MASTER THESIS

THE IMPACT OF CEO GENDER ON ENVIRONMENTAL SUSTAINABILITY STRATEGIES IN BUSINESSES

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Date: 25.11.2020

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Abstract

Both gender diversity in top management teams and the implementation of environmental sustainability strategies are topics of increasing importance for corporate agendas. The pressure by society for businesses to place sustainability in the focus of practices is increasing. This master thesis investigates the impact of CEO gender on environmental sustainability strategies, to find out to what extent gender stereotypes and social role theory affect the formulation of green strategies among the executive board. The research question *"To what extent does CEO gender have an impact on the adoption of environmentally sustain-able practices among for-profit businesses in developed countries?"* is answered based on a panel dataset containing 412 companies from the S&P 500 and FTSE 100 indices. A random effects model was used to model the data containing observations from 2015-2019, including data on environmental sustainability obtained from the Thomson Reuters Eikon database.

The analysis shows an overall increase of environmental sustainability scores throughout the years in the observation for all industry sectors. However, a connection between CEO gender and environmental sustainability strategies could not be found. Nevertheless, the results indicate a link between executive member gender diversity and environmental sustainability. This finding highlights the importance of gender diversity among the executive team and emphasises the significance of the critical mass theory for female representation in leadership. Consequently, management is advised to promote diversity through policy initiatives specifically targeting gender diversity throughout all organisational levels. This will likely not only have a positive impact on the number of female chief executive officers for the future. Through an increased awareness for environmental sustainability concerns among women, it is also likely to secure future business success based on the consumer buying behaviour evolving towards more sustainable choices.

Keywords – *CEO gender, management diversity, sustainable strategy, environmental sustainability*

Table of contents

List of Figures

List of Tables

1 Introduction

1.1 The increasing importance of environmental sustainability

Environmental sustainability is a topic of growing urgency for society, subsequently the sustainable development goals are continuously pushed forward on political agendas. Worldwide movements like “Fridays for Future” have increased pressure on businesses and politics for speeding up measures against climate change (Porter & Kramer, 2006; Lawal, 2020). According to The Guardian “we are in an age of extinction and at the point where irreversible environmental damage could be wrought” (Deverell, 2020), emphasising the importance of immediate measurements to be taken by individuals as well as businesses. Considering that businesses specifically in developed countries are responsible for a large share of greenhouse gases and pollution (Redekop, 2010), climate activists and scientists around the world are making it their primary interest to increase public pressure on these businesses (Porter & Kramer, 2006). Reaching out to politicians for them to understand the impact of these businesses on the planet and forcing governments to impose tighter restrictions on firms concerning pollution and waste disposal is on top of climate activists’ agendas.

Among those businesses, the topic of environmental sustainability has touched ground in the form of an increased consideration and focus on the reporting of corporate social responsibility (CSR), which include concerns of environmental sustainability, amongst others (Mackey & Mackey, 2018). Most companies dedicate sections in their annual reports to CSR efforts or even publish additional reports exclusively covering corporate social responsibility matters (Moravcikova, Stefanikova, & Rypakova, 2015).

1.2 Corporate social responsibility on the strategic agenda

Furthermore, there has been a surge in CSR rankings with the aim to evaluate corporations according to their CSR performance and to increase transparency in the field, accordingly. Such rankings include indices like the Dow Jones Sustainability Index, the FTSE4Good, or the MCSI ESG indices, to name a few. However, concerns were raised among researchers about the validity and especially accuracy of such rankings. Due to their composition and weighting of different aspects of corporate social responsibility, many indices are criticized as being opaque and partially ambiguous (Porter & Kramer, 2006).

More generally, it has to be acknowledged that environmental sustainability is only one aspect of corporate social responsibility as a whole (Lin-Hi, 2019). As a consequence, companies might publish extensive reports about CSR efforts and might therefore be listed in a high position in common CSR rankings even though they barely engage in minimising their environmental footprint. In the cases where sustainability is rather neglected, the organisations are

likely focusing on other aspects of CSR instead (Porter & Kramer, 2006; Mackey & Mackey, 2018). Overall, the alleged triple bottom line of economic, societal and environmental performance is focused on the avoidance of short-term behaviour to the detriment of society or the environment in favour of assuring long-term economic performance (Porter & Kramer, 2006).
To get a better understanding about the scope of measurements businesses are already taking towards environmental sustainability, it is necessary to dive deeper into the decomposition of the different elements of corporate social responsibility with a focus on aspects concerning environmental sustainability. Alongside this task, it is also vital to understand the drivers of environmental sustainability efforts within firms. Since this is a topic requiring distinct strategic directives and leadership (Gupta, Nadkarni, & Mariam, 2019), it is imperative to find out which kinds of executives are taking the lead in this task.

