's Q. Similarly, a study examining

Levant countries by Al Amosh et al. (2023) revealed a positive correlation between ESG and ROA. In contrast, Alareeni & Hamdan (2020), analysing the S&P-500, concluded that while ESG initiatives had an overall positive impact on performance measures, although certain financial KPIs like ROA and ROE were negatively affected by environmental actions, whereas Tobin's Q exhibited a positive association with CSR and environmental disclosures. On the other hand, Hussain et al. (2018), in their study on the sustainability practices of the top 100 best-performing US companies, found no discernible relationship between ESG and ROA, ROE, or Tobin's Q. Despite these disparities, the bulk of research in this domain tends to suggest a positive correlation between sustainability initiatives and financial performance, as underscored by Alshehhi et al. (2018), who analysed 132 papers examining the effects of sustainability practices on financial performance and reported that 78% of the publications highlighted a positive linkage between the two variables. Finally, one last aspect that should be taken into consideration is the "theory of slack resources", which argues that CSR actions are contingent on the company's financial resources (Preston & O'Bannon, 1997). As such, the authors argue that it is not CSR that leads to higher financial performance but rather that higher financial performance leads to increased CSR actions due to the availability of resources.

## 2.2. The Effect on the Company's Market Value

An equally ample array of literature throughout the years has focused on the effect that sustainability reporting has on the stock price and overall market valuation, with conflicting results indicating both positive (Lourenço et al., 2012; Doh et al. 2010), negative (Oberndorfer et al., 2013; López et al., 2007), mixed (Kim & Oh, 2019; Nor et al., 2016), and inconclusive (Atan et al., 2016; Yilmaz et al., 2020) results.

First and foremost, it is necessary to point out a distinction between the concept of sustainability performance and sustainability reporting as they represent two distinct yet interconnected concepts (Rezaee, 2016). Sustainability performance denotes the initiatives and outcomes that Corporate Social Governance (CSG) actions deliver to firms' stakeholders, whereas sustainability reporting entails the disclosure of such positive actions to society, incorporating a blend of quantitative and qualitative information (Khan et al., 2015). Sustainability reporting typically includes three crucial aspects, namely the economic, environmental, and social spheres (Gold & Taib, 2020).

Cho et al. (2013) argue that sustainability reporting can improve stock price informativeness as the disclosure of information reduces information asymmetry and sends positive signals to the market. This is a common opinion shared by S. Li et al. (2017), who make the case that sustainability reporting can make investors less nervous as it reduces the likelihood of a company being environmentally irresponsible, which can often lead to fines, negative publicity, and shareholder boycotts which negatively affect their stock price.

However, when empirically analysing the effect that environmental reporting has on firms' stock market returns, studies do not seem to be unanimous and greatly vary from region to region. A study conducted by Li & Wu (2017) observed a negative relationship between environmentally sustainable announcements of Chinese firms and their respective stock price on the Chinese stock market. An inconsistent market reaction phenomenon was observed by Cheung & Roca (2013), which showed that both the inclusion and deletion of Asia-Pacific firms on the Dow Jones Sustainability Index (DJSI) were met with a significant decline in stock returns and an increase in trading volume. The DJSI was first launched in 1999 and consists of a collection of stock indexes that are assessed based

on their sustainability performance. Investors can use the index to evaluate firms that exhibit robust sustainability practices and long-term viability by evaluating them on a range of environmental, social, and ESG factors (Dow Jones Sustainability World Index, 2024). Contrary to Cheung & Roca (2013), Consolandi et al. (2009) and Cheung (2011) showed that the same was not true for the European and US stock markets, which had a positive reaction to the inclusion of indexes in the DJSI while reacting negatively towards the deletion of an index. Dowell et al. (2000) analysed the relationship between multinational enterprises (MNEs) investing in different developing economies and their stock valuations. The study specifically focused on how adhering to global environmental standards, as opposed to the weaker standards allowed in the host countries, can result in higher stock valuations for these MNEs.

A study by Gold & Taib (2020) tried to reach a conclusion regarding the listing of companies' effect on the DJSI by analysing 35 papers on the subject and found that 13 studies had substantial positive results, 8 had significant negative results, 5 were inconclusive, and 9 had mixed results.

The literature suggests that there is no unanimous consensus as to how sustainability efforts translate to market reactions. Effects remain extremely circumscribed to market type, industry type, and other observed phenomena, as we could observe from the aforementioned literature.

## 2.3. The Role of Sustainable Supply Chains

The study of sustainability initiatives' impact on financial performance, particularly within the supply chains of manufacturing firms, represents a prominent subject of inquiry in the scholarly literature (Kushwaha & Sharma, 2016). This domain is commonly known as Sustainable Supply Chain Management (SSCM) or Green Supply Chain Management (GSCM), and although these two concepts appear very similar, they have a slightly different take on sustainability. GSCM focuses solely on the environmental consequences of specific steps in the supply chain and seeks to decrease the ecological footprint of those steps, while SSCM takes a more comprehensive approach by taking into account the whole range of sustainability challenges, including social and economic factors, in addition to environmental concerns. (Tronnebati & Jawab, 2023). Prominent scholars such as Kannegiesser et al. (2014) have dedicated their research efforts to studying the adverse environmental externalities inherent in automotive supply chains and devising strategies for their mitigation.

There are typically five components in a standard supply chain, namely raw materials, manufacturing, distribution, consumers, and waste. Each link within this chain bears the potential to contribute to environmental degradation, pollution, and associated risks (Kannegiesser et al., 2014). The automotive supply chain is extremely long and intricate, and it is estimated that between 60% to 70% of total production costs are expended on material procurement (Scannell et al., 2000). Simultaneously, this sector is accountable for a significant portion of energy consumption and resource utilisation (Giampieri et al., 2020; Kannegiesser et al., 2014).

The literature defines sustainable supply chains as a collection of competencies that are frequently employed to raise the financial and economic performance as well as the sustainable performance levels of manufacturing firms (Vachon & Klassen, 2008). An increasing number of automotive manufacturers are embracing sustainable supply chain management practices to mitigate environmental risks, bolster operational efficiency, and cultivate positive customer perceptions (Chavez et al., 2016). Nonetheless, as posited by Feng et al. (2017), the relationship between sustainable supply chains and financial performance is nuanced and characterised by an indirect

influence. In particular, GSCM interventions primarily impact the operational dimensions of the business, thereby exerting subsequent effects on overall company performance (Feng et al., 2017). Consequently, sustainable supply chains (SSCs) hold the potential to enhance operational efficiency by reducing waste and cutting distribution costs and production expenditures, thereby leading to superior financial performance (Busse et al., 2017; Genovese et al., 2017). Furthermore, the adoption of SSC practices increases customer satisfaction through improved delivery timelines and the provision of high-quality products and services (Green et al., 2012). From a Resource-Based View (RBV) standpoint, Feng et al. (2017) contend that SSCs enable automotive companies to seize market share by offering products and services of superior quality that are challenging for competitors to replicate.

Overall, current literature predominantly advocates that improving supply chain sustainability confers benefits upon automotive enterprises (Kushwaha & Sharma, 2016).

The SSCM literature can help us shed some insights on the complexity of measuring the actual impact that sustainability initiatives can have on financial performance. A considerable amount of negative environmental externalities are caused within the supply chain, something that is not always easy to control and adjust (Kannegiesser et al., 2014). On top of that, as pointed out by Feng et al. (2017), any improvement toward sustainability in this regard has only an indirect effect on overall financial performance, which is difficult to prove as a causal effect.

## 2.4. Effect of CSR and sustainability on automotive companies' financial performance

The literature appears somewhat sparse when it comes to studies that put sustainability or, more broadly, CSR actions directly in relation to financial performance. Nevertheless, this scarcity of far-reaching analysis encourages our inquiry as it can help to bridge some of these blind spots. Despite these limitations, the few existing studies can give us some very valuable insights. For instance, Palea & Santhià's (2022) findings underscore a robust negative correlation between financial performance and carbon emissions in the automotive sector, displaying diminished sales returns and an increased difficulty in raising capital for companies with greater emissions. In another study that enquired about the relationship between ESG scores and financial KPIs within the Asian automotive market, a positive correlation was found between a high ESG score and a high ROA and ROE (Chandrasekaran, 2022). Conversely, Nayak and Patjoshi (2020) analysed the relationship between CSR actions and financial performance and found a significantly positive link between Return on Total Assets (ROTA) and Net Profit Margin (NPM). Furthermore, Kaya and Akbulut's (2019) comprehensive analysis spanning 155 automotive firms across 20 nations over an eight-year period reveals a positive relationship between sustainability reporting and firm size, alongside a negative correlation between financial leverage and sustainability reporting. Meanwhile, in another recent study, a mostly negative or inconclusive relationship at best was found between ESG scores and the financial performance of automotive companies (Granelli & Rådeström, 2023).

Studies conducted among stakeholders from the automotive industries suggest that companies with high levels of CSR commitments are rewarded with higher customer satisfaction, and customer, and operational efficiency (García-Madariaga & Rodríguez-Rivera, 2017; Szász et al., 2021).

Dincă et al. (2022) delve into the impact of ESG criteria on firm valuation within the automotive industry, revealing inconclusive outcomes. Conspicuously, Dincă et al. (2022) point out how market valuation responses to changes in ESG scores appear subdued, indicating no tangible reaction from investors. This conclusion stands somewhat in contradiction with the findings of McPeak & Gou (2014), who analysed the DJSI and concluded that the inclusion of automotive companies in the aforementioned index had significantly higher stock returns than the industry average.

Overall, the literature surrounding the link between financial performance and sustainability initiatives within the automotive industry presents a nuanced landscape with ample room for exploration.

## 2.5. Summary of Cited Literature

The table presented in “Appendix 1” serves as a synthesis of the literature explored in this review, carefully selected to provide a clearer and more structured understanding of the current research landscape. A deliberate selection of 31 papers spanning between the years 2005 and 2023 forms the backbone of this chart. These articles were chosen for their direct relevance and conceptual alignment with our ongoing research. More specifically, these studies were carefully drawn from sections 2.1., 2.2., and 2.4. of our literature review, as they bear the closest resemblance to our inquiry. Overall, they offer a diverse and wide view of the interplay between sustainability and financial performance since they greatly vary from one another based on research scope, applied methodology, sample type, and geographical context.

The presented literature underscores a complex and miscellaneous picture regarding the relationship between sustainability and CSR initiatives with overall financial performance. It underlines an extreme diversity of results, which might be indicative of underlying complexity and methodological inconsistencies, as suggested by Wong et al. (2018). Factors such as industry type, geographic location, and observed sustainability parameters against selected performance indicators can create a vast pool of divergent and, at times, contradictory results. Moreover, the current literature has identified a lack of definitive and comprehensive studies on how and to which extent sustainability initiatives affect the automotive industry. This comes at a critical point when the sector is undergoing a significant structural transformation towards greener alternatives.

The literature review also underscores a lack of depth in fully understanding the practicalities of how and why sustainability shapes financial performance, which encourages additional research in this ambit.

## 2.7. Theoretical Framework & Hypothesis Development

### 2.7.1. Stakeholders Theory

Freeman developed Stakeholder in 1984, which reinterprets organisations’ roles beyond achieving shareholder profit. It makes the argument that companies ought to consider stakeholders, i.e., all the people and organisations impacted by their decisions. These stakeholders include employers, customers, suppliers, communities, shareholders, and the environment. It is a theory that stands in direct contrast to standard neoclassical economic theory. However, also from a neoclassical microeconomics perspective, some scholars disagree and argue instead that addressing stakeholders’

concerns could, in turn, serve shareholders the best since government regulations cannot completely address every problem in society and that market competition is inherently inefficient as such CSR initiatives can reduce conflicts between businesses and stakeholder groups, including the government, the general public, competitors, customers, and employees by replacing missing markets and the external costs that result from them (Oberndorfer et al. 2013).

Overall, there are two main schools of economic theory that argue in favour of the use of CSR as a way to increase firms' performance, namely the "social impact theory" and the "theory of good management". According to the former, corporate social responsibility and CSR-driven initiatives promote stakeholder satisfaction, which boosts a company's reputation and improves overall performance (Stevens et al., 2005). This first idea ties together with the legitimacy theory of CSR, which sees companies as part of a wider social contract in which they have to adhere to society's moral principles (Guthrie & Parker, 1989). The "Theory of Good Management," on the other hand, makes a similar claim about the beneficial relationship between performance and CSR, although the writers contend that businesses that prioritise social issues improve stakeholder relationships and boost overall performance as a result (Waddock and Graves, 1997).

There are many direct and indirect benefits that CSR can bring to organisations. Russo & Fouts (1997) argued, for instance, that from a Resource-Based View perspective, meeting stakeholder demands can be seen as a strategic investment, leading to a competitive advantage through the development of unique, difficult-to-replicate skills. Being committed to CSR also gives companies a significant amount of good reputation, which is a valuable intangible asset with a value that is difficult to estimate (Dangelico, 2015). Additionally, scholars argue that companies "do well by doing good" as meeting non-shareholding stakeholders' needs enhances shareholder value, while neglecting them risks shareholder value destruction (Freeman et al., 2010). Finally, prioritising stakeholder involvement gives businesses a long-term view perspective that helps them build solid, durable bonds built on respect and collaboration, which ultimately also benefits shareholders in the long run (Choi & Wang, 2009).

Overall, as shown by Carroll & Shabana (2010), CSR can give organisations a vast array of benefits such as cost reduction, enhanced reputation, competitive advantage, and synergistic value, which vastly outweigh the cost of CSR actions.

### 2.7.2. Agency Theory

Agency Theory, also known as Shareholder theory, proposes a neoclassical view of economic theory, which stands in contrast to stakeholder theory. In this framework, shareholders act as principals while managers act as agents whose only responsibility is to serve the best interest of the principal, i.e. profit maximisation (Friedman, 1970).

As such, neoclassical economic view proponents see sustainability as an agency cost since managers act as shareholders' agents and should, as such, act in their best interest, which is, in this case, profit maximisation (Friedman, 1970; Brown et al. 2006). Also, they believe that in a free market system, the pursuit of profit will automatically lead to a more efficient allocation of resources, which benefits society as a whole through innovation and competition, while companies that pursue CSR will have a competitive disadvantage against the firms who don't pursue such actions (Jensen, 2010).

### 2.7.3. Theoretical Framework

In the landscape of contemporary corporate finance, the intersection of sustainability and financial performance has garnered significant attention, resulting in the development of numerous theoretical frameworks to clarify this intricate connection. Among these, the framework developed by Ng & Rezaee (2015) offers a comprehensive lens through which to examine the multifaceted dimensions of sustainability performance and their implications for shareholder wealth.

This framework, which derives from Freeman's Stakeholder Theory (1984), defines sustainability as a concept that includes both financial (FI) and non-financial (ESG) aspects. This theory positions the company in an environment that requires a more comprehensive approach beyond the pursuit of immediate financial gain. It encourages the firm to contemplate the effects on various stakeholders, such as the community, society, and the environment. Within this scenario, sustainability performance extends beyond regulatory compliance to encompass a strategic orientation that harmonises shareholder and stakeholder theories.

This study is firmly anchored in this theoretical framework, leveraging it to explore the effects of sustainability performance on the financial metrics within the Automotive and Auto Parts industry. Our research rigorously examines the several aspects of ESG (Environmental, Social, Governance, and Controversies) and their individual and combined effects on financial performance measurements, following the principles outlined in this framework.

In the next chapter, following Ng & Rezaee's explanation, the study will formulate a set of hypotheses that are experimentally examined to comprehend the impact of sustainability on business performance. These hypotheses are based on the belief that strong ESG practices, although they may require substantial investment and potentially clash with short-term profitability objectives, can still lead to increased long-term shareholder value.

The application of this framework to our research allows for a nuanced analysis that goes beyond simplistic associations, seeking instead to uncover the intricate dynamics of ESG initiatives. It raises the question of how much these sustainability efforts, along with full disclosure, may reduce risk, improve operational efficiency, and ultimately have a beneficial impact on a company's market value and financial profitability.

Therefore, our investigation, based on the Ng & Rezaee framework, aims to contribute to the existing body of knowledge by shedding light on the tangible economic consequences of sustainability within a specific sector. This affirms the critical notion that sustainability performance is not just a mere corporate buzzword but rather a measurable factor that significantly impacts a firm's economic future.

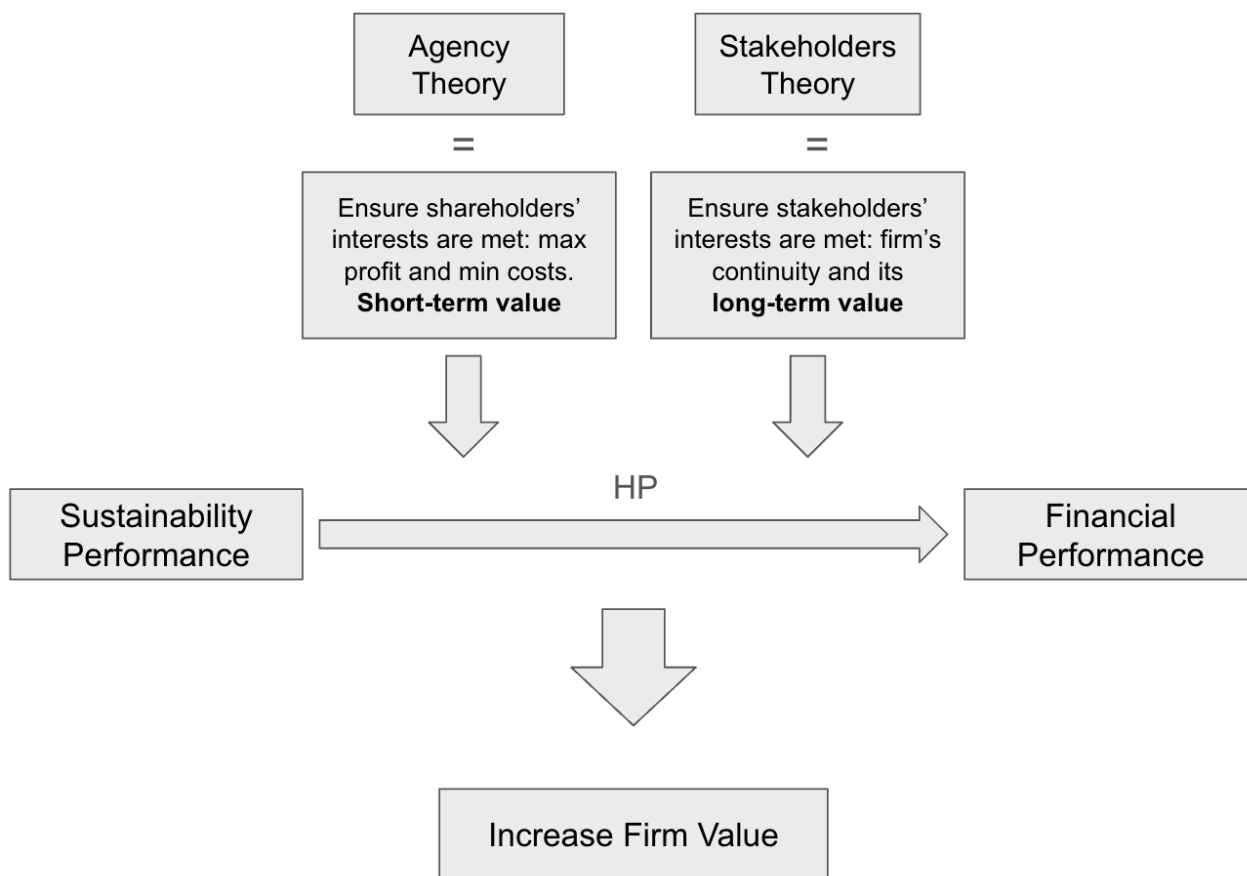


Figure 1: Theoretical Framework inspired by Ng & Razaee's theory

## 2.7.4. Hypothesis Development

This chapter focuses on formulating and explaining the hypotheses that will be used to guide the empirical research of this thesis. Each of them is derived from the theoretical framework previously explained, and they explore the potential impact of sustainability performance on financial measures. The research seeks to investigate the influence of many aspects of sustainability, including environmental, social, and governance (ESG) and controversies factors, on the financial performance of firms.

The hypotheses are based on the premise that strong ESG practices can enhance long-term shareholder value despite requiring significant investment and potentially conflicting with short-term profitability goals. Applying the framework developed by Ng & Rezaee (2015) to this study allows for a nuanced analysis that seeks to uncover the intricate dynamics of ESG initiatives and their effect on profitability and market valuation. Thus, the following hypotheses are proposed:

### *Hypothesis 1: Impact of Overall Sustainability Performance*

**H1a:** Sustainability performance negatively influences companies' short-term financial performance.

**H1b:** Sustainability performance positively influences companies' long-term financial performance.

Implementing sustainability practices often requires significant initial investments, which can strain immediate profitability, leading to potential short-term financial declines. However, over the long term, these initiatives can improve market reputation, operational efficiency, and stakeholder trust, which positively influences long-term financial performance.

#### *Hypothesis 2: Impact of Environmental Performance*

**H2a:** *Environmental performance negatively influences companies' short-term financial performance.*

**H2b:** *Environmental performance positively influences companies' long-term financial performance.*

Engaging in proactive environmental management, such as reducing emissions or waste, might involve significant initial expenses that can have a negative impact on short-term profitability. However, these efforts may yield regulatory compliance, cost savings, and competitive advantages in the long run, thus boosting long-term financial performance.

#### *Hypothesis 3: Impact of Social Performance*

**H3a:** *Social performance negatively influences companies' short-term financial performance.*

**H3b:** *Social performance positively influences companies' long-term financial performance.*

Engaging in social performance efforts, such as enhancing labour standards and community engagement, might result in rapid increases in operating expenses. However, these endeavours can gradually improve employee morale, customer loyalty, and public goodwill, ultimately leading to improved long-term financial results.

#### *Hypothesis 4: Impact of Governance Performance*

**H4a:** *Governance performance negatively influences companies' short-term financial performance.*

**H4b:** *Governance performance positively influences companies' long-term financial performance.*

Strengthening corporate governance often requires investments in transparency, board diversity, and ethical standards, potentially increasing short-term administrative costs. Over time, however, good governance reduces mismanagement risks and fosters investor trust, significantly improving financial stability and profitability in the long run.

#### *Hypothesis 5: Impact of Controversies in ESG Reports*

**H5a:** *The presence of Controversies in ESG reports negatively affects companies' short-term financial performance*

**H5b:** *The presence of Controversies in ESG reports negatively influences companies' long-term financial performance.*

The Controversies related to ESG issues can cause immediate reputational damage, leading to fines, lost business, and diminished investor trust, thereby impacting short-term profitability. In the long term, unresolved controversies may erode the company's brand value and stakeholder relationships, which can have lasting adverse effects on financial performance.

The formulation of these hypotheses aligns with the aforementioned theoretical framework by considering both the potential for sustainability efforts to create value and the associated costs and trade-offs. This thesis seeks to empirically investigate these hypotheses, providing insights into how the overall sustainability and its components influence financial performance in the short and long term. The purpose of these studies is to provide significant insights for both academic discussions and practical applications in the corporate world.

This comprehensive approach will not only enhance the academic understanding of these relationships but also offer significant practical insights for policymakers and corporate executives aiming to integrate sustainability effectively into their strategic decisions.

## 3. Methodology

### 3.1. Research Strategy and Design

Bell et al. (2022) delineate three principal research methodologies prevalent in scholarly investigations: quantitative, qualitative, and mixed-methods approaches. Each strategy possesses inherent strengths and weaknesses, making their use contingent upon the specific context of their application.

Quantitative analysis is a research method that is deeply rooted in positivist philosophy, which advocates for the measurability of phenomena and the establishment of an objective reality from which to view the world. This reality is measured through the collection and subsequent analysis of numerical data. Data can be collected through various means, such as surveys and existing datasets. Typically, researchers employ a representative sample from which findings can be generalised to a broader population. Qualitative analysis uses a deductive approach where theories or hypotheses are tested using appropriate statistical techniques, which can minimise biases and enhance reliability. However, its principal limitation is its potential inadequacy in addressing the complexities and nuances of human behaviour. (Bell et al., 2022).

Conversely, qualitative research is deeply embedded in interpretivist philosophy, which views reality as subjectively constructed by individual experiences. This approach utilises methods such as interviews, observations, and focus groups to gain deep insights into human experiences, which are not readily quantifiable. Instead of employing deductive reasoning, qualitative research typically relies on inductive reasoning to develop theories and hypotheses. This method is particularly effective in exploring underlying motivations and the intricacies of human nature. Nonetheless, its interpretive nature may introduce biases, and its findings can often hardly be used for generalisation due to the unique contexts of individual experiences (Bell et al., 2022).

The mixed-methods approach, on the other hand, seeks to synthesise the strengths of both quantitative and qualitative methodologies, thereby mitigating their respective weaknesses. This integrative strategy can provide a more comprehensive understanding of complex phenomena that may be inadequately addressed by a singular methodological focus. Mixed method research can be done either concurrently or subsequently based on the research necessities. The greatest obstacle to using a mixed-method approach lies in the complexity and nuances of integrating both quantitative and qualitative data, a process that demands meticulous methodological consistency (Creswell & Plano Clark., 2018).

In general, the nature of the research question, the characteristics of the studied phenomena, and the particular insights the researcher is seeking will determine the research strategy to be used, highlighting the need for a context-specific approach for each research (Creswell & Plano Clark., 2018).

### 3.1.1. Mixed-Methods Strategy: The Embedded Mixed-Method Design

There are a multitude of possible mixed-research designs, as pointed out by (Creswell & Plano Clark., 2018).

In a convergent Parallel Design, for instance, qualitative and quantitative data are collected independently to maintain methodological purity. This data is subsequently analysed and compared with others in order to validate or contrast the findings.

The Explanatory Sequential Design, on the other hand, starts with collecting either qualitative or quantitative data and then uses the other type of data to explain or expand the previous findings. This design is useful when the aim is to understand the underlying motives behind statistical behavioural results.

In contrast, the Exploratory Sequential Design utilises an inductive approach where qualitative data is used to investigate a phenomenon, which is later augmented with a quantitative analysis. This is typically used when exploring new research areas where appropriate theoretical frameworks might still be missing.

However, for the current research objective, the Embedded Mixed-Method research strategy was deemed the most appropriate. The overarching aim of this research is to elucidate the nature of the interaction between sustainability initiatives and financial performance. Consequently, our focus is primarily on deciphering the correlation rather than causation between these two variables. In this vein, qualitative analysis is positioned as a supportive tool that enhances our quantitative findings rather than constituting the core of our research methodology.

To achieve this objective, an Embedded Mixed-Method research strategy was adopted. This approach privileges quantitative data as the primary focus, while qualitative data serves to support and augment quantitative insights (Creswell & Plano Clark, 2018). This methodological symbiosis seeks to address aspects of the research topic that may remain underexplored through quantitative analysis alone, thereby enriching our understanding, clarity, robustness, and elaboration of the study's findings.

## 3.2. Research Quality

This chapter focuses on evaluating the research quality of the thesis, which examines the influence of sustainability measures on financial performance and economic value within the automobile industry. The assessment of research quality is determined by three essential criteria: validity, reliability, and replicability. Each of these characteristics is crucial for guaranteeing that the research findings are robust, credible, and can be effectively understood and potentially replicated by other scholars or practitioners.

### 3.2.1. Validity

Validity is considered one, if not the most important criterion in research. It represents the extent to which the instruments and techniques used in a study accurately assess the topic they intend to investigate (Bryman & Bell, 2022). In other words, validity relates to the precision and truthfulness of the research findings. It evaluates the extent to which the research accurately measures its intended target and how effectively the conclusions reflect the reality under investigation.

For the quantitative part of this study, validity is enhanced by the utilisation of solid data collection sourced from Refinitiv Eikon. This dataset encompasses extensive financial and ESG data on 180 enterprises across 28 nations. This retrieved data guarantees a comprehensive coverage of the automobile and auto parts industry, hence improving the capacity to apply the findings to a wider context. The analysis was conducted using Jupyter for Python, a reputable computational tool that supports the accurate and efficient handling of large datasets. This configuration guarantees that the analyses are conducted in a systematic manner and can be thoroughly validated.

On the other hand, in regard to qualitative research, the validity is enhanced by using semi-structured interviews, which allow for in-depth exploration of participants' perspectives while maintaining a consistent structure to compare across different cases. The process of selecting interviewees from various geographical and organisational backgrounds in the automotive industry guarantees the inclusion of a broad spectrum of perspectives. This, in turn, enhances the comprehension of how sustainability practices are perceived and executed under different market conditions.

### 3.2.2. Reliability

Reliability is a fundamental aspect of empirical research that traces its roots back to the beginnings of scientific inquiry. It refers to the consistency with which results can be replicated across different tests or observers. For example, reliability might be assessed by comparing results from one test to another or between two individuals evaluating the same behaviour (McDonald et al., 2019).

In this study, reliability is achieved through the systematic application of statistical methods to analyse the data. Utilising robust linear regressions to analyse the influence of ESGC Scores on financial indicators guarantees that the results are consistent and can be reproduced under comparable circumstances.

In addition, the implementation of a standardised interview style throughout the qualitative phase guarantees a systematic data-gathering approach that can accurately capture the intricacies of each respondent's viewpoint on sustainability projects while still allowing for some freedom in their responses.

### 3.2.3. Replicability

Replicability relates to the capacity of other researchers to duplicate the findings of a study by employing identical methodologies or processes as first employed (Bryman & Bell, 2022).

The replicability of this research is facilitated by the detailed documentation of the methodologies used in both the quantitative and qualitative analyses.

In the context of quantitative analysis, the data was sourced from Refinitiv Eikon and analysed in Jupyter using Python, which is both an accessible and well-documented platform. By explicitly identifying these tools, future researchers can employ identical or comparable computing environments to reproduce the analysis. Comprehensive information regarding the data retrieval procedure from Refinitiv Eikon, including particular data points and settings employed, enables accurate replication of the study.

The replicability of the qualitative component is enhanced by a detailed depiction of the interview process, which encompasses the criteria adopted to select participants, the interview guide, and the techniques employed for data analysis. By providing a thorough outline of how participants were chosen, how data was collected and analysed, and how conclusions were drawn from the qualitative data, other researchers can replicate the study or adapt the methodologies for similar research in other contexts.

Ensuring high research quality through careful attention to validity, reliability, and replicability is crucial in reinforcing the integrity and credibility of the findings. This thesis presents a strong and comprehensive framework that not only thoroughly examines the research issue but also makes a reliable contribution to academic knowledge and industry experience in the field of how sustainability affects financial performance. By adhering to these quality requirements, the research serves as a significant reference for both theoretical exploration and practical implementation in the subject of business sustainability.

### 3.3. Social and Ethical Considerations

In conducting research within the field of sustainability, particularly in the automotive industry, it is imperative to consider the social and ethical implications of both the research process and its potential impacts. This chapter focuses on these problems, emphasising the significance of ethical considerations in the gathering, examination, and distribution of data, as well as the wider consequences of the research findings.

This chapter emphasises the ethical aspects of conducting research, highlighting the dedication to treating all individuals and communities involved or affected with the highest level of respect. By adhering to rigorous ethical standards, the study not only advances academic knowledge but also contributes positively to societal progress. This ethical methodology guarantees that the research not only offers valuable knowledge on the sustainability practices of the automobile sector but also promotes the establishment of practices that are both efficient and fair, hence emphasising the significance of ethics in sustainability research.

#### Ethical Conduct in Research

Adhering to ethical standards in research ensures that the work is conducted responsibly and with integrity. This study strictly follows ethical criteria, beginning with the gathering and utilisation of data. The quantitative component of the study utilised data provided by Refinitiv Eikon, a reputable platform known for its adherence to intellectual property rights and compliance with data privacy laws. In the qualitative phase, involving semi-structured interviews, obtaining informed consent was crucial. The participants received comprehensive instructions regarding the objective of the study,

the voluntary aspect of their involvement, the confidentiality of the data, and their freedom to withdraw from the study at any time without any consequences. This methodology not only upholds the independence of the participants but also strengthens the credibility and ethical integrity of the research. Additionally, enhancing text tools like Grammarly and QuillBot paraphrase were used to ensure the clarity and precision of the research documentation.

## Participant Privacy and Data Protection

Ensuring the protection of participant privacy and data integrity is of utmost importance, especially when dealing with confidential information. In this study, participant data was anonymised based on the interviewees' stated wishes; only the information they specifically asked to be kept confidential was anonymised. The process of selectively anonymising the data was carried out with great care to ensure that no unauthorised individuals could access it while still honouring the preferences of each participant. This approach not only complies with data protection regulations but also builds trust with the participants and maintains the integrity of the research process.

## Consideration of Broader Social Implications

In addition to the immediate research implications, it is crucial to take into account the wider social consequences, particularly in relation to sustainability measures in the automobile sector. This includes evaluating the socioeconomic outcomes of adopting sustainable practices, such as the potential for job creation or displacement, impacts on industry standards, and broader economic effects on local and global scales.

Moreover, ethical considerations should encompass a thorough examination of the impact of these alterations on social equality.

## 3.4. Data Collection and Sampling

### 3.4.1. Quantitative Data

The data for the quantitative analysis section is sourced from the Refinitiv Eikon database, a comprehensive and widely regarded financial database that provides detailed information on a global scale. This data bank was chosen for its robust coverage of financial and sustainability metrics across a broad spectrum of companies within the industry, which this study aims to investigate. Refinitiv Eikon offers users access to an extensive range of data, encompassing financial statements, market performance indicators, and ESG scores.

The selection for the financial performance indicators was made to provide a comprehensive array that includes measures contributing to different types of company value, whether short-term, long-term, or mixed. This strategic selection ensures that profitability, market valuation, and efficiency metrics are well represented to reflect the broad impacts of sustainability initiatives on various financial aspects of the business.

The ESG scores are particularly crucial to this study as they serve as a proxy for measuring a company's engagement and performance in sustainability initiatives. By utilising this database, the

research is based on dependable, extensive, and current data, establishing a strong basis for assessing the influence of sustainability activities on economic value in the automobile industry.

#### 3.4.1.1. Sample Selection

The scope of this study encompasses a strategically selected sample of 180 companies operating within the “*Automobiles and Auto Parts*” industry, spread across 28 different countries. This deliberate decision was made to capture a vast and representative range from the worldwide automotive sector, thereby ensuring the findings are both relevant and applicable across different market dynamics and regulatory environments.

The selection criteria focused on companies for which comprehensive data were available for the last five fiscal years. This timeline was selected in light of the noticeable lack of values prior to this point in time, which emphasises the significance of examining the most recent and pertinent trends in sustainability and financial performance in the sector.

The sample’s geographic diversity is intended to ensure a robust basis for analysing the impact of sustainability efforts on economic value. The analysis takes into consideration the varying degrees of environmental regulation, market maturity, and corporate sustainability adoption rates across different geographic locations and company sizes.

This meticulous and comprehensive approach to selecting the sample is crucial for the study’s aim to provide detailed insights into how sustainability initiatives contribute to economic value in the ever-changing global automotive sector.

#### 3.4.1.2. Sustainability Performance Measurement

This study utilises ESG (Environmental, Social, and Governance) Scores from the Refinitiv Eikon database as a proxy for sustainability performance to assess the impact of sustainability initiatives on the economic value of companies in the automotive industry.

According to Refinitiv Eikon’s provided information (2024), these ESG scores are determined based on a company’s public disclosures and verifiable data, evaluated in ten specific categories. The categories encompass Resource Use, Emissions, Environmental Innovation, Workforce, Human Rights, Community, Product Responsibility, Management, Shareholders, and CSR Strategy. Each category provides a different view into the several aspects of a company’s sustainability initiatives, from environmental stewardship and innovation to social responsibility and governance practices.

In order to enhance this evaluation, the study employs the ESG Combined Score (ESGC), which integrates the ESG Score with an analysis of ESG-related controversies reported in global media. This inclusion aims to adjust the ESG performance score by accounting for the impact of negative media coverage on significant, material ESG controversies. For companies involved in such controversies, the ESGC is calculated as the weighted average of the ESG Score and the impact of the controversy on the fiscal period, with recent controversies affecting the latest complete period’s score. When companies are free from controversies, the ESGC is equivalent to the ESG Score. This methodology reflects a comprehensive and “corrected” measure for the purpose of our research, acknowledging the role of ESG controversies in shaping public perceptions and, potentially, the economic value of automotive companies.

According to the same information source, the ESG Controversies Category Score, part of the ESGC, is determined based on 23 ESG controversy topics, penalising companies involved in scandals and adjusting their overall score and rating accordingly. This score is continually updated with new developments in each controversy, ensuring the most current reflection of a company's ESG standing. Moreover, this approach mitigates the market cap bias, recognising that larger companies often attract more media attention and, consequently, may be more affected by controversy-related score impacts. Utilising ESGC Scores for this study provides a nuanced analysis of how sustainability efforts, encapsulated across these ten categories, contribute to the overall economic value of companies within the Automobile and Auto parts industry.

This method not only aligns with the study's objective to explore the comprehensive impact of sustainability but also ensures that the analysis is based on objective and quantifiable data. This enables a detailed examination of the relationship between sustainability practices and economic value, incorporating the critical dimension of ESG controversies to present a holistic view of sustainability performance.

#### *3.4.1.3. Financial Performance Measurements*

This study meticulously gathered a comprehensive array of financial and operational data for each company within the selected sample to analyse the impact of sustainability initiatives on economic value. The data were sourced from the Refinitiv Eikon database.

The retrieved dataset encompasses critical financial and operational performance indicators representing different areas of the companies' economic value, including:

- **Profitability Measures:** Net Income, Earnings Before Interest and Taxes (EBIT), Gross Margin, Operating Margin, EBIT Margin, EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) Margin.
- **Liquidity Measures:** Quick Ratio, Cash and Equivalents.
- **Performance and Efficiency Measures:** Inventory Turnover, Asset Turnover, Free Cash Flow.
- **Leverage and Solvency Measures:** Total Debt, Short-Term Debt, Long-Term Debt, Total Debt to Total Equity Ratio.
- **Fundamental Indicators:** Tot Assets, Shareholders Equity, Total Equity, Current Assets, Total Revenue, Net Income.
- **Market Value Measures:** Company Market cap, P/E Ratio, Earnings Per Share (EPS), Book Value per Share (BVS), Dividend per Share Yield % (DSY).
- **Taxation and Regulatory Impact:** Tax Rate.

The selection of these factors was based on their capacity to shed light on the financial well-being and operational effectiveness of the companies, providing valuable insights into how sustainability

practices might influence various dimensions of economic value, from profitability and growth prospects to liquidity and leverage.

The dataset's extensive scope and comprehensive nature establish a robust basis for performing meticulous quantitative examinations with the objective of revealing the intricate connections between sustainability measures and the economic success of enterprises operating in the automobile and auto parts sector.

#### 3.4.1.4. Additional Financial Measurements

Building on the collected financial and operational data, this study employs several calculated financial metrics to deepen the analysis of the impact of sustainability initiatives on companies' economic value. These metrics, derived from the raw data, are designed to offer insights into the profitability of the companies within our sample, providing a multifaceted view of their financial performance and health.

##### *Profitability*

**Return on Assets (ROA)** is calculated by dividing Net Income by Total Assets, offering a measure of how efficiently a company uses its assets to generate earnings.

$$ROA = \text{Net Income} / \text{Total Assets}$$

**Return on Equity (ROE)** results from dividing Net Income by Shareholders' Equity, reflecting the profitability generated by shareholders' equity.

$$ROE = \text{Net Income} / \text{Shareholders Equity}$$

**Return on Invested Capital (ROIC)** is a comprehensive metric derived in a two-step process: firstly, Invested Capital is calculated as the sum of Total Debt and Total Equity, subtracting Cash and Equivalents, indicating the total capital invested in the business. Secondly, Net Operating Profit After Taxes (NOPAT) is determined by adjusting EBIT for the Tax Rate. ROIC, the ratio of NOPAT to Invested Capital, assesses the efficiency of a company in allocating the capital under its control to profitable investments.

$$\text{Invested Capital} = \text{Total Debt} + \text{Total Equity} - \text{Cash and Equivalents}$$

$$\text{Net Operating Profit After Taxes (NOPAT)} = \text{EBIT} * (1-t)$$

$$ROIC = \text{NOPAT} / \text{Invested Capital}$$

## 3.4.2. Qualitative Data

### 3.4.2.1. Sampling

Lohr (2021) categorises the methodologies of scientific research sampling into two primary frameworks: probability sampling and non-probability sampling. Probability sampling involves the

selection of a random subset of a population, which enables researchers to generalise findings to the entire population. In contrast, non-probability sampling does not employ random selection, resulting in varying probabilities of representation among potential participants. This method is frequently applied in qualitative research or in situations where obtaining a random sample is arduous.

In the context of the current research, a convenience sampling strategy has been adopted. This method leverages participants who are easily accessible to the researcher; as such, it is not random. The primary benefits of convenience sampling include enhanced accessibility to information and greater time efficiency. At the same time, it creates a high risk of sampling bias, which may limit the applicability of the research findings to the broader population (Lohr, 2021). The decision to utilise convenience sampling was influenced by the challenges associated with securing a random sample and the constraints imposed by time. Overall, seven candidates were selected to take part in the interview process.

#### 3.4.2.2. Semi-Structured Interviews

According to Creswell & Plano Clark (2018), interviews can serve as an integral part of mixed-method research since they provide numerous insights and perspectives of the studied phenomena. The selection of the interview type is contingent upon the research question, objectives, and the desired depth of analysis.