1.3 The female leadership perspective and environmental sustainability

According to an article published in the Harvard Business Review in 2016, "there are more CEOs of large US companies who are named David than there are CEOs who are women" (Johnson, Hekman, & Chan, 2016). The share of women in leadership roles within Fortune 500 companies is at a consistently low level of less than 10% throughout recent years and 33% of businesses worldwide have not yet appointed any women to senior roles at all (Spencer, Blazek, & Orr, 2019; Lageberg & Schmidt, 2020).
At the same time, numerous studies have already emphasised the importance of gender diversity for corporate boards and its positive effect on corporate social responsibility, including environmental sustainability (Arfken, Bellar, & Helms, 2004; Bear, Rahman, & Post, 2010; Galbreath, 2011; Boulouta, 2013). As Waldman et al. (2006) state, the CEO as the key decision maker is responsible for developing a CSR strategy (Waldman, Sully de Luque, & Washburn, 2006; Waldman, Siegel, & Javidan, 2006). Based on this notion other researchers, such as Manner (2010) and Huang (2013) have already addressed the effects of CEO characteristics, such as education, leadership style, tenure, and also gender on corporate social responsibility. Pursuant to the findings of Manner, "having a female CEO is positively and significantly related to proactive CSP [Corporate Social Performance]" (Manner, 2010, p. 62). It has to be considered however, that the sample included only a small proportion of female CEOs. Moreover, due to the various elements merged in corporate social responsibility, those findings should be validated specifically regarding the aspect of environmental sustainability.

1.4 Research objective and contribution

As a consequence, the aim of this thesis is to extend previous studies by analysing different businesses in developed countries concerning their efforts towards environmental

sustainability as a component of CSR. The central research goal of this thesis is to find out whether CEO gender has an impact on businesses concerning the adoption of more environmentally sustainable practices. Thus, the main research question which is supposed to be answered is the following:

To what extent does CEO gender have an impact on the adoption of environmentally sustainable practices among for-profit businesses in developed countries?

Based on the theoretical contributions to the topics of executive leadership, sustainability and gender, this thesis is supposed to extend the findings of previous studies concerning CEO characteristics and their implications on corporate strategy. Moreover, further evidence should be presented regarding the positive impact of gender diversity among executive board members on CSR in general and environmental sustainability specifically. Waldman and Siegel (2008) noted that most research on CSR has neglected the role of executives in the formulation and implementation of corresponding initiatives. Consequently, this thesis is supposed to extend the findings on the environmental sustainability aspect of CSR from the board perspective towards the executive suite. Through incorporating the gender aspect, this thesis will also serve as an extension for the findings of Manner (2010) concerning a positive impact of female CEOs on corporate social performance. Firstly, this thesis will focus on overcoming the lack of an adequate female sample size, which has limited the reliability of these findings. Secondly, by focusing on environmental sustainability as one specific aspect of corporate social responsibility, this thesis is supposed to tackle the issue of insufficient transparency in the different corporate social responsibility and corporate social performance ratings.
From a practical perspective, the findings are supposed to add to the ongoing debates about gender diversity, especially in management, through uncovering potential gender differences in environmental leadership among for-profit businesses. Acknowledging that companies face increasing pressure regarding the establishment of strategies focusing on environmental sustainability (Porter & Kramer, 2006), further insights on measures to facilitate company-wide adoption of such strategies will be useful to secure long-term success for both businesses and the environment (Fritz, Smith, & Wesely, 2017).

1.5 Outline of the study

The second chapter of this thesis outlines the theoretical framework of the study, including the relevance of CSR and environmental sustainability for corporate strategy formation, the creative leeway of the CEO in the development of such strategies, as well as social role theories and gender stereotypes influencing corporate leadership and thus corporate strategy. Chapter three introduces the methodology for the empirical investigation based on the research design,

the data selection, the measurement instruments including the conceptual framework and lastly, the procedure for the data analysis. The outcome of the analysis is elaborated on throughout chapter four, containing all relevant findings and the results for the hypotheses which were tested. Lastly, chapter five contains the discussion and conclusion in consideration of the limitations of the study and suggestions for future research.