Creswell & Plano Clark (2018) classify interview methodologies into three primary types: structured, unstructured, and semi-structured. Unstructured interviews are characterised by open-ended conversations to allow a free flow of thoughts and ideas of the participant with minimal intervention from the researcher. This format is typically employed in exploratory research to capture a broad range of insights. Conversely, structured interviews are defined by a predetermined set of questions, which are administered uniformly to every participant, giving the researcher considerable control over the interview process. This method is predominantly used in quantitative research to ensure consistency and repeatability.

Semi-structured interviews, however, offer a compromise between the structured and unstructured formats. This format features set questions but with a high degree of flexibility based on the interviewee's responses and the natural flow of conversation. This approach enables a balance between maintaining structural integrity and accommodating spontaneous depth, making it particularly suited for qualitative analysis where both consistency and adaptability are crucial (Creswell & Plano Clark, 2018).

With the exception of one interview, which was conducted through a questionnaire and answered via email, semi-structured interviews were chosen as the backdrop for qualitative analysis as this approach was deemed to be the most suitable on the basis of our research objectives. Several factors were taken into consideration. Semi-structured interviews allowed for a good balance of flexibility and consistency. These two characteristics were deemed necessary for the following reasons. In this research, semi-structured interviews were selected to align with our nuanced research objectives. This choice was informed by several considerations: firstly, the need to tailor interviews to leverage the unique competencies and perspectives of each participant, and secondly, the requirement to maintain comparability and focus throughout the interview process.

Our research question and objective are very complex, and the expertise required to try to provide an answer directly may exceed the one owned by the interviewees in the automotive field. In order to overcome this issue, it was necessary to take into account their niche knowledge and formulate

questions that could lead to a comprehensive mosaic that could answer the study’s inquiries with the highest level of accuracy, given the acquired sample.

### 3.4.2.3. Interview Guide

The semi-structured interviews followed diverse arrangements and lengths based on the participants’ required inputs, knowledge, as well as their time constraints. The interviews lasted between 15 and 30 minutes, and on average, 11 questions were asked per interview. The discussions were either held in person or through the online platform Zoom. The only exception was an interview that was answered through a questionnaire over an email exchange. This was due to the participant’s time restrictions, which prevented a face-to-face interview.

The professionals in the chosen sample represent several positions of expertise within the automotive industry, including sales representatives, accounting managers, financial controllers, operations leaders, and technology experts, for a total of seven interviewees. Their backgrounds are mixed, and together, they represent five different countries, namely Indonesia, Italy, Japan, Korea, Slovenia, and Sweden, which ensures a very diverse pool of expertise and perspectives that can help us gather a wider picture of the interplay between sustainability and financial performance. The roles and contributions of these participants to the research were systematically catalogued, as outlined in the accompanying table.

*Table 1: Interview Guide*

<b>Name</b>	<b>Company</b>	<b>Role</b>	<b>Offered perspective</b>	<b>Country</b>	<b>Date &amp; Duration</b>
Y.F.	Mitsubishi Heavy Industries	Sales representative/ cost controller – Toll gate collection system	Implementing sustainability during financial difficulties	Japan	07/02/2024 16:11 min
E.L.	Tesla	Sales representative	EV technology, purchase preferences, customer demographics	Japan and Indonesia	23/02/2024 19:28 min
K.O.	Doshisha University	Expert in Technology-based industries and semiconductors	Integration of advanced electronics and semiconductors in the automotive industry	Japan	12/02/2024 30:11 min
A.B.	Polestar	Head of operations control	Sustainability path of Polestar, integration of sustainability with business objectives	Sweden	06/03/2024 32:37 min
K.J.	Siliko	Financial controller	Automotive supplier relationship with sustainability initiatives	Slovenia	27/03/2024 15:41 min

S.B.	Fonderia Casati	Sales representative	Automotive supplier relationship with sustainability initiatives	Italy	16/04/2024 16:32 min
H.P.	Hyundai	Administration and Accounting manager	Integration of sustainability in the company strategy, developing sustainability goals and tracking them	Korea and Italy	06/05/2023 n.d.

Interview questions adhered to certain key characteristics that were chosen to ensure good qualitative answers and alignment with the research objectives. These characteristics can be described as follows:

- 1) **Open-ended:** Given the inductive nature of our research, open-ended questions were vital since they encouraged interviewees to express their thoughts freely, share personal experiences, and provide nuanced information, which is crucial for depth in qualitative analysis.
- 2) **Neutrality:** the interview questions were formulated in the most neutral possible way. It was important that the interviewees wouldn't sense any opinion or preconceived notion that the researcher might have, which could have, in turn, led to biased answers.
- 3) **Sequencing:** The questions were structured to progress from general to more specific. Initially broad and introductory, as the interview progressed, they gradually narrowed down and became more focused. This sequencing was designed to allow the interviewees to clear up their minds and enhance their understanding of the research objectives as the interview progressed.
- 4) **Adaptability:** The interviews were flexible, allowing for the integration of follow-up questions in response to significant insights or statements. This adaptability was crucial for exploring emergent themes and clarifying specific points.

Here are a few examples of these characteristics in chronological order as they were mentioned.

1) **Open-ended:**

*“Can you describe some of the sustainability initiatives your company has implemented in recent years? How do these initiatives align with your company’s overall financial objectives?”*

2) **Neutrality:**

*“Can you provide an example of a sustainability project that significantly influenced your company’s financial performance? What were the key factors that contributed to its success or challenges?”*

3) **Sequencing:**

*“All right. So, can you tell me a bit about the company you worked for and what was your role?”*  
*→“OK. So yeah, so interesting. And then, well, what do you think drove your customers, in this case, Singapore, to purchase your product? So, what was their main focus and the main problem that we’re trying to solve?”* →*“So, during your role as cost control team, to what extent did consideration of sustainability such as emission reduction influence decision making? So essentially, was it more to do with the environment or more to do with money?”*

4) **Adaptability:**

*“Interviewer: OK, thank you. Then, the second question. Are you aware of some challenges that Tesla faced when implementing some sustainability Initiatives, and if so, how were these addressed?”*

*E.L.: So about the batteries, they are charged with thermal power. I’m not sure whether our electricity is fully clean, you know what I mean? So, still, we create carbon deposits. And of course our cars are coming from Shanghai, China, so to produce the battery is really [...] I think most of the parts we try our best to utilise the sustainable energy option, but still the mining, fabricating, and also packaging, still there is carbon output. I’m not sure 100% but there is some kind of effort for sustainability.*

*Interviewer: OK, so you basically say the problem with Tesla is more in the supply chain?*

*E.L.: Yes, I think so. I think there is a problem with the supply chain like on a global scale”.*

## 4. Quantitative Research

### 4.1. Analysis

In the quantitative section of this study, we thoroughly analyse the relationship between sustainability initiatives, measured by the ESGC Score, and their financial implications in the automobile and auto parts industry. Our analysis is conducted using a large dataset obtained from the Refinitiv Eikon database. The study employs complex statistical techniques enabled by Jupyter Notebook for Python coding language. This Python-based platform is essential for accurately processing and analysing complex data.

The first step of our analytical method involves a thorough data-cleaning procedure to ensure that the dataset is prepared for detailed statistical analysis. An initial step for the analysis consists of creating a correlation matrix to find which variables have significant correlations with the ESGC Score and, thus, could be relevant in the regression. This method allows the focus of the regression analysis on the most important components, excluding excessive data that could cause multicollinearity issues.

The following step focuses on creating geographical dummies to acknowledge the geographical impact of the variables studied. Each dummy represents the industry’s companies of a specific geographic area.

The analytical centre of this study revolved around the use of the Ordinary Least Squares (OLS) regression model, which was chosen for its effectiveness in elucidating the relationships between sustainability and the financial performance measures selected.

This model was later subjected to a diagnostic test called Q-Q plot to check the distribution of each regression’s residuals and verify the presence of normality trends and possible outliers.

After analysing the plots, we decided to perform an RLM to obtain more accurate results. The focus of our investigation then revolved around the utilisation of robust regression, which has been chosen for its ability to withstand the influence of outliers and its capacity to offer dependable insights even when confronted with fluctuations in the data. This methodological decision eliminates the necessity for distinct outlier diagnostics, such as Cook’s distance, by intrinsically accounting for the disproportionate impact of outliers on the regression results.

As a final step, the research drilled further into the analysis of the impact of sustainability, studying the effect of each sustainability component. These analyses specifically focused on the individual dimensions of ESGC, namely environmental, social, governance, and controversy. This approach provided a detailed perspective on how each component affects different financial measures.

The basis of our quantitative analysis lies in the robust regression model, which clarifies the intricate connections between the ESGC Score and selected financial performance measurements. This methodology not only guarantees the accuracy and reliability of our results in the presence of irregularities in the data but also simplifies our analysis, enabling us to focus on the significant effects of sustainability activities. By using robust regression, we are selecting an analytical approach that prioritises the strength and dependability of our findings. This will improve the credibility and clarity of our investigation of the relationship between sustainability and financial performance in the automobile industry.

This chapter will outline the detailed process of our quantitative analysis, starting from data preparation and ending with the regression models. The research will then continue in the following chapter with a careful interpretation of the RLM regression findings. The final ambitious objective of this analysis is to illuminate the strategic importance of sustainability programs, offering a comprehensive empirical basis to facilitate the incorporation of sustainability into corporate financial strategy within the automobile industry.

#### 4.1.1. Data Cleaning

The initial phase of the quantitative analysis carried out in this study involves the crucial step of data cleansing and preparation. This passage is critical to ensuring the integrity and robustness of the entire examination. This essential process entailed combining two comprehensive datasets retrieved from the Refinitiv Eikon database. One data frame contains detailed financial performance metrics of companies in the automobile and auto components industry, and the other dataset entails the ESGC Score along with its various categories and sub-categories of the same sample.

The merging of these data frames was conducted with meticulous attention to detail, guaranteeing a cohesive dataset that aptly shows both the sustainability and financial variables of the previously described sample along the last five registered fiscal years.

During this preliminary phase, significant effort was placed into effectively handling missing values. This is a frequent obstacle in the data analysis process and requires proper attention. If not addressed properly, this issue may, in fact, compromise the validity of the final research findings and result in inaccurate conclusions.

The approach to managing missing data was twofold. Whenever feasible and theoretically valid, missing values were replaced with zeros, a technique especially suitable in cases where the lack of a value logically indicates nonexistence or non-occurrence. On the other hand, when this method was not suitable or could cause misinterpretation and unattainable results, instead of being replaced with a null value, the entries were removed from the dataset.

This prudent yet assertive strategy ensured that the remaining data were both thorough and dependable, establishing a strong basis for precise analysis.

Furthermore, in order to assess the mismatch in scales and units of the merged dataset, a thorough standardisation process was undertaken. This step is crucial to guarantee comparability and uniformity throughout the dataset, enabling an unbiased analysis of the relationships between standardised financial metrics and ESG scores. This passage is also necessary to prepare the data for the next step, which involves the regression process. Standardisation is essential in regression analysis because it enables the assessment of variables on a uniform scale, which improves the interpretability and reliability of the analysis.

The meticulous data cleaning and preparation phase, characterised by thoughtful integration, strategic handling of missing values, and careful standardisation, set a robust foundation for the study.

The study not only set the foundation for an in-depth investigation into the relationship between sustainability and financial performance in the automotive industry but also emphasised the dedication to a rigorous methodology and precise analysis.

This preliminary phase underscored the importance of a well-prepared dataset as the cornerstone of insightful and reliable quantitative analysis.

#### 4.1.2. Correlation Matrix and Variable Selection

After preparing the dataset for analysis, a correlation matrix was employed. The correlation matrix served as a valuable statistical tool in the analysis process as it systematically discerns the strength and intricacy of the relationships among a diverse array of variables compared to the ESGC Score. This matrix presented a straightforward and quantifiable depiction of the interrelationships between each financial performance indicator and sustainability measure within the designated dataset. By carefully examining the correlation coefficients, it was possible to glean insights into the metrics that held a significant linear relationship with the ESGC Scores.

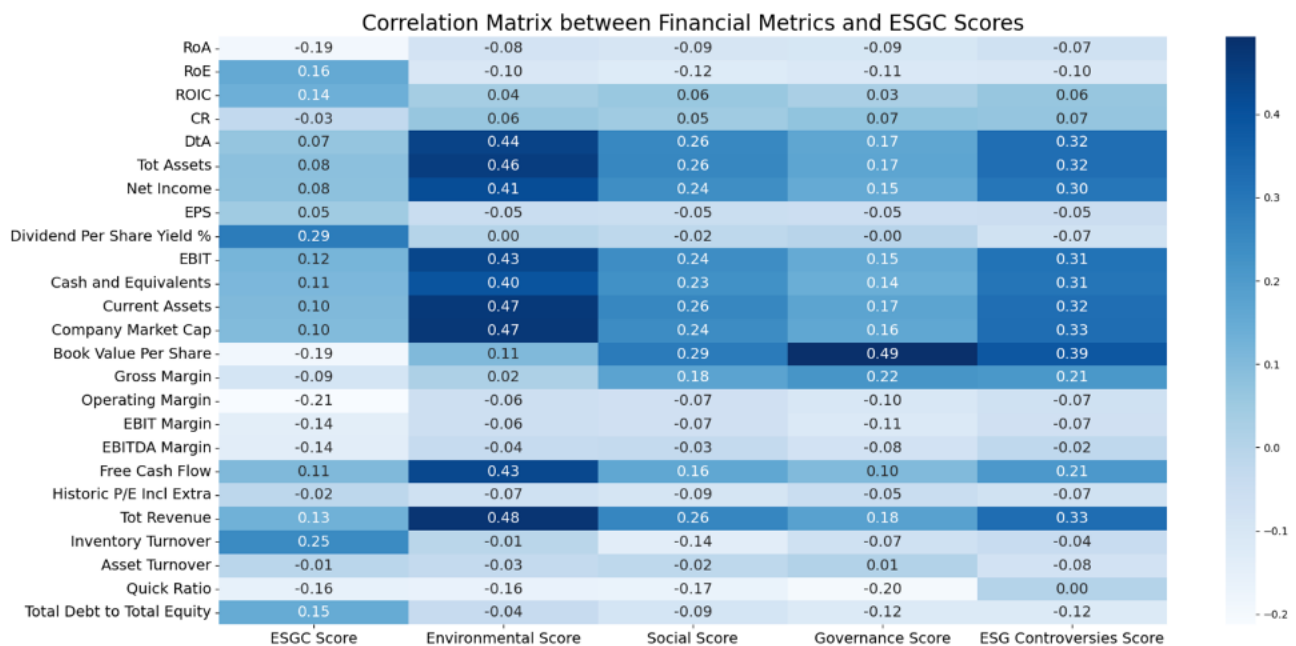


Figure 2: Correlation Matrix between Financial and Sustainability Metrics

Based on the statistical significance obtained from the correlation matrix, insights gathered from the literature review, and consideration of the theoretical framework, the study focused on evaluating two main areas of the companies' economic performance: *profitability* and *market evaluation*.

The selected profitability indicators included ROA, ROE, and ROIC. These measures provide insights into a company's long-term and short-term financial health and operational effectiveness, making them suitable for assessing both the immediate and future financial consequences of sustainability.

For market evaluation, the study specifically targeted Company Market Capitalization (MC), BVS, and DSY. These measures were chosen not only for their correlation values but also for their ability to provide insights into how the market values the company and the direct financial returns to shareholders. They reflect long-term market perceptions and are influenced by sustainability commitments. The selection of these variables reflects a strategic approach to align empirical analysis with relevant literature, theoretical frameworks, and hypotheses regarding how financial indicators contribute to a company's short-term, long-term, and mixed value.

This approach ensures that the study follows strict statistical standards while aligning with established research, thereby enhancing the validity and relevance of the findings.

Before proceeding with this analysis, it is crucial to note the dichotomy between the correlation of overall ESGC Scores with financial performance indicators and individual ESGC components with financial performance indicators. This observation highlights the varying impacts of different dimensions of ESGC on financial metrics, warranting further research to understand how each component individually influences financial outcomes.

### 4.1.3. Geographical Implications

#### 4.1.3.1. Geographical Areas Data Overview

The geographical distribution of the companies within the selected dataset is pivotal to understanding the regional dynamics that may affect the interplay between sustainability initiatives and financial performance.

The research sample analysed contains a total of 180 companies in the Automobile and Auto Parts Industry, spanning 28 different countries. After a careful examination of the data, the organisations were then grouped into three major geographical areas: Americas, Asia, and Europe. As shown in *Figure 3*, the firms are distributed among these areas as follows: the Americas accounts for 44 companies, Asia contains the largest number with 87 firms, and Europe comprises 49 companies.

Notable, South Africa, being the only representative from the African continent, has been strategically placed in the European category to ensure consistent data and avoid excluding its distinct contribution to the analysis.

While Asia includes the majority of the industry firms, the contribution seems to originate from fewer country representatives than Europe, respectively 10 for Asia and 14 for the European zone. The American continent seems to have the smallest portion of the industry in terms of number of participants.

The geographical stratification of the dataset facilitates a nuanced analysis, enabling us to examine the relative weights each region contributes to the dependent financial variables.

This stratification is essential because it enables the evaluation of regional impacts on financial outcomes, perhaps linking variances in performance to the degree of sustainability integration in different markets.

Country Name	Geographic Area	Number of Companies
United States of America	Americas	35
Canada	Americas	5
Brazil	Americas	3
Mexico	Americas	1
Japan	Asia	26
China	Asia	25
India	Asia	12
South Korea	Asia	9
Taiwan	Asia	5
Australia	Asia	4
Hong Kong	Asia	3
Malaysia	Asia	1
Philippines	Asia	1
Thailand	Asia	1
Germany	Europe	10
France	Europe	6
Italy	Europe	5
Switzerland	Europe	5
Sweden	Europe	4
Turkey	Europe	4
United Kingdom	Europe	4
Austria	Europe	2
Netherlands	Europe	2
Ireland	Europe	2
Spain	Europe	2
Finland	Europe	1
Norway	Europe	1
South Africa	Europe	1

Geographic Area	Number of Companies
Americas	44
Asia	87
Europe	49

Figure 3: Geographical distribution of the research data

#### 4.1.3.2. Geographical Dummies

Dummy variables are used in regression analysis to account for the distinct influence of different geographical areas. Each dummy variable is assigned a value of '1' for companies located inside a particular geographical region and '0' for enterprises located outside of that area. For instance, the 'Geo\_Asia' dummy assigns a binary value of '1' to companies located in Asia and a binary value of '0' to all other firms. Similarly, the terms 'Geo\_Americas' and 'Geo\_Europe' are defined in an identical manner, guaranteeing that the distinct geographical impacts are separated and their influence on financial performance can be accurately quantified.

In this study, the regressions incorporated these dummy factors as control variables in addition to the ESGC Score, which is used as the independent variable. This approach allows for the evaluation of whether the correlation between sustainability, as measured by the ESGC Score and financial measures, is uniform across all regions or if there are specific regional trends. The research's objective is to provide a more accurate assessment of the impact of sustainability on financial performance metrics by taking into account geographical variations. This strategy enables the mitigation of potential distortion caused by regional differences.

The utilisation of these statistical tools is especially crucial for this research, given the wide array of enterprises, including established, growing, and frontier markets. This method enables a comprehensive examination of the financial effects of sustainability, considering not only the underlying economic and corporate practices but also the regulatory and environmental laws that are widespread in various geographical regions.

The regression coefficients of the geographical dummies provided insight into the impact of being situated in Asia, the Americas, or Europe on a company's financial indicators while accounting for the extent of sustainability activities measured by the ESGC Scores.

#### 4.1.4. OLS Regression

Once the geographical dummies were generated, several regression analyses were performed.

The Ordinary Least Squares regression (OLS) is a widely used method for estimating the coefficients of linear regression equations (either simple or multi-linear) that model the relationship between one or more independent quantitative variables and a dependent variable (Huber, 2004).

The OLS aims at estimating  $p$  unknown parameters ( $\theta_1, \theta_2, \dots, \theta_p$ ) from  $n$  observations ( $y_i = y_1 + \dots + y_n$ ).

$$y_i = \sum_{j=1}^p x_{ij} \theta_j + u_i$$

Where  $x_{ij}$  are the known coefficients and  $u_i$  are the independent random variables with the same distribution (approximately).

In general, the OLS model uses this formula for the observations and obtains residuals by minimising the sum of the squares:

$$\sum_i (y_i - \sum_j x_{ij} \theta_j)^2 = \min!$$

In this study, the OLS regression is a fundamental statistical tool to examine the complex interplay between sustainability performance, measured by the ESGC Score, and other financial performance metrics. OLS regression estimates the degree to which the independent variable predicts the dependent variable, providing insights into the strength and direction of the relationship. The OLS model is structured to minimise the sum of the squared deviations between the observed and predicted values, leading to the optimal line that fits the data points in a multi-dimensional space.

This thesis utilises OLS regression to perform six separate analyses, each focusing on a certain financial indicator. Three of these analyses examine profitability, while the other three evaluate market value.

### Variables:

#### *Independent Variable:*

The ESGC Score, a sustainability rating provided by Refinitiv Eikon, is used as the independent variable in each regression. This score is determined by a thorough review of firms' sustainability reports and media-based disputes, and it represents the companies' commitment to environmental, social, and governance standards, adjusting these ratings with a thorough investigation using media-based information. For instance, if an enterprise declares great waste recycling and dismissal practices but then the local newspaper advocates recent cases of illegal dismissal of industrial waste from that industry, the environmental score will be levelled down.

#### *Dependent Variables:*

The dependent variables in these regressions are the financial metrics that address the singular influence of sustainability on these metrics. These analyses have the objective of investigating the influence of **ESGC Score** on two representative aspects of the companies' economic value: profitability and market value. The former represents the short-term firm value, and the latter indicates the long-term perspective.

To address the impact on the companies' profitability, three indicators have been selected: Return on assets (RoA), Return on Equity (RoE), and Return on Invested Capital (ROIC).

**RoA** was detected as a measure to quantify the company's profitability in relation to its total assets, therefore reflecting the effectiveness with which a corporation utilises its assets to generate earnings.

**RoE**, instead, is an indicator that gauges the profitability in relation to stakeholders' equity, offering insight into how effectively a company is using investments to generate growth.

**ROIC**, on the other hand, reflects a company's efficiency in allocating capital to profitable investments, essentially measuring the return that a company makes over its invested capital.

These measures collectively provide a comprehensive snapshot of a company's current financial profitability and offer valuable insights into how operational efficiency and capital utilisation can shape future growth and financial performance.

For the Market Evaluation, the selected metrics are Company Market Capitalization, Dividend per Share Yield, and Book Value Per Share.

**MC** is taken as representative of the market value, indicating the total value of a company's shares of stock. This metric illustrates the market perceptions of its future growth prospects and overall health.

**DSY** represents the monetary gain that shareholders obtain in relation to the stock price they have paid, reflecting the company's capacity to generate cash flows and compensate its investors.

Finally, **BVS** is a metric that approximates the lowest value of a firm's ownership stake. In this study, this indicator is utilised to gauge how sustainability performance might impact a company's net asset value, providing valuable insights into the sustainable management of a firm's equity in relation to its market valuation.

Together, these metrics offer comprehensive insights into a company's long-term value creation by highlighting market perception, investor returns, and equity growth trends.

*Control Variables:*

In order to take into account the differences in geographical locations, dummy variables (Geo\_Americas, Geo\_Europe, Geo\_Asia) are included as control variables in every regression model. These enable the separation of the influence of sustainability on financial performance from regional influences, guaranteeing that the discovered connections are not distorted by geographical-related factors.

By doing so, the analysis aims to capture the true essence of how sustainability initiatives might influence financial performance across the different regions represented in the dataset.

Through careful construction and execution of these OLS regression models, the study aims to provide robust, empirical evidence on the financial ramifications of sustainability practices in the automotive industry, considering both profitability and market valuation dimensions and controlling for regional influences.

Table 2: Analysed Variables

Variable Type	Variable Name	Definition
<b>Independent</b>		
<u>Sustainability:</u>	ESGC Score	It provides a rating of the company's ESG performance based on the reported information on the sustainability statements, with the controversies overlay taken from global media sources (LSED, 2024)
<b>Dependent</b>		
<u>Profitability:</u>	Return on Assets (ROA)	A metric that indicates a company's profitability in relation to its total assets. ROA can be used by management, analysts, and investors to determine whether a company uses its assets efficiently to generate a profit (Weigand, 2014)
	Return on Equity (ROE)	A measure of a company's net income divided by its shareholders' equity. It is a gauge of a corporation's profitability and how efficiently it generates those profits.

		The higher the ROE, the better a company is at converting its equity financing into profits (Weigand, 2014)
	Return On Invested Capital (ROIC)	Calculation used to assess a company's efficiency in allocating capital to profitable investments (Weigand, 2014)
<u>Market Valuation:</u>	Company Market Cap (MC)	It represents the total dollar market value of a company's stock price multiplied by the number of the company's shares (Weigand, 2014)
	Dividend Per Share Yield (DSY)	It is a financial metric that indicates the annual percentage of a company's stock price that is distributed as dividends (Weigand, 2014)
	Book Value Per Share (BVS)	It represents the common shareholders' equity divided by the number of the company's shares (Weigand, 2014)
<b>Control</b>		
<u>Geographical Dummies:</u>	Geo_Americas, Geo_Asia, Geo_Europe	Dummy variables representing the 3 geographical areas: Americas, Asia, and Europe.

#### 4.1.5. Diagnostics: Q-Q Plots

After performing the OLS regression, a testing phase was implemented. Diagnostic testing is a critical step following the execution of regression analysis, as it helps ensure the integrity of the model's assumptions.

During this stage of the analysis, Quantile-Quantile (Q-Q) plots were created for each of the six regression models in order to assess the distribution of residuals. Residuals are calculated as discrepancies between observed and projected values. A Q-Q plot is a graphical tool used to compare two probability distributions by plotting their quantiles against each other. Ideally, if the residuals are normally distributed, the points in a Q-Q plot will fall along a straight line.

However, as shown in *Figure 4*, the regressions performed displayed different levels, some minor and some more significant, of deviations from linearity, indicating that the residuals did not follow a normal distribution. In fact, the plots show the presence of several outliers. An outlier refers to a data point that deviates significantly from other observations, sometimes due to measurement variability or experimental errors. Outliers are particularly problematic in regression analysis as they can significantly influence the estimations of a model's parameters, potentially resulting in incorrect outcomes.

The Q-Q plots revealed a significant presence of outliers, particularly in the left tail of the distributions. This indicates that certain residuals were substantially lower than what would be anticipated under a normal distribution. The assumption of normality of residuals is crucial in OLS regression since it forms the basis for the validity of different statistical tests, including those used to determine the significance of coefficients. When this assumption is not upheld, it might cause the standard errors to be underestimated, which in turn leads to overconfident estimations of the model's parameters.

Due to the existence of extreme values and the inability to satisfy the assumption of normal distribution, it was necessary to switch to a more robust analytical method. Robust regression techniques, such as the Robust Linear Model regression, offer alternatives that can minimise the influence of outliers and provide more reliable parameter estimates when the standard OLS assumptions are not met. By transitioning to such methods, the analysis aims to produce more accurate and trustworthy insights into how sustainability initiatives influence financial performance metrics across the automotive industry despite the anomalies detected in the data.

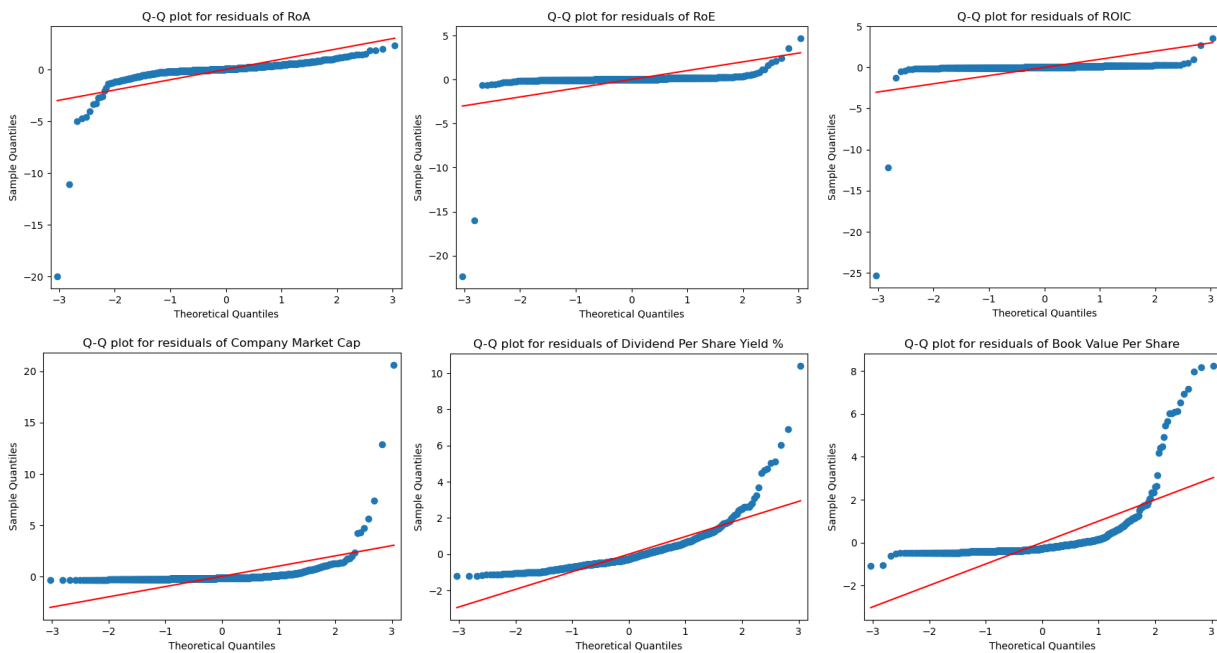


Figure 4: Q-Q Plots of the OLS Regressions

#### 4.1.6. Robust Linear Model (RLM) Regression

Robust Linear Model (RLM) serves as an alternative to OLS regression, especially in datasets where outliers might distort the analysis.

The first robust version of the linear model was first theorised in 1981 by P.J. Huber in his book “*Robust Statistics*”. The model is a “robustised” version of the classical linear least square, as it mitigates the impact of the outliers by giving them less importance in the calculation of the regression coefficients, providing a more reliable estimation of relationships between variables (Huber, 2004).

Huber starts by enunciating and addressing the weaknesses of the OLS formula, and then he develops the *robustised* version of RLM.

If the classical OLS minimise the sum of squares, the RLM minimise the sum of “less rapidly increasing functions of residuals” (Huber, 2004) in order to minimise the effect of outliers. The RLM formula is then:

$$\sum_i \rho(y_i - \sum_j x_{ij} \theta_j) = \min!$$

From which we obtain

$$\sum_i \psi(y_i - \sum_j x_{ij} \theta_j) x_{ik} = 0$$

Where  $\psi = \rho'$  and  $k= 1, 2, \dots, \rho$ .

In this study, the robust regressions implemented are calculated through the use of Python's statsmodels module, which utilises the HuberT norm and the Median Absolute Deviation (MAD) as key components of the methodology (Statsmodels, 2023).

The HuberT is the Statsmodels' given name, which stands for Huber's Theory.

The MAD, on the other hand, is a measure that represents the variability of a set of numerical data. It serves as an alternative to the standard deviation and is used to estimate the scale or spread of the residuals in the robust regression model (Statsmodels, 2023).

Applying the HuberT norm and MAD in robust regression ensures that the parameter estimates are not disproportionately affected by outliers, which is a key advantage over OLS regression. This strategy is extremely useful when the distribution of errors does not follow a normal pattern, a condition evident in the dataset as inferred from the Q-Q plot.

Although the robust regression model is more intricate than OLS, its results are still easy to read, which is essential for ensuring clear statistical inferences. The results obtained using this robust method, such as the coefficients and standard errors, offer a perceptive viewpoint on how sustainability influences financial indicators.

By utilising techniques specifically tailored to handle data anomalies, the research offers a nuanced comprehension that may better correspond to the dataset's actual characteristics.

#### 4.1.7. Comparison OLS vs RLM

The next step of the study aimed at identifying which type of regression could be a better fit to represent the complex interplay of relationships that this study seeks to investigate. While comparing the OLS and Robust regression, the following metrics were examined: Mean Absolute Error (MAE) and Root Mean Square Error (RMSE).

MAE is a statistical metric that calculates the average of the absolute errors between predicted values and observed data points. It is a useful measure of prediction accuracy that is less affected by extreme values compared to RMSE.

On the other hand, RMSE is more sensitive to outliers as it squares the errors before averaging them; thus, it tends to be larger when high-error values exist. In the context of regression analysis, smaller values of MAE and RMSE imply a more accurate alignment of the model with the data.

Based on the regression outputs shown in *Table 3*, it is evident that RLM consistently demonstrates reduced MAE values compared to OLS for all six financial measures. This indicates that RLM is offering a more precise average prediction, with fewer and less significant deviations from the observed values. The reduction of MAE in the case of Company Market Cap and Book Value per Share is particularly remarkable, respectively +0.08 and +0.09, in the context of RLM compared to OLS, showing a significant enhancement in predictive accuracy.

Regarding RMSE, which penalises larger errors more severely by squaring the residuals, the RLM occasionally showed higher values than OLS. This counterintuitive result can be attributed to the Huber T function employed in the RLM approach. The Huber T function is designed to reduce the impact of outliers on the regression estimates by applying a linear loss to large residuals instead of a quadratic loss, which is the standard in OLS. This characteristic implies that although RLM may have a higher RMSE because of the existence of outliers, it does not artificially increase the coefficients of the model in response to these extreme values as OLS regression might. Therefore, a higher RMSE in RLM does not necessarily indicate poorer model performance but rather reflects a model that is robust to the undue influence of outliers.

Overall, the findings suggest that RLM offers a stronger and more reliable estimation of the correlation between sustainability parameters, measured by ESGC scores, and financial performance metrics. RLM is a more suitable model for this study because it is more robust to outliers. This means that it can accurately capture the true patterns in the data rather than being influenced by extreme and unrepresentative data points. The performance of the RLM demonstrates its effectiveness in managing data anomalies, thereby providing a more precise representation of the influence of sustainability on financial performance.

Table 3: Comparison between OLS and RLM

Variable	Model Type	MAE	RMSE	Delta MAE	Delta RMSE
RoA	OLS	0.378	0.991	+ 0.03	-0.01
	RLM	0.352	1.004		
RoE	OLS	0.155	0.996	+ 0.04	-0.00
	RLM	0.111	1.000		
ROIC	OLS	0.129	0.996	+ 0.05	-0.00
	RLM	0.082	1.001		
MC	OLS	0.311	0.999	+ 0.08	-0.01
	RLM	0.231	1.012		
DSY	OLS	0.643	0.971	+ 0.03	-0.01
	RLM	0.615	0.981		
BVS	OLS	0.475	0.998	+ 0.09	-0.03
	RLM	0.387	1.024		

#### 4.1.8. ESGC Sustainability Components

An integral component of this study's deeper exploration into sustainability's impact on financial measures is the analysis of the ESGC Score. Refinitiv uses the sustainability rating provided by LSEG (London Stock Exchange Group); thus, the information provided in this study about these sustainability measures is retrieved from the LSEG's main website.

The ESGC Score is a comprehensive measure of a company's performance in terms of its ESG practices. It is designed to take into consideration the special relevance of ESG issues to each industry, the level of transparency in reporting, and the seriousness of any ESG-related scandals.

The entire ESGC Score is determined by quantifying each of these areas into four key components: Environmental, Social, Governance, and Controversies scores.

**Environmental Score:** This component evaluates a company’s influence on the natural environment, encompassing measurements related to energy efficiency, waste management, resource depletion, and the efficacy of environmental policies and procedures.

**Social Score:** The social component of the score assesses factors pertaining to human capital, community involvement, societal influence, labour standards, and the company’s dedication to promoting social welfare.

**Governance Score:** This rating measures a company’s governance practices, encompassing elements such as the composition of its board, the structure of its audit committee, rules on bribery and corruption, and other indicators that indicate robust corporate governance.

**Controversies Score:** LSEG acknowledges that there may be instances where a company’s actions deviate from its stated commitments. The Controversies Score assesses the magnitude and frequency of adverse events, guaranteeing that the ESGC Score accurately reflects actual performance rather than solely reported methods.

By breaking down the ESGC Score into its individual components, it’s possible to ascertain with greater precision how different aspects of sustainability are influencing financial performance. For instance, the Environmental Score can demonstrate how environmentally efficient methods can result in cost savings or revenue development, while the Social and Governance scores can uncover the advantages of ethical business practices on brand reputation and operational risk management. The Controversies Score has a direct impact on how a firm is perceived in the market and, consequently, on its financial valuation. The all-encompassing strategy highlights the complex and diverse aspects of sustainability and its various ways of impacting financial results in the automobile industry.

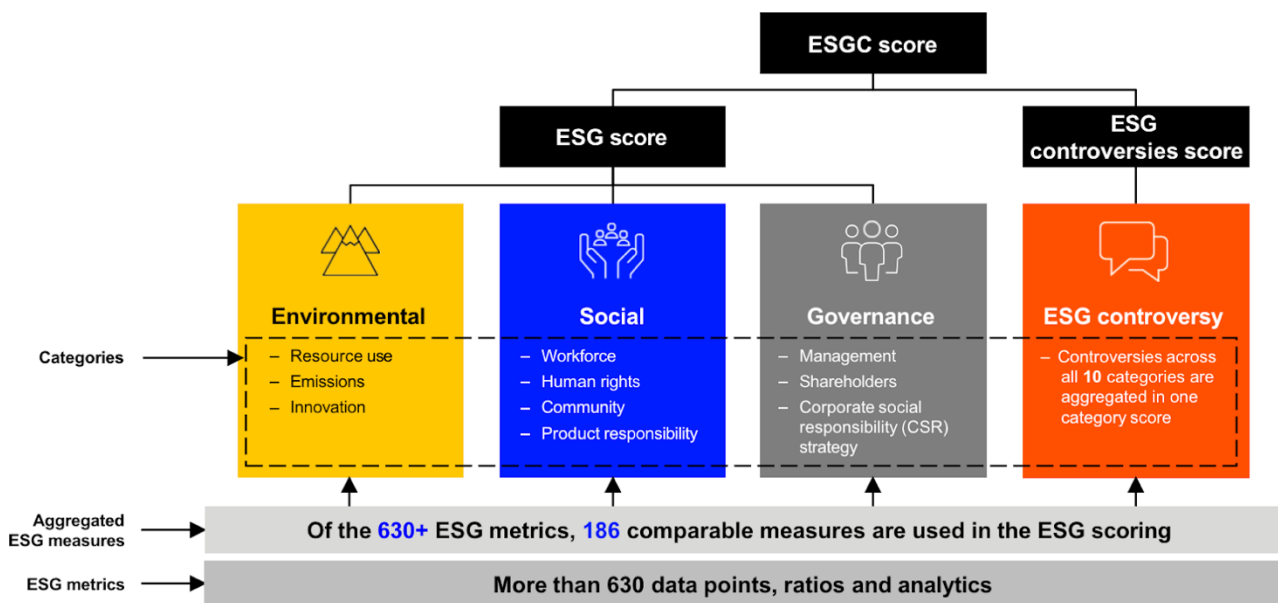


Figure 5: Refinitiv Eikon’s Sustainability Rating according to the LSEG Website.

#### *4.1.8.1. Industry Overview*

Prior to delving into the regression analyses, it was crucial to assess the current condition of sustainability in the Automobile and Auto Parts industry by examining the trends of the past five years. The objective of this analysis was to identify and analyse patterns and changes in the implementation and incorporation of sustainable measures. In the next chapter, we provide a set of pie charts for each year analysed, demonstrating the relative contributions of the four ESGC score components to the industry's overall sustainability profile.

The visualisation of these data through pie charts will allow for a clear and immediate understanding of how the emphasis on different aspects of sustainability has evolved within the industry. By examining the relative sizes of each component annually, we can detect emerging trends, such as increasing attention to governance issues or a heightened focus on environmental concerns, which might correlate with broader industry and global sustainability movements.

This step not only establishes the foundation for a more in-depth quantitative analysis but also presents a coherent account of the industry's progress towards sustainability. Comprehending these patterns is essential, as they indicate how the industry is reacting to legal constraints, market requirements, and public anticipations regarding sustainable development. This perspective is extremely helpful for placing the next regression results in the correct historical and industry-specific context. It provides a thorough background against which the influence of sustainability on financial performance may be evaluated.

#### *4.1.8.2. RLM with ESGC Components*

Following the industry trend analysis, the study progresses to a more granular examination of how specific components of sustainability impact financial performance within the Automotive and Auto parts industry. This is accomplished by doing several RLM regressions, each specifically tailored to analyse the impacts of a different component of sustainability reporting on a financial indicator.

For these regressions, the independent variables consist of the four key components of the ESGC score: Environmental Score, Social Score, Governance Score and ESG Controversies Score.

The regression models continue to use the same dependent variables as in the previous analyses. These variables consist of the previously explained six financial metrics, which are further divided into two categories: profitability and market value.

In order to account for any external regional factors that could potentially distort the correlation between the sustainability components and financial results, the model incorporates geographical indicators for the Americas, Europe, and Asia. By including this factor, the regression analysis can account for geographical differences, resulting in a more accurate assessment of the specific impact of each sustainability element.

By executing these RLM regressions, the research seeks to illuminate the particular aspects of sustainability that exert the greatest influence on financial indicators through the use of these RLM regressions. This will provide valuable insights for developing focused strategies for corporate sustainability practices. These findings are crucial for organisations seeking to improve their sustainability practices and for investors that take into account ESG considerations when making investment decisions.