2 Theoretical framework

2.1 CSR and environmental sustainability in corporate strategy

Corporate social responsibility is "the subset of a firm's responsibilities that are aimed at directly benefiting society" (Mackey & Mackey, 2018, p. 352). Pursuant to McWilliams and Siegel (2001), in engaging in CSR firms go beyond compliance and firm interests in favour of promoting a positive social impact. There is a supposed tension between the traditional neoclassical approach of maximising shareholder value (Friedman, 1970) and the aim of CSR activities to boost environmental performance through recycling and a reduction of pollution, among others (McWilliams, Siegel, & Wright, 2006; Mackey & Mackey, 2018). According to the perspective of many business and society scholars, in certain circumstances firms need to place the interests of other stakeholders above shareholder value maximising to have a positive impact on society at large (Mackey & Mackey, 2018). Moreover, some firms manage to create a sustained competitive advantage based on the utilisation of environmental social responsibility as a resource or capability instead of treating it as an obligation (Hart, 1995; Fritz, Smith, & Wesely, 2017). When considering corporate social responsibility from a strategic perspective and employing the substantial resources and expertise available with sure instinct, it can become a source of enormous progress for both businesses and society (Porter & Kramer, 2006). Moreover, the accelerating pressure put on firms by important stakeholders and society (Porter & Kramer, 2006; Lawal, 2020) causes the valuation of companies in the market to be increasingly dependent on their environmental and social contributions (Hart & Milstein, 2003; López, Garcia, & Rodriguez, 2007).

Within the scope of corporate social responsibility, the World Commission on the Environment and Development (WCED) defines sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 15). Accordingly, based on the definition of the Palgrave Encyclopaedia of Strategic Management, an "environmental strategy is a firm's long-term orientation about how to manage the environmental practices and develop environmental resources and capabilities to gain a good fit with its stakeholders' expectations." (Aragón-Correa & Ortiz-de-Mandojana, 2018, p. 508). At the firm level, sustainability can be conceptualised according to the so-called triple

bottom-line, encompassing economic growth, environmental quality, and social responsiveness (Bansal, 2005; Konrad, Steurer, Langer, & Martinuzzi, 2006; Porter & Kramer, 2006). Among these three interlocking principles, the environmental quality aspect addresses the natural environment and ecosystems, customers, communities and suppliers, concentrating on the limitation of the firm's impact on the natural environment through minimising the employment of natural capital (Galbreath, 2011). These efforts can entail various measures, such as the reduction of emissions in company facilities and operations, an increase in the efficiency in energy usage, risk assessment based on environmental impact analysis, or the achievement of a contraction in the environmental impact caused by products and services (Wielkiewicz & Stelzner, 2005; Galbreath, 2011). A proactive environmental strategy involves strategic planning in anticipation of future developments in regulations and trends through the setup of alternative operational processes and products to deliberately prevent harm being done to the environment (Aragón-Correa & Sharma, 2003). Hart (1995) operationalises proactive environmental strategy established on the three interrelated elements of pollution prevention, product stewardship, and sustainable development.

According to the findings from literature concerning the potential environmental and competitive advantages companies can derive from the integration of environmental sustainability concerns in corporate strategy, hypothesis 1 can be inferred:

There is an overall increase in strategic considerations of environmental sustainability among for-profit business in developed countries.

2.2 CEO influence on corporate strategic decision-making

According to the upper echelon theory established by Hambrick and Mason (1984), "organisational outcomes – both strategies and effectiveness – are viewed as reflections of the values and cognitive bases of powerful actors in the organisation" (Hambrick & Mason, 1984, p. 193). Strategic situations are perceived from the personal perspective of organisational leaders, creating individualised interpretations of such situations according to the experiences, values, and personalities of the executives (Hambrick, Upper Echelons Theory, 2018). This finding indicates that the characteristics and values of chief executive officers can have a strong impact on the formulation of corporate strategy. They act as screens or filters for the analysis of complex situations, affecting strategic decisions and firm outcomes (Manner, 2010). Moreover, observable characteristics and demographics of CEOs were found to contribute to their cognitive- and value-based filters (Hambrick & Mason, 1984). According to the updated findings of Hambrick (2007), the link between strategic decisions and resulting firm outcomes and many of the executives' characteristics has been validated throughout different studies succeeding the initial research on the upper echelon theory (e.g. McGuire, Dow, & Argheyd, 2003;

Carpenter, Geletkanycz, & Sanders, 2004; Hambrick, 2007). The upper echelon theory therefore emphasises the necessity to consider the attributes of company leaders in order to be able to properly interpret company behaviour and predict organisational outcomes (Hambrick & Mason, 1984; Hambrick, 2018).