## 4.2. Presentation of Results

The “Presentation of Results” chapter stands as the critical nexus in this thesis, where the empirical evidence is presented, revealing the complex relationships between sustainability activities and financial performance in the Automotive and Auto Parts industry. This chapter is meticulously designed to articulate the results obtained from the robust regression analyses, reflecting upon the potency and implications of sustainability as it correlates with corporate economic metrics.

In this analysis, we will examine the impact of comprehensive ESGC Scores, as well as the specific effects of the Environmental, Social, Governance, and Controversies factors. This delineation aims to present a holistic view of sustainability’s financial repercussions, ranging from broad trends, analysing the ESGC Scores’ effects, to specific impacts, using the ratings of the four sustainability areas. The findings are organised in a systematic way, starting with the overall impacts identified using RLM regressions and then examining the specific contribution of each ESGC component. By doing so, this chapter endeavours to fulfil the objective of not only quantifying but also qualifying the relationship between sustainability practices and financial outcomes.

The narrative will progress from the overarching industry trends to the specific effects on profitability and market valuation, offering a thorough comprehension of how sustainability is integrated into the essence of financial performance. The results will provide a solid foundation for the next discussion and will support the thesis’s goal of offering significant insights into both the academic field and industry practice. Through this presentation, the chapter seeks to encapsulate the essence of the research, presenting in detail the findings from the research analysis explained in the previous chapter.

### 4.2.1. RLM with ESGC Scores

This chapter focuses on presenting and discussing the data findings from the Robust Linear regressions, which sheds light on the potential impact of the ESGC Score on the selected financial measures.

The RLM shows the results presenting three key statistics: the P-value ( $P > z$ ), the coefficients, and the standard error.

The P-value is used to establish whether the variable estimated is statistically significant or not. Notably, if the value presents a  $P > z$  inferior to 0.05, the independent variable (ESGC Score) has a statistically significant effect on the dependent variable (Financial Metric).

The coefficient, instead, represents the magnitude of the effect. For instance, if the coefficient of the variable ESGC Score is 7, then one more unit of this variable increases the dependent variable by 7 units.

Lastly, the standard error represents the variability around the estimated coefficient. The smaller the standard error, the more accurate the coefficient estimates.

The following paragraphs will delve deeper into the analysis of the findings, presenting the data results and giving possible explanations of the results provided by the regressions.

### Profitability Measures:

Figure 6 below shows the RLM regressions' results of the three selected profitability measures: ROA, ROE, and ROIC.

The regressions also contain geographical dummies, showing whether one region might contribute more or less to the effect of the singular financial measure.

Overall, the profitability measures do not seem to be affected by sustainability. By analysing the p-values, it is clear that ESGC Scores do not appear to be statistically significant in explaining the variance of both ROA and ROE, as the values are way above 0.05 (respectively 0.326 and 0.878).

However, sustainability's impact seems to be statistically significant on the ROIC, with a p-value that is way below 0.05.

Focusing on the only significant impact, the ROIC seems to be negatively influenced by the ESGC ratings with a coefficient of -0.0031. This negative impact has quite a small magnitude; however, it still could be significant when considering the big values of ROIC.

The variance of this effect results is almost absent with a standard error of 0.001, which gives robustness and validity to this finding.

The geographical division does not appear to be significant in the regression. Therefore, this evidence suggests that the region where a company is located is not statistically relevant in the analysis.

Results for RoA:

#### Robust linear Model Regression Results

Dep. Variable:	RoA	No. Observations:	829
Model:	RLM	Df Residuals:	824
Method:	IRLS	Df Model:	4
Norm:	HuberT		
Scale Est.:	mad		
Cov Type:	H1		
Date:	Sun, 21 Apr 2024		
Time:	14:32:49		
No. Iterations:	23		

	coef	std err	z	P> z	[0.025	0.975]
const	0.0716	0.106	0.676	0.499	-0.136	0.279
ESGC Score	-0.0108	0.011	-0.983	0.326	-0.032	0.011
Geo_Americas	0.0006	0.108	0.005	0.996	-0.211	0.212
Geo_Asia	0.0021	0.107	0.020	0.984	-0.208	0.212
Geo_Europe	0.0180	0.108	0.167	0.867	-0.193	0.229

Results for RoE:

Robust linear Model Regression Results

Dep. Variable:	RoE	No. Observations:	829
Model:	RLM	Df Residuals:	824
Method:	IRLS	Df Model:	4
Norm:	HuberT		
Scale Est.:	mad		
Cov Type:	H1		
Date:	Sun, 21 Apr 2024		
Time:	14:32:49		
No. Iterations:	26		

	coef	std err	z	P> z	[0.025	0.975]
const	0.0316	0.009	3.608	0.000	0.014	0.049
ESGC Score	-0.0001	0.001	-0.154	0.878	-0.002	0.002
Geo_Americas	-0.0134	0.009	-1.503	0.133	-0.031	0.004
Geo_Asia	-0.0061	0.009	-0.692	0.489	-0.023	0.011
Geo_Europe	-0.0159	0.009	-1.780	0.075	-0.033	0.002

Results for ROIC:

Robust linear Model Regression Results

Dep. Variable:	ROIC	No. Observations:	829
Model:	RLM	Df Residuals:	824
Method:	IRLS	Df Model:	4
Norm:	HuberT		
Scale Est.:	mad		
Cov Type:	H1		
Date:	Sun, 21 Apr 2024		
Time:	14:32:49		
No. Iterations:	25		

	coef	std err	z	P> z	[0.025	0.975]
const	0.0390	0.010	3.973	0.000	0.020	0.058
ESGC Score	-0.0031	0.001	-3.074	0.002	-0.005	-0.001
Geo_Americas	-0.0075	0.010	-0.746	0.456	-0.027	0.012
Geo_Asia	0.0089	0.010	0.896	0.370	-0.011	0.028
Geo_Europe	-0.0003	0.010	-0.028	0.978	-0.020	0.019

Figure 6: Results of the RLM regressions for the Profitability Measures

Market Valuation Measures:

Figure 7 presents the findings related to the market valuation metrics from the RLM regressions. The dependent variables representing the market valuation impact are MC, BVS, and DSY

All in all, sustainability ratings seem to have statistically significant impacts on all three financial indicators, with p-values below 0.05. Furthermore, the ESGC Score has a positive impact on the three variables with positive coefficients.

MC appears to be positively influenced by sustainability performance with a coefficient of 0.031, meaning that an increase in sustainability score of one unit results in a raise of approximately 0.03 units of the company's market capitalisation. Moreover, the standard error is low, indicating that there is a significant level of accuracy for this impact.

The geographical dummies have p-values below 0.05. Thus, the companies' location might be significant in addressing the dependent variable.

Additionally, sustainability positively influences DSY. The magnitude of this impact is fairly high compared to the one on the other financial variables with a coefficient of 0.13337. This value indicates that one more unit of ESGC Score increases the dividend per share yield by approximately 1/8 of a unit (0.13 unit). The standard error maintains a low level, indicating a high level of precision of this impact. The presence of a company in a specific region regarding this variable seems to be statistically significant only for Asia and Europe.

Finally, even the dependent variable BVS results are positively influenced by the sustainability performance of the companies. The coefficient is 0.0413, meaning that one more unit of ESGC Score increases the dependent variable by approximately 0.04 units. The level of accuracy of this observation is high with the presence of a low standard error. The presence in a specific region seems to be statistically significant for all three regions analysed.

Results for Company Market Cap:

Robust linear Model Regression Results

Dep. Variable:	Company Market Cap	No. Observations:	829
Model:	RLM	Df Residuals:	824
Method:	IRLS	Df Model:	4
Norm:	HuberT		
Scale Est.:	mad		
Cov Type:	H1		
Date:	Sun, 21 Apr 2024		
Time:	14:32:49		
No. Iterations:	29		

	coef	std err	z	P> z	[0.025	0.975]
const	0.0410	0.040	1.035	0.301	-0.037	0.119
ESGC Score	0.0301	0.004	7.292	0.000	0.022	0.038
Geo_Americas	-0.2260	0.040	-5.587	0.000	-0.305	-0.147
Geo_Asia	-0.1664	0.040	-4.154	0.000	-0.245	-0.088
Geo_Europe	-0.2303	0.040	-5.710	0.000	-0.309	-0.151

Results for Dividend Per Share Yield %:

Robust linear Model Regression Results

```

=====
Dep. Variable:      Dividend Per Share Yield %      No. Observations:      829
Model:              RLM                          Df Residuals:          824
Method:             IRLS                         Df Model:               4
Norm:               HuberT
Scale Est.:         mad
Cov Type:           H1
Date:               Sun, 21 Apr 2024
Time:               14:32:49
No. Iterations:    20
=====

```

	coef	std err	z	P> z	[0.025	0.975]
const	-0.7704	0.239	-3.223	0.001	-1.239	-0.302
ESGC Score	0.1337	0.025	5.377	0.000	0.085	0.182
Geo_Americas	0.3058	0.244	1.254	0.210	-0.172	0.784
Geo_Asia	0.7373	0.242	3.052	0.002	0.264	1.211
Geo_Europe	0.7934	0.243	3.261	0.001	0.317	1.270

Results for Book Value Per Share:

Robust linear Model Regression Results

```

=====
Dep. Variable:      Book Value Per Share      No. Observations:      829
Model:              RLM                          Df Residuals:          824
Method:             IRLS                         Df Model:               4
Norm:               HuberT
Scale Est.:         mad
Cov Type:           H1
Date:               Sun, 21 Apr 2024
Time:               14:32:49
No. Iterations:    18
=====

```

	coef	std err	z	P> z	[0.025	0.975]
const	0.0377	0.084	0.448	0.654	-0.127	0.202
ESGC Score	0.0413	0.009	4.727	0.000	0.024	0.058
Geo_Americas	-0.1799	0.086	-2.098	0.036	-0.348	-0.012
Geo_Asia	-0.2833	0.085	-3.337	0.001	-0.450	-0.117
Geo_Europe	-0.2571	0.086	-3.007	0.003	-0.425	-0.090

Figure 7: Results of the RLM regressions for the Market Valuation Metrics

Appendix II presents a comprehensive overview of the RLM regressions results, showing the impact of the overall ESGC Score on the FIs.

## 4.2.2. ESGC Components Findings

This section aims to present the findings regarding the influence of the four ESGC components on the companies' profitability and market value within the Automobile and Auto parts sector. Moreover, it provides a general overview of the industry trend throughout the last five years to address the temporal influence of these observations. This analysis is then followed by the presentation of the individual impact of each component on the financial measures with the relative significance level of the observations.

### 4.2.2.1 Industry Trend

This section explores the changing dynamics of the ESGC Components in the Automotive and Auto Parts industry over the last five years. The aim is to uncover discernible trends and shifts in the sustainability landscape.

The pie charts depicted in *Figure 8* provide a visual representation of the different contributions of the ESGC components to the main ESGC Score, with Controversies consistently occupying the largest segment. Regarding this factor, It is worth mentioning that the ESGC Score methodology begins with an average of Environmental, Social, and Governance scores, which is then modified in light of Controversies, thereby inherently giving this component substantial weight in the overall assessment.

Consequently, the primary focus of our trend analysis centres on the Environmental, Social, and Governance scores.

When comparing data from different years, it is evident that Governance and Social Scores have a stronger impact on the composite ESGC score than the Environmental Score.

A marked dip in the Environmental Score between 2019 and 2021 emerges as a point of interest, potentially linked to the operational and strategic impacts of the COVID-19 pandemic. A subsequent rebound in 2022 and an equilibration across all three ESG areas by 2023 suggest a recalibration of sustainability priorities post-pandemic.

Notably, the influence of Controversies on the overall sustainability rating appears to diminish in 2023, indicating a possible reduction in adverse events or improved management of such issues within the industry.

This analysis indicates a gradual shift towards a more balanced approach to sustainability, with 2023 being a year where environmental concerns recover importance and become more closely aligned with social and governance factors. The reduction of controversy-related effects also indicates an industry that is improving its capacity to navigate the intricate landscape of sustainability.

These observations could work as an opportunity for future investigation, specifically in comprehending the lasting consequences of pandemic-induced alterations on sustainability measures inside the automotive industry.

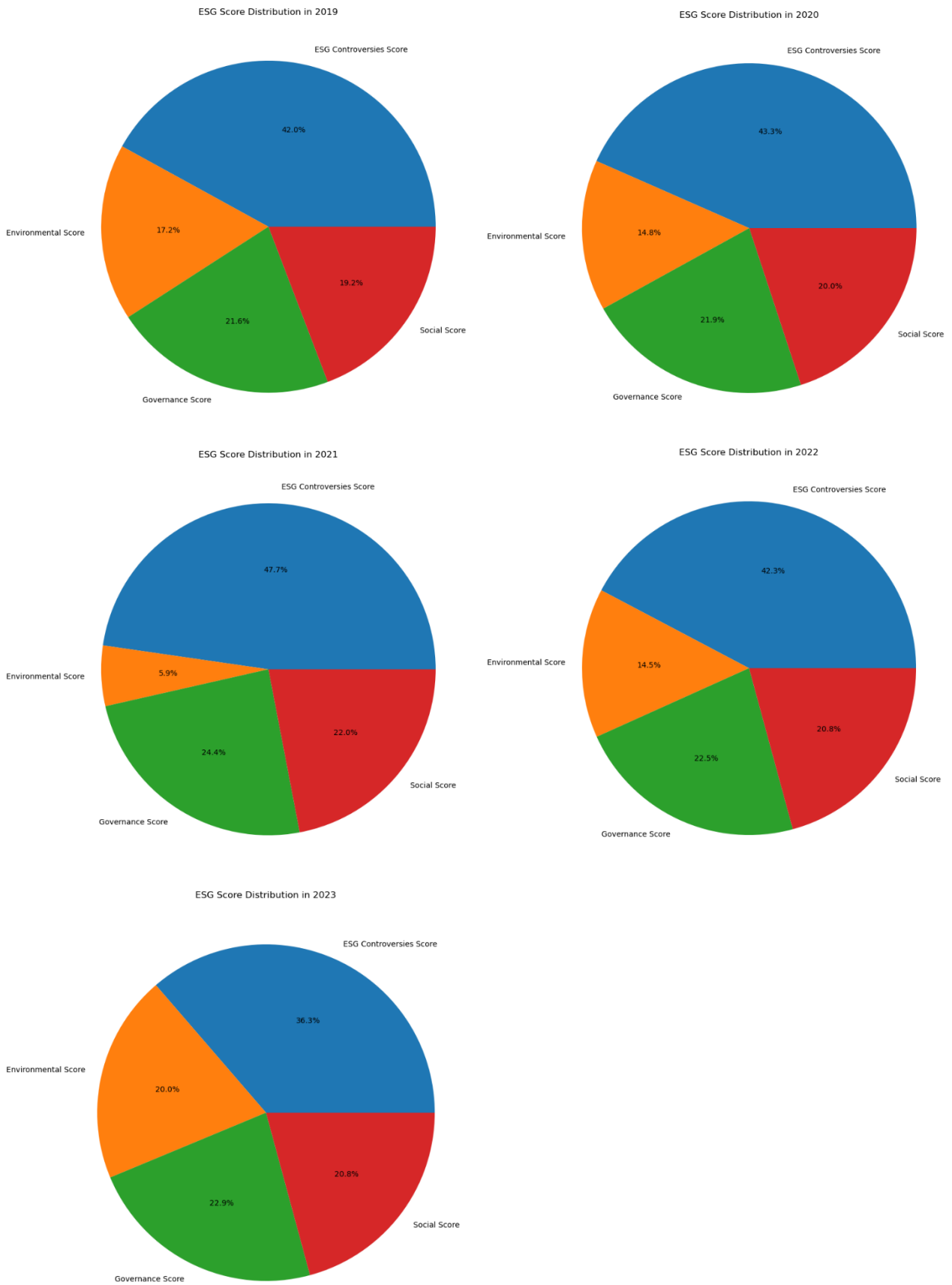


Figure 8: Contribution of individual ESGC components throughout the last 5 years.

#### 4.2.2.2. Effect on Company Profitability and Market Value

##### Profitability:

When analysing the RLM regression results (*Table 4*) concerning profitability measures (ROA, ROE, ROIC), ROA and ROE seem to be negatively influenced by some sustainability components.

Particularly, ROA appears to be negatively influenced by Governance (G), Social (S), and Controversies Scores (C), with coefficients respectively -0.0498, -0.0462, and -0.0464. This might indicate a detrimental effect of ESGC factors on asset efficiency.

On the other hand, ROE seems to be negatively influenced by all the ESGC components. However, the coefficients are much smaller compared to ROA.

Despite the significant influence of overall ESGC scores on profitability, individual ESGC components do not show a significant impact on ROIC. This suggests that the combined effects of ESGC factors integrate differently when considering the broader investment landscape.

An interesting aspect related to the geographical dummies is that when it comes to the implications of ROE, Asia seems to have more companies with high ROE values than other geographical areas. This could be interpreted that this negative impact may be greater in companies that are in Asia compared to the firms that are located elsewhere.

Finally, all these observations present a small standard error, enhancing the reliability of these findings.

##### Market Valuation:

In regard to the ESGC components influence on the market valuation indicators, BVS and MC are statistically influenced. On the other hand, these components do not significantly influence the DSY with a p-value above 0.05.

Specifically, the ESGC Controversies (C) score positively influence both BVS and MC, with respectively +0.05 and +0.02 coefficients. BVS is also positively influenced by the Governance Score with a coefficient of approx. +0.04, reinforcing the value of effective corporate governance in enhancing the company's share value.

When looking at the geographical dummies, companies located in the Americas tend to have higher BVS than companies in other areas; therefore, this positive impact could be greater in this region. When it comes to MC, this effect seems greater in the European area, perhaps reflecting regional variations in how sustainability factors are valued by the market. All these relations still present standard error values below the confidence threshold, giving strong statistical significance to these findings.

*Table 4* below shows a comprehensive overview of the RLM regressions results of the ESGC components' impact on the FI and the relative geographical impact.

Table 4: RLM Regressions Results of ESGC Components on FI

IV \ DV	PROFITABILITY									MARKET VALUATION								
	ROA			ROE			ROIC			MC			BVS			DSY		
ESGC Components	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value
E	-	-	-	-0.003	0.001	0.010	-	-	-	-	-	-	-	-	-	-	-	-
S	-0.046	0.018	0.012	-0.004	0.001	0.006	-	-	-	-	-	-	-	-	-	-	-	-
G	-0.050	0.018	0.007	-0.005	0.001	0.000	-	-	-	-	-	-	0.043	0.016	0.007	-	-	-
C	-0.046	0.018	0.011	-0.004	0.001	0.001	-	-	-	0.015	0.006	0.014	0.048	0.016	0.003	-	-	-

CV \ DV	PROFITABILITY												MARKET VALUATION												
	ROA				ROE				ROIC				MC				BVS				DSY				
	E	S	G	C	E	S	G	C	E	S	G	C	E	S	G	C	E	S	G	C	E	S	G	C	
Americas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.042	0.039	-	-	-	-	-
Europe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asia	-	-	-	-	0.002	0.002	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-0.022	-0.021	-	-	-	-	-

## 4.3. Discussion of Results

### 4.3.1. Sustainability Impact on Company Profitability and Market Value

This chapter of the research serves as the analytical cornerstone, where the gathered data is not merely recapitulated but scrutinised to extract deeper meanings, discern patterns, and postulate theories that could augment existing literature or practice.

This particular section synthesises the findings from RLM regressions concerning the ESGC scores' influence on financial metrics within the automotive and auto parts industry.

#### Impact on Profitability:

The profitability indicators, namely ROA, ROE, and ROIC, provide a detailed and nuanced perspective. While the ESGC Scores do not manifest a statistically significant effect on ROA and ROE, ROIC presents an interesting exception. The presence of a negative coefficient in the ROIC, although minor in magnitude, is of considerable importance and can have significant implications when applied to larger ROIC values. The association between ROIC and sustainability ratings is worth considering due to the low standard error. This relationship has implications for investment efficiency in the context of sustainability. Additionally, the inclusion of geographical variables indicates that the location does not have a substantial impact on the profitability results in the context of sustainability.

#### Impact on Market Valuation:

When it comes to market valuation, the RLMs show that sustainability has a stronger impact. The three indicators, namely MC, BVS, and DSY, have a positive correlation with ESGC Scores. This highlights sustainability as a viable means of increasing market value.

The impact on **CM** is particularly striking, as indicated by the positive coefficient. This suggests that developments in sustainability could lead to an increase in market capitalisation. The credibility of

sustainability as a value-adding offer in the market is strengthened by the presence of a low standard error in this conclusion.

The influence on **DSY** is not only statistically significant but also substantial in magnitude, indicating that a rise in sustainability scores can correlate with a tangible increase in dividends. This aligns with a burgeoning investor preference for sustainable practices, potentially viewing them as indicative of sound management and future financial health.

Finally, the **BVS** is also positively influenced, although with a smaller coefficient compared to dividends.

### *Synthesis and Implications:*

The distinct divergence in the impact of sustainability on profitability versus market valuation is intriguing, as profitability metrics like ROA and ROE do not show a significant correlation with sustainability scores but a small negative impact on the ROIC. The reasons for this factor might be various. For instance, it could be caused by an increase in investment costs related to sustainability initiatives. It is widely debated that while strong sustainability performance may enhance a company's image among shareholders, it often necessitates substantial initial expenditures. Whether these expenses will translate into future gains for the company remains uncertain, as sustainability initiatives are typically associated with long-term value creation. However, the available data is currently insufficient for making reliable forecasts, complicating the ability to predict the long-term financial impacts of these sustainability investments accurately. On the other hand, the market valuations are positively influenced.

Overall, the finding shows that the greater impact of sustainability relies on the market valuation of the companies. This suggests that investors and stakeholders might value sustainability differently from its direct influence on immediate financial returns. Companies with higher ESGC Scores are more likely to attract a greater number of investors because they are regarded to have lower risk and are better prepared for the future. This enhances investor trust and increases the market valuation of these companies. Moreover, better sustainability could improve brand image and reputation, which can indirectly affect market valuation. In addition, sustainable enterprises frequently benefit from more convenient access to different forms of funding under favourable terms, which further enhances their market price. Adhering to environmental standards not only reduces the likelihood of receiving fines but also enables companies to take advantage of government incentives, enhancing market views without directly impacting current profitability. Furthermore, implementing proactive strategies to handle environmental, social, and governance challenges helps prevent future crises and financial losses, which are typically recognised and valued by the market.

These factors collectively suggest that while current profitability might not be directly enhanced by sustainability, the broader financial ecosystem, including market valuation, perceives significant value in sustainability efforts.

These findings might find additional explanations from the interviews conducted, which will be addressed in the subsequent chapter dedicated to qualitative research.

This qualitative research has the potential to offer a more comprehensive knowledge of how company executives and stakeholders view and value sustainability programmes. It could provide deeper insights and a more nuanced understanding compared to the quantitative results reported.

### 4.3.2. Contribution of ESGC Components of the Financial Metrics

The empirical findings from the RLM regressions analysis not only reveal the nuanced impact of ESGC components on profitability and market valuation metrics but also underline a critical distinction. Similar to the overall ESGC score, the individual components have a negative impact on immediate profitability and positive effects on specific areas of market valuation, specifically BVS and MC. This differentiation emphasises the varying effects of sustainability on the short-term versus long-term value of the company, suggesting that while immediate financial metrics such as ROA, ROE, and ROIC might suffer due to the costs or adjustments associated with implementing sustainable practices, these same practices enhance long-term market perceptions and valuations.

The observed negative impacts on ROA and ROE by Governance, Social, and Controversies scores reveal a complex trade-off. Adopting rigorous sustainability practices is critical for long-term sustainability and corporate ethics but might incur costs or inefficiencies affecting asset performance in the short term. The smaller coefficients associated with ROE suggest that equity returns, though impacted by sustainability factors, may be buffered by other elements of corporate finance, such as capital structure or external funding conditions.

Remarkably, the analysis reveals that overall ESGC Score has a substantial and negative influence on ROIC, yet when each individual ESGC component is examined separately, none show a significant effect. This suggests that the combined impact of ESGC factors may interact in a way that cumulatively affects the company's efficiency in using invested capital, potentially due to synergistic effects or overlapping costs not evident when these components are analysed in isolation. This complexity highlights the multifaceted nature of sustainability impacts, where the holistic integration of ESG practices may present challenges that are not immediately apparent through the lens of individual factors.

In terms of market valuation, the positive influence of Controversies and Governance scores on MC, BVS, and DSY underscores the market's favourable perception of robust governance and effective controversies management as indicators of sound risk management and ethical business practices. These findings indicate that stakeholders place importance on transparency and accountability, which could ultimately result in increased market valuations.

Geographically, the more pronounced negative effects on Asian companies related to profitability and the positive impact on American firms on the market valuation could reflect varying regional regulatory environments, societal expectations, and market maturity concerning sustainability practices. This variation emphasises the significance of context-specific techniques for handling ESG effects. It also indicates that multinational companies may have to customise their sustainability methods to conform to regional attributes and the expectations of stakeholders.

The insights from the quantitative analysis of ESGC components and their varied impact on financial metrics will likely be further enriched by the forthcoming qualitative research. The qualitative interviews are expected to delve deeper into the reasons behind the observed relationships, exploring how corporate executives perceive and strategize around ESGC components. These discussions may uncover particular organisational practices, industry patterns, or stakeholder expectations that affect how these components influence financial indicators. Furthermore, qualitative research has the potential to reveal effective solutions or strategies that organisations may use to maximise the benefits of their ESGC capabilities, leading to increased profitability and market valuation. The integration of quantitative data and qualitative insights will hopefully yield a deeper understanding of the dynamic interaction between sustainability practices and financial success.

## 5. Qualitative Research

### 5.1 Analysis

In the current state of research that seeks to intertwine the concepts of sustainability and financial performance, a significant blind spot is evident. This gap is characterised by the absence of definitive causal linkages between these variables, a shortfall highlighted in the preceding literature review. Historically, the field has been dominated by quantitative studies that endeavour to delineate the relationship between sustainability and financial performance through numerical analysis. While this approach extensively offers a logical pathway to ascertain the existence of a relationship, it falls short in providing possible explanations, dynamic insights, or alternative perspectives that could illuminate the intricate dynamics between these variables.

It is within this context in mind that the present inquiry has opted to employ a qualitative analytical framework to improve our comprehension of the subject matter. This decision is predicated on the belief that qualitative research can significantly enrich our understanding by offering new insights, offering possible causal explanations, and providing ideas for future research.

#### Research design

Qualitative research allows for a vast array of different designs, which are highly contingent on the research question that must be answered and on the subsequent analysis. One of the most common designs is Phenomenology research design, which is concerned with comprehending the fundamental nature of individuals' experiences. This approach entails conducting in-depth, comprehensive interviews to gain a profound understanding of how individuals perceive their own realities. Researchers must set aside their preconceived notions in order to accurately capture the unaltered core of the experiences reported by participants (Khan, 2014).

Grounded Theory, on the other hand, is a research method that focuses on creating hypotheses by directly using evidence obtained via systematic collection and analysis. In contrast to phenomenology, this approach is inductive and begins without any preconceived ideas; instead, it relies on evidence to generate theories (Symon & Cassell, 2012). This approach utilises a series of coding processes, open, axial, and selective coding, to systematically improve and connect data categories in order to develop a cohesive theory. Grounded Theory is a highly successful approach for studying new or poorly understood phenomena and has broad applicability in several fields of the

social sciences. It utilises an inductive approach aimed at generating new theories, while the aim of the present research is to use qualitative data as a supportive role to augment the quantitative findings with a more holistic perspective, thus making this type of design not ideal for the current research scope.

As such, a case study design was deemed as the most appropriate design. This type of research focuses on understanding complex and multifaced issues, which is done through detailed contextual analysis such as interviews, observations, or secondary sources, which can provide a holistic picture of a case and the more intricate dynamics that underline it (Baxter & Jack, 2008). The studied case could be an individual, a group of people, or an organisation.

There are several reasons that spoke in favour of choosing this particular research approach.

First and foremost, the research question at hand is extremely complex and difficult to answer through qualitative interviews since each person who was interviewed is only knowledgeable about their specific role within a particular niche of the automotive industry. As such, it was necessary to flank and approach the research question from the unique and limited perspective of the interviewees. For this reason, multiple questions were asked that were relevant to their experience and could bring us closer to understanding the interplay between sustainability and financial performance. Therefore, each interview is treated as a piece of a larger mosaic (case), which can ultimately give us a new perspective on the research problem. Other popular research designs didn't meet our research objectives and were therefore excluded. Grounded theory, for instance, utilises an inductive approach to generate theories through qualitative data. However, our amount of data is too limited for such an ambitious goal and is instead used to enhance, complement, or contrast findings from the quantitative analysis and literature review.

Another reason that spoke in favour of utilising this particular design lies in the high diversity of our sample, which also made it necessary to create specifically tailored interviews to accommodate each candidate's knowledge. This diversity is also reflective of the automotive industry and supply chain as a whole. Case studies provide the perfect ground for this type of holistic analysis. Case studies are also a great tool to capture contextual influences such as regulatory environments, technological shifts, and competitive pressures (Baxter & Jack, 2008). In short, the complexity of the current research question, the fragmented niche knowledge of the interviewees, the diverse interview questions, and the expected contribution of the qualitative analysis made a case study design the preferred choice.

### *Data analysis*

Building upon the previous chapter, where the qualitative design was outlined, this chapter examines the methodology of analysis that will set the stage for understanding how data will be analysed and transformed into valuable information. In this case, the priority is to select the most appropriate analysis tool that aligns with the complex narrative-rich data that comes from the unique experiences of the interviewed participants.

One of the most common analysis tools is thematic analysis. Thematic analysis is a highly interpretive method that allows researchers to grasp the complexity and nuances of qualitative data. It involves the systematic identification, coding, analysis, and reporting of themes within the data that can capture the most essential parts of human experiences (Cassell & Gillian, 2012).

This method, although extremely popular due to its versatility, would not be a good fit for this research for several reasons. First of all, the current data is extremely specific and diverse; this can render the thematic analysis superficial since the captured themes wouldn't give a comprehensive understanding of the specific insights and details that are crucial to answering the research question. The depth of the individual insights is crucial to understanding the interplay between sustainability and financial performance from the perspective of different stakeholders. Thematic analysis, on the other hand, generalises and summarises the findings into themes that are not the aim of the research. Another major problem lies in the narrative-rich data that was collected, where the context of their unique experience within the automotive industry ecosystem is as important as the content itself, something that, with a thematic analysis approach, could not be captured.

Finally, each interview was uniquely tailored for each participant based on their job description, expertise, and place within the automotive industry. This was fundamental due to the necessity of understanding each unique perspective and how sustainability plays out throughout the whole supply chain. Given this setup, the questions and subsequent answers are extremely heterogeneous, reflecting the diversity of the industry and the intricacies of sustainability initiatives. Consequently, attempting to divide the context-specific insights into themes would not only misinterpret the data but also diminish the value of the unique information that these interviews aim to capture.

For this reason, a narrative analysis approach was chosen because this method is the most relevant for the current research objective, which can make the best use of our data. This type of analysis studies the stories that people tell, and it is used to understand how individuals make sense of their personal experiences and the world around them, which is ideal for capturing rich subjective perspectives (Cassell & Gillian, 2012). The effect that sustainability has on financial performance is an extremely intricate topic that can have many influences across the whole supply chain, with many small facets that can add up and create a large influence if observed from a macroscopic perspective. For this reason, it is imperative to understand the full extent of personal experiences within this industry and how these could relate to the larger picture. Narrative analysis has a wide range of applications in the business context; for instance, it is used in marketing for consumer research or for organisational studies to inquire about leadership styles and employee experiences (Damodaran, 2017). It has many strengths, like contextual understanding, data richness, and adaptability to different research frameworks. Yet, it also has various weaknesses, such as the lack of generalizability, subjective interpretation, and difficulty in analysing very rich data (Cassell & Gillian, 2012). Despite these shortcomings, the narrative analysis remains the most well-suited method for the current research aim. In short, the intricacies of the automotive industry combined with the complex research question that this inquiry tries to answer requires rich and subjective data to be analysed and interpreted, something which other methodologies would fail to do.

## 5.2. Insights

### 5.2.1 Narrative Blocks

As already mentioned, due to the high heterogeneity of interviews, thematic analysis has to be excluded. However, the topic of sustainability was at the centre of each interview, which allowed the development of narrative blocks for analysis. These narrative blocks were either implicitly or

explicitly mentioned during the interviews and included an introduction to sustainability initiatives, followed by the challenges involved, to then conclude with the outcomes that these initiatives brought. Overall, each interviewee possesses a unique narrative regarding the role that sustainability plays in the automotive industry, which must be captured to comprehend the different viewpoints fully.

### **N.1: Y.F. – Mitsubishi Heavy Industries – Sales representative/cost control team**

Sustainability initiatives: Sustainability is an integral part of Mitsubishi’s mission, “Shoki Hoko” (Corporate Responsibility to Society) is the philosophy that guides the organisation.

Challenges: The project in which Y.F. was involved lost a lot of money. As such, sustainability fell completely out of sight in favour of minimising financial losses.

Outcomes: no tangible sustainability outcome due to the impossibility of conciliating it with financial responsibilities.

Y.F. sees **sustainability and financial objectives as two distinct aspects of good business practices**. According to him, a company should first focus on becoming financially stable before taking sustainability and other SDGs into consideration. This is likely a result of his work experience as a cost controller during a troublesome period for his department, which might have impacted his view on sustainability and the role it plays within an organisation. Although his company possessed clearly defined sustainability politics, the reality of financial constraints disconnected sustainability ideas from operational realities.

### **N.2: E.L. – Tesla Motors – Sales representative**

Sustainability initiatives: For Tesla, sustainability is an integral part of its brand identity. As such, it promotes the use of EVs and implements sustainable power sourcing like solar power.

Challenges: High costs of batteries, reliance on government subsidies to make EVs accessible for consumers, and supply chain issues, which can affect the overall sustainability of the product.

Outcomes: Sustainability boosts customer loyalty and promotes a positive image within the car market.

E.L. possesses a more integrated view of how sustainability is interlinked with the day-to-day activities of a firm. His perspective **highlights the importance of sustainability in creating long-term competitive advantage and customer satisfaction**. Yet, at the same time, he recognises the sustainability challenges posed by the supply chain. His view is likely influenced by the EV environment where he works, in which sustainability is a key selling point. Overall, his narrative doesn’t highlight any conflict between sustainability and practical business operations, with government incentives playing a significant role in promoting EV adoption.

### **N.3: K.O. – Doshisha University – Technology-based industry expert**

K.O. is not directly involved in the automotive industry; however, his knowledge of the technology-based industry gave valuable insights into the future of the sector and the possible obstacles to implementing sustainability.

Sustainability initiatives: K.O. discusses the integration of future technologies that could indirectly increase sustainability, such as autonomous driving and solid-state batteries.

Challenges: Technological hurdles are currently impeding the development of more sustainable options in the automotive sector, such as technological limitations in semiconductors, supply chain integrations, and chemical limitations for more efficient batteries.

Outcomes: New technologies could bring significantly higher sustainability in the long term.

K.O. provides a unique and detached perspective on the topic due to being not directly involved with the automotive industry and having expertise in technology-based industries. His narrative presents numerous technical challenges that were mostly untouched by other interviewees, which makes him **sceptical about the current contributions of EVs to CO2 reduction**. However, he nevertheless sees this potential in future technologies.

#### **N.4: A.B. – Polestar – Financial controller**

Sustainability initiatives: Sustainability is seen as an integral part of Polestar's operations. They plan on developing a net zero-emission car.

Challenges: The main problem was in controlling suppliers and adhering to high sustainability standards. She also mentioned the problem of giving monetary and measurable values to intangible concepts like sustainability.

Outcomes: A.B. highlights the potential cost savings from sustainability actions.

A.B. talks about how Polestar incorporates sustainability into every aspect of their business, from manufacturing to sourcing to design. This narrative emphasises **sustainability as not simply a regulatory requirement but also as a strategic commitment that is intrinsic to their business model**. She also highlights the need for a holistic industry change in this direction. Her perspective could be reflective of a broader industry change towards this direction due to Polestar being a new player in the automotive field.

#### **N.5: K.J. – Siliko – Business controller**

Sustainability initiatives: K.J. talks about the OEM standards to which his company adheres whilst also taking proactive measures such as investing in solar energy and focusing on the manufacturing of components for EVs.

Challenges: Discusses the high pressure from automotive clients, which is often difficult to push down the supply chain.

Outcomes: Reduction in energy costs and increase in operational efficiency.

K.J. has a very **practical view of the relationship between sustainability and financial performance**. He mentioned very tangible benefits that derived from increasingly adopting sustainability practices. His narrative from a supplier perspective is extremely valuable as his company is facing direct pressure from automotive companies and their standards. His testimony also underscores the difficulties that suppliers have in enforcing high standards on their suppliers.

#### **N.6: S.B. – Fonderia Casati – Sales team**

Sustainability initiatives: Sustainability initiatives were largely driven by customer demands and regulatory requirements. Yet his company also adopted a proactive stance by exceeding certain sustainability requirements.

Challenges: High investment costs, which lead to higher operational costs.

Outcomes: High sustainability awareness opened up new business opportunities and improved working conditions.

S.B.'s narrative focuses on **the operational improvements that sustainability can bring and the indirect financial positive outcomes from those actions**. He highlights the importance of certificates in ensuring fair and standardised business practices, as well as his company's role in exceeding industry standards and expectations, suggesting a company culture in which sustainability is seen as a business opportunity rather than a financial burden.

#### **N.7: H.P. - Hyundai – Administration and Accounting manager**

Sustainability initiatives: Hyundai has integrated sustainability into its daily operation and is heavily focused on reducing waste and energy consumption to increase its competitive advantage. They plan on achieving the RE100 target in the next years and utilise only renewable energy.

Challenges: High investment costs, which lead to difficulty in achieving ambitious goals whilst maintaining operational efficiency

Outcomes: Stark reduction in energy usage, water usage, and other materials.

The narrative of H.P. highlights a **well-defined view and role that sustainability plays** in the eyes of Hyundai decision-makers; this is evidenced by how deeply embedded it is in the day-to-day activities and vision of the company. Sustainability is seen as a tool to save money, improve the brand image, and increase its competitive advantage. Hyundai holds a very proactive stance towards this trend and has **clearly stated goals and tools to track the progress in achieving such goals**.

## 5.2.2 Interview Deep dive

The following chapter will go through every single interview, briefly summarise them, and scoop out the most interesting takeaways, which will be scrutinised in the next chapter.

### 5.2.2.1 Interview N.1

#### **Y.F. – Mitsubishi Heavy Industries – Sales representative/cost control team**

Y.F. Worked for three years as a sales representative and later as a cost controller of toll gate collection systems at Mitsubishi Heavy Industries in Japan. He was particularly involved with the ERP2 (Electronic Road Pricing) system project in Singapore, which is an advanced GPS-based toll collection system. The whole project was financially burdensome and led to a large financial loss for his company. For this reason, sustainability goals were frequently neglected since the priority was to limit financial losses. The interview highlights a recurring tension between financial performance and sustainability initiatives, which fell out of sight due to circumstances.

The interview with Y.F. highlights some interesting points, most notably the financial conflicts that his organisation faced, which pushed sustainability initiatives down the priority lists.

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*“In short, it was all about money because we were in huge red, and all the managers were super upset... So, that’s why we actually, as a company, wanted to focus on the environmental issue or the other SDGs<sup>1</sup>. So that’s what we are supposed to do, but when you are running out of money, you can’t.”*

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This anecdotal statement seems to confirm Preston & O’Bannon’s (1997) Theory of Slack Resources, which states that CSR and other sustainability initiatives fade away when under the pressure of financial constraints. More evidence can be found in the following two statements.

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*“Y.F.: ... there’s a corporate statement, and they tell us that we should also focus on the SDGs. There’s like one, so it’s Japanese, but it’s called “Shoki Hoko” goal, it was said more than 100 years ago. It means, I, Mitsubishi, as a whole group, must focus on the society. So yes, in that term, we have like small things in our mind that we should also care about. But after that, make money.*

*Interviewer: OK. So then, the environment becomes more like an afterthought?*

*Y.F.: Yes, it can be a result of the good job or the good business.”*

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#### 5.2.2.2 Interview N.2

##### **E.L. – Tesla Motors – Sales representative**

E.L. delineates Tesla’s prominent role within the EV sector and its commitment to sustainability. He talks about the high costs of EVs, particularly due to the battery costs. In this sense, government subsidies are crucial to make EVs accessible to consumers. He also pointed out the issues within the supply chain and the pollution it can create. Finally, he makes the case that sustainability topics are effectively incorporated into Tesla’s branding, which can improve sales through customer loyalty, thus increasing financial performance.

E.L. works for Tesla Motors, which is regarded as a prominent player and a pioneer in the EV sector. He made many interesting points throughout the interview, which revealed some interesting dynamics regarding the role that sustainability plays in his job.