2.3 The limiting impact of managerial discretion

Since organisations were found to reflect the characteristics and values of their top executives (Hambrick, 2018) one of the central questions in management research is to what extent chief executive officers are able to impact firm strategy and outcomes (Gupta, Nadkarni, & Mariam, 2019). Various management theorists have identified both internal and external constraints impacting the freedom executives possess in strategic decision making (Lieberson & O'Connor, 1972; Hannan & Freeman, 1977; Pfeffer & Salancik, 1978). This poses a limitation of the upper echelon theory based on the concept of managerial discretion developed by Hambrick and Finkelstein (1987; 1990). Managerial discretion can be defined as "the latitude that executives have to affect the activities of the companies that they run" (Linden & Teece, 2018, p. 950). The chief executive officer is able to influence firm behaviours based on his or her personal preferences, accordingly and the extent of this influence implies the importance of the CEO for the formulation of strategic firm directives. It has to be considered however, that the scope of influence can fluctuate based on changes in environmental and firm contexts, which can hamper or boost chief executive officers' authority (Gupta, Nadkarni, & Mariam, 2019). Thus, considering that the level of executive discretion is impacting the scope to which executive preferences and characteristics will be reflected in organisational strategies and outcomes, managerial discretion acts as a moderator of upper echelons conjectures (Hambrick, 2018).

Regardless of the potential mitigating influence of managerial discretion, there is a non-negligible responsibility of chief executive officers for firms' strategic directives including CSR concerns (Huang, 2013). As a result, CEO personality might act as an enabler or constraint despite the objective degree of discretion the CEO holds (Carpenter & Golden, 1997; Wangrow, Schepker, & Barker, 2015; Gupta, Nadkarni, & Mariam, 2019). In addition, personality was found to influence strategic matters as a key source of managerial discretion, creating space for the translation of ideologies into strategies (Gupta, Nadkarni, & Mariam, 2019). Furthermore, the way CEOs specify and advertise their strategic vision and goals was also shown to be shaped by their personality. In this context personality is influencing the approach of mobilising and coordinating the affiliated activities with the top management team as agents for the implementation of strategy across various organisational levels (Resick, Whitman, Weingarden, & Hiller, 2009; Nadkarni & Herrmann, 2010; Herrmann & Nadkarni, 2014).

Moreover, the CEO's perceived discretion is crucial in exerting influence beyond the contextually determined discretion he or she occupies (Gupta, Nadkarni, & Mariam, 2019).

2.4 Social roles, leadership and gender stereotypes

Carpenter et al. (2004) already highlighted the need to dive deeper into gender as a characteristic influencing the upper echelon research. As a starting point, the social role theory approach to leadership behaviour (Eagly & Johnson, 1990; Eagly & Johannesen-Schmidt, 2001) indicates the necessity to differentiate between gender roles and leadership roles. This approach implies that, while leaders occupy different roles in a hierarchy, they simultaneously operate under the constraints of their gender roles (Eagly, Johannesen-Schmidt, & van Engen, 2003), which can be defined as "consensual beliefs about the attributes of women and men" (Eagly, Johannesen-Schmidt, & van Engen, 2003, p. 572). This is supported by the stereotype construct describing the exhibition of behaviours and common characteristics which are group-specific, such as for male or female groups, by members of such groups (Corsini, 1999; Hoyt & Murphy, 2016; Larsson & Alvinius, 2019).

Accordingly, the findings from research concerning gender role stereotypes revealed women to have a strong communal orientation and a focus on the support and maintenance of relationships. This results in a tendency for females to put greater care towards their surroundings and putting the needs of others above their own (Hisrich & Brush, 1984; Hater & Bass, 1988; Eagly & Karau, 1991; Rosener, 1995; Eagly, Johannesen-Schmidt, & van Engen, 2003; Nielsen & Huse, 2010). This is opposed by expectations generally placed on men, who are perceived as agentic, as in dominant, assertive, and authoritative (Bem, 1974; Carli & Eagly, 2011). In earlier research, Kanter (1977a) argues for increased environmental sensitivity and policymaking exerted by women, based on the influence of characteristics deemed to be particularly female. Conforming with this, the results from research by Betz, O'Connell, & Shepard (1989) demonstrate higher moral orientation and ethical standards among women than among men. Subsequent findings of Biggins (1999) additionally indicate a better representation of stakeholders' needs by women. The focus on stakeholders' needs is supposed to reinforce the development of initiatives in areas such as sustainability through female stewardship of resources and their contribution to public goods (Galbreath, 2011; Gangadharan, Jain, Maitra, & Vecci, 2019). This argument is supported by a number of researchers demonstrating that women have an increased focus on the establishment of a positive surrounding concerning social welfare, 'going green' in general and the reduction of carbon emissions in particular (De Silva & Pownall, 2014; Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016).