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*“E.L.: So, about the batteries, they are charged with thermal power. I’m not sure whether our electricity is fully clean, you know what I mean? So, still we create carbon deposits. And of course, our cars are coming from Shanghai, China, so to produce the battery is really... I think most of the parts we try our best to utilise the sustainable energy option, but still the mining, fabricating, and also*

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<sup>1</sup> Sustainable Development Goals

*packaging, still there is carbon output. I'm not sure 100% but there is some kind of effort for sustainability.*

**Interviewer:** *OK, so you basically say the problem with Tesla, is it more in the supply chain?*

**E.L.:** *Yes, I think so, I think there is a problem with the supply chain on a global scale. So, in practice, I think there are a lot of conflicts between sustainability and profitability. So, to balance both I think government effort plays a role, for example, the incentives.”*

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This excerpt reveals a common problem with supply chains, namely the high levels of pollution that sourcing and disposing of materials generates, as pointed out by Kannegieser et al. (2014). This seems to be a reoccurring trend, as seen by interviews where suppliers highlight pressure from the automotive manufacturers on one side, but on the other side, the same pressure is not applied to their suppliers. Another interesting insight emerges from the following snippet.

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**E.L.:** *But I think in Japan they are more concerned about sustainability than in Indonesia. But since Indonesia is still a developing country and still growing, it used to be only gasoline or diesel power engines, but lately, there is also a market for hybrid and electric vehicles [...] I think that Japan does sustainability way better than Indonesia, but I think Indonesia is catching up to them.*

**Interviewer:** *[...] The main difference is in the purchasing power? So, essentially, in Japan, people are more aware because of economic disparity. Is that correct?*

**E.L.:** *Yes, I think if Indonesia's buying power is on par with the Japanese, I think they are also interested in buying, for example, hybrid vehicles or electric vehicles [...]"*

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This seems to again confirm the Theory of Slack Resources from Preston & O'Bannon (1997) only on a macroscopic level. The economic disparity between Japan and Indonesia allows Japanese consumers to purchase greener but more expensive vehicles.

Finally, another major point he made was about the central role that government subsidies play in incentivising the use of EVs, which would otherwise be less affordable for consumers. This is important because it might add another layer of difficulty in calculating the effects that sustainability has on financial performance. More precisely, how far do government subsidies play a role in the profitability equation? This could perhaps distort the whole equation and make more sustainable EV-focused companies appear as financially better performing than their less sustainable counterparts, but this is due to government help rather than as an effect of sustainability itself. Government

subsidies can also be tied to legitimacy theory. In this context, by producing sustainable EVs, Tesla conforms to the expectations, which are rewarded by the government in the form of subsidies.

### 5.2.2.3 Interview N.3

#### **K.O. – Doshisha University – Technology-based industry expert**

K.O. has a profound knowledge of technology-based industries and semiconductors. As such, questions focused on the challenges of integrating advanced electronics in the automotive sector. The conversation brought up the financial ramifications of implementing new technologies, such as solid-state batteries, and the difficulties in matching them with current chemical production capacities, as well as technological limitations that currently don't allow for the full implementation of autonomously driven cars which will still take a few years before being reliably used. These two aspects could have a long-term financial impact due to possible cost savings during manufacturing and regulatory compliance.

K.O. has a vast knowledge of technology-intensive industries. As such, the interview focused on viewing the automotive industry from these lenses and discussing the future and current integration of these technologies. It revealed a lot of insights and nuances. He, for instance, highlights a big problem of the current EV sector, which is the use of Lithium-ion batteries (LIB), which are unsafe, have a short lifecycle, and create substantial amounts of pollution once they get disposed of. LIB could be replaced by solid-state batteries, which don't have such acute problems. Yet this transition won't happen in the near future because there is a mismatch between what the chemical industry can develop and what the automotive industry needs. Overall, he doesn't see the current EV industry as a good alternative for CO2 reduction.

Another issue that was touched upon was the possible future development of autonomous self-driving vehicles, which can significantly reduce pollution through efficiency, particularly with the use of AI (Khayyam et al., 2020). He points out another industry shortcoming, which is the semiconductor industry.

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*“[...]and if you realise the full automatic driving system, industry technology people said you need at least A 14, that means 1.4 nanometers. And at this moment we are going to commercialise probably in 2026. So again, at this moment, we cannot complete the fully automatic driving system, so that's the current situation.”*

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Another major problem in the semiconductor industry, he highlights, is the high energy demand that the production of semiconductors requires.

K.O. also sheds light on the distinct organisational structures of the semiconductor and automotive industries, highlighting the challenges automotive companies may face due to these differences. The automotive sector is a vertically integrated system where they control a significant part of the supply chain and the production process, whilst the semiconductor industry follows a horizontal integration model where each company specialises for a very specific niche within the supply chain. This means

that the automotive industry will need to learn how to work within this new environment and open itself up to collaborations in order to gain capabilities that they currently do not have, like software engineering.

Overall, K.O.'s interview has not contributed to answering our research question, yet his insights are extremely valuable to understanding the future of the industry, the problems ahead, and how sustainability could develop.

#### 5.2.2.4 Interview N.4

##### **A.B. – Polestar – Financial controller**

A.B. explained Polestar's plans to integrate sustainability across all divisions, including procurement and finance. She talked about how operational strategy and company success are entwined with sustainability, especially when it comes to creating zero-emission vehicles. Although no significant conflicts between sustainability and profitability were noted, integrating sustainable practices is thought to be crucial for preserving market relevance, adhering to legal requirements, possibly lowering long-term costs, and taking advantage of market incentives for environmentally friendly products.

A.B.'s interview highlights many interesting points, that can find confirmation both in the literature review as well as in the quantitative analysis findings.

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*“And I mean, we do have the different legal requirements like your taxonomy and so on. And it is pretty hard to know exactly what to report and how to do it. Then and yeah, how to put money on things like that?”*

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This quote is indicative of a larger trend that was explored by Rezaee (2016), who makes a distinct difference between sustainability and sustainability reporting. This discrepancy can also be used to explain possible research inconsistencies, which could partially explain the lack of a clear relationship between sustainability and financial performance.

Another aspect that is frequently mentioned is the integration that sustainability has within the business and how it shapes everyday decisions.

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*“A.B.: [...] but I would say that sustainability is also part of our core business. So, it's also interlinked in all the other departments as well. So, it's not just the sustainability department that works with sustainability, it's everywhere within Polestar, including finance.”*

*“Interviewer: [...] how does Polestar integrate sustainability consideration into its financial planning and decision-making processes in your fields?”*

*A.B.: I don't see it as a separate part. It's already kind of part of all the car programs that we have, it's not a separate process. So already when you put the requirements when you decide you're gonna make a new car, it's roughly a 3-4 year program to do that, it takes a long time to develop a car, and already at the start you set the requirements from a sustainability perspective. So, the R&D team is already from start working on finding solutions that fulfil those requirements same as the procurement team working on finding suppliers that fulfil the requirements that we have. So I would say it's already interlinked in each and every car program, so it's not something separately we do [...].”*

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This seems to be something similar to the Shoki Hoko philosophy that Y.F. mentioned in his interview. A.B. also mentioned that no conflicts have emerged so far between sustainability and financial performance. Knowing the experience of Y.F., it would be interesting to know if this mentality would shift in the case of financial struggles.

Other interesting points that were touched upon were the difficulty in calculating the effects and trade-offs of sustainability actions, minimising waste, managing suppliers, and ensuring that they also adhere to the same sustainability principles.

#### 5.2.2.5 Interview N.5

##### **K.J. – Siliko – Business controller**

K.J. works for Siliko, a prominent automotive supplier from Slovenia. He described his company's efforts to be environmentally friendly, especially thanks to solar energy investments and the fabrication of electric car components. These measures have improved operational efficiency innovation and directly decreased energy expenses. Nevertheless, it is challenging for his company to meet the strict sustainability requirements from automotive firms for Original Equipment Manufacturers (OEMs). This type of pressure often fails to be pushed down to their suppliers.

K.J.'s testimony provides the research with great insights as it enriches it with the automotive suppliers' perspective and the sustainability challenges they face. Numerous valuable insights emerged from this conversation. He, for instance, highlighted the pressure that automotive companies put on suppliers to be more sustainable, yet the same pressure is not necessarily redirected to the tier two and tier three suppliers. This is a common and difficult-to-solve problem that prevents the effective implementation of GSCM, as has already been explored by Genovese et al. (2017).

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*“[...] we also have questionnaires for our suppliers. But I would say we don't check them as much as the BMW, and we are not so stringent.”*

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Despite these shortcomings, Siliko is heavily investing in sustainability because it sees this as an investment for cost saving and operational improvement.

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*“I would say the greatest cost saving is from the green energy that we produce ourselves. We cover almost 20% of our electricity with solar power [...] and I think that over the long run, it’s going to reduce our costs and improve our efficiency.” We cover almost 20% of our electricity with solar power [...], and I think that over the long run, it’s going to reduce our costs and improve our efficiency”.*

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These initiatives seem to be well aligned with the Resource-Based View (RBV) perspective, which suggests that sustainability initiatives can bring long-term competitive advantages to organisations by providing them with difficult-to-replicate skills (Russo & Fouts, 1997).

Most importantly, he shed light on an important fact that might at first be overlooked. Namely, when asked if they used some KPIs to measure the effects of their sustainability actions, he replied as follows:

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*“I wouldn’t say we have specific KPIs for this, but we tend to get the certificates, and I think this is like the tool maybe to assess how we improve, better and better certificates of sustainability and stuff like this.”*

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This is important because both K.J. and later S.B. highlighted the importance of certificates for their sustainability efforts. They worked both as suppliers for the automotive sectors. Yet when this question was asked to E.L. and A.B., they didn’t bring up any sustainability certificate and instead said that they have no tool to measure their sustainability. This opens the door for a lot of discussion as it could indicate a mismatch in tracking the sustainability journey.

Finally, he also mentioned that increased sustainability is something positive for his company, not only because of the previously mentioned increase in efficiency but also because it allowed them to gain more clients and thus capitalise on the current trend. This last point seems to be well aligned with Freeman et al. (2010) Stakeholder theory and confirms the positive effects that it can have on organisations, in particular with Stevens et al. (2005) perspective of this theory, which highlights the positive effects that organisational reputation can give, especially over the long run.

#### [5.2.2.6 Interview N.6](#)

##### **S.B. – Italian foundry – Sales team**

S.B. spoke about his experience working in a foundry that produced turbines and exhaust manifolds for the automotive sector. He described the company’s sustainability efforts, which were motivated by both clients and regulatory obligations, which, for instance, included enhancing waste management and emissions systems. Part of the driving force behind these efforts was the necessity to establish and preserve commercial ties with significant automakers while adhering to strict environmental regulations. Despite these initiatives resulting in higher operating expenses at first, they also created new business prospects. By lowering possible liabilities and enhancing workplace

quality, the investment in improved emission systems not only complied with requirements but also improved worker health and safety, thereby contributing to productivity and financial performance.

S.B. provides us with another glimpse into the supplier perspective of sustainability. This was the only interview where the questions mirrored another interview, namely K.J.'s interview. This decision was predicated on the relative comparability of the two situations, which highlighted multiple commonalities and differences.

He first introduced the sustainability policies of his company which adhered to very high standards. The reason for these standards came as a subsequent step of the ISO14000 certificate, which they needed to attract more customers. To be precise, S.B.'s company installed a new filtration system which heavily reduced fumes inside the foundry to well below what the government allowed, meaning that his foundry had higher standards than what was required. Just like Siliko's example, this ties well with the concepts expressed by Freeman et al. (2010) and Stevens et al. (2005).

Just like K.J.'s testimony informed us, S.B. also received the highest degree of pressure from his clients, who suggested this stakeholder group as the driving engine for sustainability in the automotive landscape. S.B.'s company from its side also pressured its suppliers to adhere to the same environmental standards that the automotive industry subjected them to.

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*“There was a request. Then, the response was a different kettle of fish; the request was made, and some complied right away. Those who did not comply immediately, however, then provided us with a plan over time to comply with the requests. [...] they always agreed to cooperate on these improvements.”*

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The pressure that they subjected their suppliers to suggests a higher degree than Siliko, which could be indicative of a lack of standards, lack of control, or lack of enforceability, which gives out different responses across the industry.

Then, he also made a very insightful comment where it is possible to observe the positive financial and social effects that sustainability had on his company's financial performance. He argues that the new filtration system gained them new clients and improved the working conditions of the workers inside the foundry. He then continued by explaining the positive environmental effects that an investment in a new plant brought them, namely an increase in efficiency, which led to a decrease in energy consumption. Finally, he points out the difficulty of measuring the effects of sustainability on financial performance because the effects are indirect, and it's not easy to link them to specific actions. However, he believes that there is certainly a positive financial effect overall.

#### [5.2.2.7 Interview N.7](#)

##### **N.7: H.P. - Hyundai – Administration and Accounting manager**

H.P. works as an administrator and accounting manager for Hyundai Corporation in Italy, which is under the larger umbrella of Hyundai Motor Company. This branch specialises in the trade of steel products. In his answers, he provides a detailed description of the role that sustainability has in the grand strategy of his company and how it is integrated into the day-to-day activities. Some of these initiatives include reducing paper, water, and electricity usage through increased efficiency and clean

energy investments. These initiatives can improve the brand image and lead to competitive advantage through increased efficiency. What stands out is the clear definition of future sustainability goals, with clear ways to measure their effectiveness.

There are various concepts mentioned throughout the interview which are worth taking a closer look at. One of these is their proactive stance towards sustainability, which has a pragmatic reason behind it, something which was not immediately evident with the proactive stance of Polestar, which A.B. described.

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*“Hyundai Corporation recognises regulations resulting from changes in domestic and international government policies and environmental laws as potential risks and minimises risks through preemptive response.”*

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This can be indicative of a view in which sustainability is recognised as a stable trend that will increase in significance as time passes. As such, taking a proactive approach can put Hyundai ahead of its competition. This seems to align itself with Stakeholder Theory as sustainability actions and, more broadly CSR activities can replace missing markets and avoid the need for regulatory policies, something which ultimately benefits companies. As well as highlighting the role of regulations, or rather the threat of it alone in shaping the industry.

For Hyundai, investing in sustainability is a long-term investment, as evidenced by the following quote.

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*“[...] it is crucial for any company to prioritise sustainability initiatives. Such initiatives contribute to long-term value creation by enhancing brand reputation.”*

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Such insights support the ideas of Stakeholder theory, which makes the case that focusing on stakeholders can improve the brand image and, as such, increase the company’s value over the long term. A similar positive long-term benefit was observed through the quantitative analysis, which revealed that sustainability positively influences the companies’ market valuation measures.

It is also worth mentioning a few other insightful comments from H.P., namely a company-wide employee training to increase awareness of eco-friendly practices, something which can boost both environmental performance and environmental reputation, as evidenced by Dangelico (2015). Thus, it is in synchrony with the previously mentioned effort to improve Hyundai’s brand image.

The meticulous tracking of environmental goals was another thing that stood out in the interview, which is something that was not observed at the same scale in other interviews, as H.P. provided the exact numbers of how much energy (KWh) and water (tons) was saved thanks to careful resource management. This can give Hyundai a more detailed picture of the financial and environmental effects that these actions can have. At the same time, it is worth remembering that this was the only interview conducted in written form, something which could have given H.P. to provide us with

information that would have otherwise not been immediately available during a normal semi-structured face-to-face interview.

### 5.2.3 Discussion of Results

The interview provides the current research with valuable qualitative research from real industry examples, which enhances the validity of the inquiry and sheds some light on potentially overlooked dynamics. These findings seem to align themselves with the theory of slack resources, the RBV, and the Stakeholder theory. Stakeholder theory in particular was the concept that found the most confirmation, in particular, positive financial effects from brand reputation, customer relations, and employee satisfaction were noted. Fundamentally it should also be noted that the numerous competitive advantages that sustainability and CSR actions bring to organisations can only be observed over the long run (Choi & Wang, 2009).

It also revealed the central role that supply chains play in shaping sustainability. More precisely, it reveals a lack of uniform standards and practices across the industry, particularly with lower-tier suppliers. This lack of oversight poses a major obstacle to automotive producers' sustainability goals. The existing challenges in the supply chain could be further intensified by the growing reliance on and consolidation of advanced technologies, which demand a significant quantity of semiconductors and other electronics. The longstanding practice of vertical supply chain integration in the automotive industry may gradually become less prevalent, potentially leading to diminished oversight. This shift could negatively impact sustainability pursuits. However, it is important to acknowledge the significant limitations of this analysis. The limited number of participants does not provide a sample size large enough to allow for generalisations across the entire automotive industry. Additionally, the highly interpretative nature of the analysis may have introduced unintentional biases, potentially distorting the true implications of the findings.

Despite that, the current findings confirm sustainability as a valuable intangible asset that can give organisations countless advantages over their competitors.

## 6. Discussion

### 6.1. Interpretation and Integration of Findings

The presented research has provided a detailed and wide overview of the impact that sustainability efforts have on the financial well-being of automotive enterprises in which quantitative and qualitative insights collide to give us a more nuanced perspective on the whole subject. Both of these are, in turn, supported by a strong theoretical foundation that underpins the whole research.

The quantitative findings affirm the assertions of some scholars cited in the literature review while contradicting others. For example, the results indicate a negative association with ROIC, ROA, and ROE, mirroring findings similar to those of Alareeni & Hamdan (2020). Specifically, a negative ROIC suggests that sustainability initiatives, at least in the short term, act as a cost to the firm. This can be attributed to large upfront investments required for sustainable practices, which may not immediately yield returns sufficient to cover these costs (ABM F. Rahi et al., 2021).

In particular, it is necessary to delve deeper into understanding the negative effect on ROIC. ROIC quantifies the effectiveness of a company's capital utilisation in generating profits. It encompasses variables such as NOPAT and total invested capital (Damodaran, 2007).

According to a study by Morgan Stanley (2023), accurately measuring ROIC has become complex due to the rise of intangible investments in business. These intangibles, often expenses on the income statement, may depress ROIC in the short term because they are recorded as costs before their benefits are realised. The negative impact of sustainability initiatives on ROIC can often be linked to these intangible investments.

Many sustainability efforts, such as environmental technologies or governance programs, are intangible and don't immediately enhance financial statements. Consequently, while such initiatives might initially reduce ROIC due to upfront costs, they are crucial for long-term strategic value. Adjusting financial evaluation methods to better reflect these intangibles can provide a clearer picture of how sustainability investments impact financial performance. The potential long-term benefits of these investments could be further studied in the future as more data becomes available, allowing for a more comprehensive analysis of their impact over time.

Additionally, sustainability projects often involve long payback periods due to these initial outlays, with the related benefits typically slow to materialise and contribute to real profit gains (Brown, 2011). Such long payback periods adversely affect the short-term calculation of ROIC. These findings are supported by the personal experiences of industry professionals K.J. and S.B., who confirmed these impacts in their interviews.

This concept of sustainability affecting short-term financial performance is further supported by RLM regression results analysing the effects of ESGC components on profitability measures. The fact that social, governance, and controversies scores influence both ROA and ROE supports the notion that these measures, which represent the profitability of the last financial period, are closely linked to immediate company gains (Damodaran, 2007).

Furthermore, there is an overall positive effect of sustainability on market valuation metrics, such as MC, DSY, and BVS, paralleling previous findings, most prominently those by McPeak & Gou (2014), who specifically researched the automotive industry. Several potential explanations for this link include improved brand reputation, as noted by E.L. and H.P., which is critical in enhancing how investors and other stakeholders perceive the company, thereby influencing the trust associated with it. Additionally, increased attention to sustainability reporting acts as a powerful tool to reduce information asymmetry and provides investors with additional information that sends positive signals to the market, as mentioned by Cho et al. (2013). These factors directly affect the company's market price and share value, positioning the company as wealthier, more reliable, and future-oriented. A sustainable company is often perceived as an organisation that values its future continuity and is adept at managing its financial assets to accommodate green and CSR improvements, which, over time, enhance the firm's competitiveness.

From these results, we conclude that in regard to Ng & Razaee's (2015) theoretical framework, our analysis supports the Stakeholder Theory, as it demonstrates the impact of sustainability initiatives on the company's long-term value but contradicts the Agency Theory.

Geographically, the conclusions drawn from this analysis are not universally applicable due to the several biases related to the results, particularly as the majority of the companies studied are based in Asia. This significant presence can affect the outcomes of the regression, as observations related to

this factor are disproportionately high compared to those related to other regions. Asia, as a continent, includes countries with substantial cultural, religious, ethnic, and legislative differences compared to Europe or North America, making it difficult to generalise Asian trends to individual Asian countries. Sustainable supply chain management is also highlighted as an area of great strategic importance in this research, not only because a majority of pollution occurs throughout the supply chain, as pointed out by Keanegieser (2014), but also because it offers significant and unique competitive advantages, as evidenced by the qualitative findings. An aspect repeatedly touched upon is the “theory of slack resources” from Preston & O’Bannon (1997), which views sustainability as a consequence of financial well-being rather than a cause. This theory finds confirmation in the testimony of Y.F. yet does not necessarily stand in contradiction to other theoretical frameworks like the Stakeholder Theory. It can be speculated that a surplus of financial resources may allow companies to invest more in sustainability initiatives, which can, in turn, lead to multiple operational benefits that ultimately translate into long-term value.

This research underscores the complexity of assessing the impact of sustainability on financial performance. While the quantitative data might suggest a mixed immediate financial outcome, qualitative insights, and broader market analyses indicate that sustainability is increasingly critical for long-term viability and value creation in the automotive industry. Overall, the synthesis of diverse findings provides a detailed portrayal of the dynamic relationship between sustainability and financial performance in the automotive sector. While the immediate financial benefits may appear inconsistent, the long-term strategic advantages of enhanced market valuation, improved stakeholder perceptions, and reduced risk highlight that sustainability practices are crucial for future-proofing businesses against environmental, social, and economic challenges. This comprehensive integration of literature, quantitative, and qualitative insights not only deepen our understanding of the multifaceted impacts of sustainability but also emphasises the critical importance of contextual factors in shaping these outcomes, suggesting that firms should adopt a long-term perspective when evaluating the benefits of their sustainability efforts, balancing short-term financial considerations with strategic gains.

Table 5, provides a comprehensive summary of how both the quantitative and qualitative findings address the thesis hypothesis.

Table 5: Answers to the thesis hypothesis

Hypothesis	Quantitative	Qualitative	Summary
H1a	Supported	Supported	ESGC score negatively influences some profitability measures, probably due to the large expenses for ESG initiatives. This is also supported by the majority of interviewees
H1b	Supported	Supported	ESGC score positively influences some of the market valuation measures. Companies can benefit in the long term from the financial market through higher sustainability performance. This is also supported by interviewees that enhance the sustainability effects on brand reputation, investors’ trust and company reliability

<b>H2a</b>	Supported	No data	E score negatively influences ROA and ROE. However, the interviewees could not give us meaningful insights on this matter.
<b>H2b</b>	Not Supported	Supported	E score impacts in the long term do not appear to be statistically significant. However, the interviewees disagreed with this point.
<b>H3a</b>	Supported	Not Supported	S score negatively influences ROA and ROE. However, interviewees did not agree with this point and only talked about the benefits of sustainability to the company's workforce (S.B.)
<b>H3b</b>	Not Supported	Supported	S score impacts in the long term do not appear to be statistically significant. However, the interviewees disagreed with this point. S.B. talks about how the implementation of a new air filtration system improved the working conditions of the workers inside the foundry.
<b>H4a</b>	Supported	No data	G score negatively influences ROA and ROE. The interviewees could not give us meaningful insights on this matter.
<b>H4b</b>	Supported	No data	G score positively impacts BVS. The interviewees could not give us meaningful insights on this matter.
<b>H5a</b>	Supported	No data	ESG Controversies score negatively influences all the selected profitability measures. The interviewees could not give us meaningful insights on this matter.
<b>H5b</b>	Supported	No data	ESG Controversies score positively influences all the selected market valuation measures. The interviewees could not give us meaningful insights on this matter.

## 6.2. Practical Implications

The practical consequences of this research are significant, especially for decision-makers in the automobile sector who are responsible for managing the challenges of incorporating sustainability into their strategic goals. The results offer a detailed comprehension of how sustainability measures, despite their possible negative impact on immediate financial performance due to upfront expenses and the intangible character of numerous expenditures, are essential in ensuring long-term financial well-being and gaining a competitive edge. This study emphasises the significance of taking a comprehensive and extended view when assessing the effects of sustainability initiatives.

For industry leaders and policymakers, the insights from this research support the need to develop and implement sustainability strategies that not only comply with current regulatory requirements but

also anticipate future environmental and social trends. The evidence that sustainability can enhance market valuation, for instance, suggests that integrating sustainable practices can be a significant factor in driving investment and improving shareholder value over time. This is particularly relevant for companies looking to attract a new generation of investors who prioritise ESG factors in their investment decisions.

In addition, the research emphasises the significance of improving openness and reporting methods. As sustainability initiatives grow increasingly intricate and essential to company plans, transparent and thorough reporting can mitigate information imbalance, bolster stakeholder confidence, and perhaps result in positive market impressions.

Additionally, the use of standardised sustainability questionnaires and forms for suppliers can serve as an effective tool for managing and monitoring the sustainability practices of a company's supply chain. Findings also highlight the importance of certificates such as ISO14000 in ensuring standardised fair practices within the industry. This not only aids in maintaining control over the sustainability credentials of stakeholders but also facilitates benchmarking against competitors. Such measures can potentially yield a competitive advantage by ensuring that all players in the supply chain adhere to agreed-upon sustainability standards, thereby enhancing the overall credibility and reliability of the company's sustainability claims. These strategies do not merely boost compliance; they also leverage sustainability as a core element of strategic differentiation in the marketplace.

Decision-makers are advised to take these findings into account when making strategic plans and investment decisions. By prioritising sustainability as an integral part of their corporate strategy, organisations may cultivate resilience, adaptation, and, eventually, sustainable profitability. This method not only enhances the company's advantages but also contributes to wider societal and environmental welfare, integrating business achievements with global sustainability objectives. The study establishes a basis for forthcoming investigation and advancement in sustainability plans, indicating specific domains where supplementary data and enhanced analytical procedures could result in more profound understandings. Decision-makers should utilise this continuing research to consistently improve and adjust their plans to suit the changing requirements of sustainability and market expectations. Engaging proactively with sustainability can enhance a company's prospects for long-term profitability and industry leadership.

### 6.3. Limitation and Future Research

This thesis utilises a combination of quantitative and qualitative methodologies to examine the influence of sustainability on financial performance in the automobile sector. While this approach provides a thorough understanding of the topic, it also has clear limitations. The quantitative aspect of the study is limited by the data obtained from a particular database, which covers the last five fiscal years. This constraint not only limits the range of data but also implies that the study may fail to encompass all pertinent financial and sustainability criteria, thus impacting the thoroughness of the research. Additionally, the five-year timeframe may not adequately reflect the long-term financial returns of sustainability investments, as these benefits often materialise over more extended periods. Furthermore, there is a limitation related to causality: while the analysis can identify relationships between sustainability and financial performance, it cannot definitively establish causation.

The regression methodology implemented is the one provided by the statsmodels module for Python, which is particularly suited for nonlinear distributions (Statsmodels, 2023). However, it is important to note that different analytical tools might provide different results. Consequently, future research should explore and experiment with different methodologies to verify and compare our findings of this study, ensuring more robustness and reliability. Finally, the analysed time period also coincides with the COVID-19 pandemic period, an event that severely impacted the whole transportation industry and likely altered the extracted data from that time period.

Qualitative research encounters difficulties regarding the selection of interview participants, as it relies on a convenience sample and on those who have willingly chosen to take part. This may result in a selection bias since the opinions stated may not accurately represent the wider sector if those who hold more positive views about sustainability are more inclined to participate. Moreover, the acquired insights are derived from individual viewpoints and personal encounters, which, although valuable, are necessarily subjective and may not universally apply or accurately represent wider industry patterns. Additionally, the sample size of 7 is very modest and not remotely large enough to be generalisable and representative of the industry.

Geographical diversity is another limitation, as the distribution of companies covered may influence the results. Regional disparities in legislative frameworks, cultural perspectives on sustainability, and economic circumstances can all influence the execution and perceived significance of sustainability initiatives. The methodological limitations of the mixed-methods approach, while strong, restrict the ability to extrapolate findings to many contexts or properly forecast future trends. These limitations indicate that the findings should be interpreted with caution and highlight the areas where more study is needed to improve our understanding of how sustainability affects financial performance in the automotive industry.

The current study offers a wide scope of research suggestions to be explored in the future. One such suggestion could be to expand the qualitative analysis in order to find more candidates and obtain more robust findings. A longitudinal study could also be made to determine the long-term effect of sustainability on financial performance and how it changes in the short-term. Reflecting upon the insights given by K.O., future studies could focus on the emergence of new technologies such as A.I. technology, self-driving cars, and solid-state batteries and how their adoption can alter the relationship between sustainability and financial performance. Finally, future studies could also investigate the driving force that sustainability can have on innovation, something that was not explored in the current research. There are just a few suggestions that can hopefully inspire future researchers to deepen their knowledge on this topic.

## 7. Conclusion

The research conducted in this thesis provides a comprehensive analysis of how sustainability impacts the financial performance of automotive companies, utilising a mixed-method approach that blends quantitative data and qualitative insights.

Throughout this study, it has become clear that sustainability initiatives may present difficulties for short-term financial performance due to substantial upfront expenses and the intangible nature of certain investments. However, they are essential for promoting long-term sustainability and gaining a competitive edge in the industry.

The results illustrate that the company's short-term worth might be adversely impacted by sustainability endeavours, mainly because of the initial capital inputs needed and the delay in reaping the advantages of these activities. Nevertheless, these identical sustainability parameters have demonstrated a favourable association with enduring financial indicators, specifically with respect to market valuation. This indicates that investments in sustainability not only recoup their costs over time but also yield significant benefits in terms of improved market perceptions, higher stakeholder trust, and increased firm resilience against environmental and social concerns.

The thesis highlights the significance of considering sustainability as a fundamental part of strategic planning, emphasising the need to balance present expenses with potential long-term advantages. Decision-makers in the automotive industry are advised to implement sustainability strategies that are in line with their overall business objectives and meet social expectations. This will improve their capacity to attract investment and maintain a competitive position in a continuously changing market.

Ultimately, sustainability programs, despite their potential for immediate financial difficulties, are essential for ensuring enduring financial prosperity and sustainability within the automotive sector. This study has demonstrated that adopting a deliberate and well-planned strategy for sustainability can result in substantial advantages, not just for the company itself but also for the wider community and the environment. Further research should investigate the dynamics mentioned, specifically examining how different sustainability practices affect financial measures in different time periods and market situations. This will help us enhance our understanding and implementation of these methods in the corporate realm.

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# Appendix

## Appendix I: Table of Cited Literature

Authors & Year	Research Focus	Methodology	Sample Size & Industry Focus	Key Findings	Financial Performance Metrics Used	Market or Geographic Region	Data Source
Al Amosh et al. (2023)	Impact of ESG on financial performance in Levant.	Content analysis, 883 observations from 124 companies.	124 companies from Levant countries.	Positive impact of ESG on financial performance, especially on ROA.	Tobin's Q, ROA, ROE	Levant countries	Annual reports, CSMAR database.
Alareeni & Hamdan (2020)	ESG's impact on performance of S&P 500-listed firms.	Panel regression analysis, 2009-2018.	US S&P 500-listed companies.	Positive association between ESG disclosure and firm performance measures.	ROA, ROE, Tobin's Q	United States	Bloomberg ESG scores, financial data.
Atan et al. (2016)	ESG disclosure and its effect on firm performance	Content analysis	Top 100 Malaysian firms	Higher ESG disclosure associated with better financial performance	Various metrics	Malaysia	Publicly available reports
Chandrasekaran (2022)	CSR's effect on firm performance in the Asian automotive sector.	Fixed and random effects panel regression models.	21 automotive companies from 7 Asian countries.	CSR significantly enhances performance; emphasizes ESG aspects.	ROA, ROE	Asian automotive sector	Thomson Reuters database.
Cheung (2011)	Impact of DJSWI changes on US stocks' performance.	Event study analysis on stock return, risk, and liquidity.	US stocks added to or removed from the DJSWI during 2002–2008.	No significant impact on stock return and risk; liquidity improves near the day of change.	Stock returns, volatility, liquidity measures	United States	DJSWI, CRSP.
Cheung & Roca (2013)	Impact of stocks added to/deleted from a sustainability index in Asia Pacific.	Event study on returns, risk, and liquidity of stocks.	Stocks in Asia Pacific markets included in or deleted from the Dow Jones Sustainability World Index, 2002–2010.	Decline in returns and increase in trading volume upon changes; no change in systematic risk, increase in idiosyncratic risk.	Stock returns, trading volume, systematic risk, idiosyncratic risk	Asia Pacific	Dow Jones Sustainability World Index, stock market data.
Consolandi et al. (2009)	Influence of DJ Sustainability Index on firm value	Event study, comparative analysis	Firms in Dow Jones Sustainability Index	Firms in the DJ Sustainability Index showed better stock performance	Stock performance	Global	Dow Jones Sustainability Index, financial databases
Dincă et al. (2022)	Relationship between ESG and firm value in automotive industry.	SEM approach on data from 131 listed automotive companies worldwide.	131 automotive companies worldwide.	Mixed influences of E, S, G scores on firm value, some inconclusive effects.	Firm value	Global, automotive industry	Morningstar Direct, Sustainalytics.
Doh et al. (2010)	Market response to CSR endorsements by institutions.	Event study on stock market response to Calvert Social Index changes.	Stocks listed in the Calvert Social Index.	Negative reactions to CSR repudiations; prior performance predicts social performance.	Stock price reactions, operating income/assets	United States	Calvert Social Index, Lexis Nexis, COMPUSTAT.
Elsayed & Paton (2005)	Environmental performance's impact on firm performance.	Static and dynamic panel data regression.	227 UK firms, 1994-2000.	Neutral impact of environmental performance when controlling for firm heterogeneity.	Tobin's q, ROA, ROS	United Kingdom	BMAC, Datastream, FAME.
Granelli & Rådeström (2023)	ESG impact on financial performance in	Regression analysis on data from 79	79 automotive & auto parts companies globally.	Significant negative relationship between ESG and Tobin's Q;	Tobin's Q, ROA	Global	Data from 2012 to 2021.

	automotive industry.	companies, 2012-2021.		no significant relation to ROA.			
Hussain et al. (2018)	Sustainability performance's impact on financial performance.	Content analysis of 152 sustainability reports, regression analysis.	100 top-performing US firms.	Mixed effects of SP and SD on FP; environmental and social performances positively related to FP.	Tobin's Q, ROA, ROE	United States	Sustainability reports, GRI framework.
Jaggi & Freedman (1992)	Pollution performance's impact on financial performance.	Pollution performance indices and financial metrics correlation.	13 pulp and paper firms.	Negative association between pollution performance and economic performance.	Net Income, ROE, ROA, Cash Flows	United States	EPA pollution reports, COMPUSTAT.
Kaya & Akbulut (2019)	Relationship between sustainability reporting and firm performance.	Logistic regression analysis of automotive firms.	155 automotive firms from 20 countries, 2010-2018.	SR positively relates to firm size; negative relation with financial leverage.	Tobin's Q, ROA, firm size, financial leverage ratio	Global, automotive industry	Thomson Reuters Datastream, GRI Database.
Khalid et al. (2023)	Impact of CGI on profitability in Chinese firms.	Empirical analysis on A-share listed companies.	Chinese A-share listed companies.	Positive effect of CGI on firm profitability, enhanced by the Environmental Protection Law 2015.	Profitability measures	China	Chinese A-share listed companies data.
Khan et al. (2021)	CSR, green innovation practices on financial performance.	Content analysis from 67 companies.	67 companies across five continents.	Mixed results; Green Product Innovation positively relates to ROE and ROI.	ROI, ROE, ROA	Global	Annual reports, sustainability reports.
Kim & Oh (2019)	Relationship between CSR and financial performance in Indian firms.	Panel data logistic regression analysis of 155 automotive firms.	155 automotive firms from 20 countries, 2010-2018.	Significant positive relationship between SR and firm size; negative with financial leverage.	Tobin's Q ratio, return on assets, financial leverage ratio	Global, automotive industry	Thomson Reuters Datastream, GRI Database.
Li & Wu (2017)	Environmental sustainability and stock market performance in China.	Event study methodology.	1595 announcements from listed Chinese firms in manufacturing.	Negative market reactions to environmentally sustainable announcements.	Stock returns, abnormal returns.	China	China Listed Firm's CSR Database, stock market data.
Li et al. (2017)	Impact of CER on CFP moderated by government regulation.	Data from 1179 Chinese energy-intensive companies.	1179 observations from energy-intensive industries.	Positive effect of CER on CFP, strengthened by government regulation.	ROA	China	Corporate annual reports, CSMAR, NRDC.
López et al. (2007)	CSR practices and financial performance in Europe.	Comparative analysis of firms in and not in DJSI.	55 European firms in DJSI vs. not in DJSI, 1998-2004.	CSR practices initially have a short-term negative impact on performance.	Profitability, revenue, assets, capital, ROE, ROA	Europe	AMADEUS database, DJSI, financial statements.
Lourenço et al. (2012)	Market value of CSP through DJSI membership.	Empirical analysis against a Surrogate Complementary Index.	600 firms from Canada and the USA.	CSP has significant explanatory power for stock prices over traditional accounting measures.	Market value of equity, earnings, book value	Canada, USA	Dow Jones Sustainability Index, Thomson Worldscope.
McPeak & Guo (2014)	"Go Green" trend's impact on automotive industry financial performance.	Comparative analysis of financial performance across companies.	15 companies: American consumer goods, global automakers, Tesla.	Positive relationship between CSR initiatives and financial performance in automotive industry.	ROE, stock return, profitability ratio	Global, automotive industry	Financial reports, Dow Jones Sustainability Index.
Nayak & Patjoshi (2020)	CSR contribution's effect on financial performance in	Descriptive statistics, correlation, and	Five automotive companies in India.	Positive correlation between CSR contributions and	NPM, ROI, ROE, ROTA	India	Published financial statements and reports.

	Indian automotive companies.	regression analysis.		financial performance ratios.			
Nor et al. (2016)	Environmental disclosure's effect on financial performance in Malaysia.	Regression analysis based on annual report disclosures.	Top 100 companies by market capitalization in Malaysia, 2011.	Found mixed results on the impact of environmental disclosure on financial performance.	Various metrics.	Malaysia	Public annual reports.
Oberndorfer et al. (2013)	Stock market value of sustainability index inclusion in Germany.	Event study with Fama and French model, t-GARCH(1,1) model.	Companies listed on Frankfurt stock exchange in DJSI STOXX and DJSI World.	Negative stock market reactions to sustainability index inclusions, especially DJSI World.	Stock returns, abnormal returns	Germany	Dow Jones Sustainability Index, Datastream.
Palea & Santhià (2022)	Carbon risk and mitigation strategies' financial impact in the automotive industry.	Empirical analysis using accounting-based and market-based measures.	Car and component manufacturers worldwide.	Negative association between carbon emissions and financial performance.	Profitability ratios, Tobin's q	Global, automotive industry	Carbon Disclosure Project, Refinitiv DataStream.
Pekovic et al. (2018)	Environmental investments on economic performance.	Fixed-effects model with French firms.	Over 6000 French firms.	Inverted U-shape effect of environmental investments on economic performance.	Net profits	France	INSEE surveys, ANTIPOL, EAE.
Souza Cunha & Samanez (2013)	Performance of sustainable investments in Brazil.	Portfolio performance measures on ISE portfolios.	ISE, Brazilian stock market.	ISE showed increasing liquidity but not superior financial performance.	ROA	Brazil	BM&FBOVESPA, ANTIPOL, EAE surveys.
Velte (2017)	Impact of ESG performance on financial performance in Germany.	Analysis of firms listed on German stock indices.	412 firm-year observations.	Positive impact of ESG on ROA; governance performance shows the strongest impact.	ROA, Tobin's q	Germany	Asset4 database, financial reports
Wong et al. (2018)	CER's impact on operating income in China.	Content analysis of Fortune 500 Chinese firms' CER practices.	Fortune 500 Chinese manufacturing firms.	Positive impact in Eastern China, negative in Western China.	Operating income	China	Corporate reports of Fortune 500 Chinese manufacturers.
Yilmaz et al. (2020)	Stock market value of sustainability index inclusion for Borsa Istanbul firms.	Event study methodology.	Firms listed on Borsa Istanbul included in the BIST Sustainability Index.	No strong evidence of impact on stock returns; inclusion reduces total risk and enhances resilience against declines.	Stock returns, systematic risk, total risk.	Turkey	Borsa Istanbul, BIST Sustainability Index, financial data.
Zhang & Ouyang (2021)	Effect of CER on CFP mediated by firm reputation.	Empirical analysis with Chinese firms.	10,995 firm-year observations from 2346 firms.	CER enhances CFP via firm's prominence and favorability.	ROA, ROS, ROE, Tobin's q, EVA.	China	Annual reports, CSMAR, CNRDS, Guba.

## Appendix II: RLM Regressions Results of ESGC Score on FI

IV \ DV	PROFITABILITY									MARKET VALUATION								
	ROA			ROE			ROIC			MC			BVS			DSY		
	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value	Coeff.	Std. error	p-value
ESGC Score	-	-	<0.05	-	-	<0.05	-0.003	0.001	0.002	0.030	0.004	0.000	0.041	0.009	0.000	0.134	0.025	0.000
Americas	-	-	-	-	-	-	-	-	-	-0.226	0.040	0.000	-	<0.05	-	-	-	<0.05
Europe	-	-	-	-	-	-	-	-	-	-0.230	0.040	0.000	-	<0.05	-	-	-	<0.05
Asia	-	-	-	-	-	-	-	-	-	-0.166	0.040	0.000	-	<0.05	-	-	-	<0.05

## Appendix III: Interview Transcripts

<https://drive.google.com/file/d/169on69-Uu93pKjnXWtd2eLclJUmX0wN5/view?usp=sharing>