These views can be backed by the results of earlier Swedish studies on climate change related risk judgments, exhibiting that women are facing more substantial concerns about the issue compared to men and that more women than men are willing to take action for risk mitigation

(Carlsson-Kanyama, Ripa Juliá, & Röhr, 2010). This is congruent with the finding that many female CEOs appear to be driven by a sense of purpose in the form of a positive impact on the community and the world as a whole (Spencer, Blazek, & Orr, 2019).

Within the scope of corporate boards, gender diversity is already considered one of the more recent governance issues organisations have to face (Singh, Terjesen, & Vinnicombe, 2008; Gangadharan, Jain, Maitra, & Vecci, 2019). Gender diversity has been promoted as boosting the inflow of new information, insights and perspectives, ultimately resulting in advanced organisational value and performance (Carter, Simkins, & Simpson, 2003; Miller & del Carmen Triana, 2009) as well as an increased emphasis on long term rather than short term considerations (Adams & Ferreira, 2009; Ahern & Dittmar, 2012; Matsa & Miller, 2013). One particular aspect of improvement through the expansion of female appointees on corporate boards is the increased enforcement of ethical conduct as perceived by shareholders and thus an improved quality of governance (Galbreath, 2011; Gangadharan, Jain, Maitra, & Vecci, 2019). As a consequence, it is not surprising that female representation on corporate boards was found to enhance a company's environmental consciousness (Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016).

Transferring these findings from the board perspective to the appointment of chief executive officers, through giving women access to leadership positions, environmental sensitivity and policymaking are placed on corporate agendas, as this is determined by their specific characteristics (Kanter, 1977a; Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016).

Combining the conclusions which can be drawn from the upper echelon theory, the concept of managerial discretion and the social roles theories lead to hypothesis 2:

Companies led by female CEOs exhibit more distinct environmental sustainability strategies than companies led by male CEOs.

3 Methodology

3.1 Research design

In order answer the research question "To what extent does CEO gender have an impact on the adoption of environmentally sustainable practices among for-profit businesses in developed countries?" the two hypotheses outlined in chapter 2 will be tested based on an empirical analysis of quantitative data of for-profit companies in developed countries. Considering the role of such businesses as one of the main contributors to the worldwide greenhouse gas emissions (European Parliament, 2019), it is feasible to design the research around these types of companies to conduct a reliable analysis of the underlying issue. For obtaining a

holistic report about the inclusion of aspects concerning environmental sustainability in corporate strategies and the impact chief executive officers are able to exert on them, a quantitative approach incorporating data from a large sample of companies from various sectors and with different sizes listed in common stock indices is used.

3.2 Data selection

The Thomson Reuters Eikon database was selected as the primary source for gathering data on environmental sustainability for those companies. This database offers company data on numerous key performance indicators concerning environmental, social, and corporate governance (ESG) issues, reporting separate values for each of the three categories. It extends the ESG data from the Thomson Reuters ASSET4 database (Thomson Reuters, 2017), which has been applied for previous studies on similar research topics (e.g. Cheng, Ioannou, & Serafeim, 2014; Eccles, Ioannou, & Serafeim, 2014; Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016). The environmental part, which is in the focus of this thesis, comprises three sub-areas within the Thomson Reuters Eikon database: resource use, emissions, and environmental innovation. These areas are in line with the conceptualisation of environmental strategy established by Hart (1995) and the goal of environmental sustainability to reduce repercussions on the environment caused by companies and to limit the exploitation of natural capital (Galbreath, 2011). Separate scores for each of the three sub-categories can be extracted from the database, enabling a distinct analysis of each of the particular aspects of relevance for the topic. The values for environmental sustainability overall and resource use, emissions, and environmental in particular are reported as grades ranging between A+ and D- and as numerical scores compiled based on a data-driven evaluation of the relative ESG performance of a broad range of companies (Refinitiv, 2020).

General company data, such as industry and financial data, as well as board composition, will be retrieved from the ORBIS database by Bureau van Dijk containing exhaustive and reliable data on private companies and entities (Bureau van Dijk, 2020). Furthermore, ORBIS also contains data on executives, supporting the data from EIKON with the CEO gender, which will be applied to properly investigate the relation between the gender of the chief executive officers and the environmental performance of the firms included in the analysis. A time-lagged analysis of the variables will be employed to account for changes within companies over time, since Hambrick and Mason (1984) suggest that for strategic initiatives to manifest within an organisation there are diverging “lag times”.

3.3 Sample

Accounting for the fact that female CEOs still only constitute a share below 10% of CEOs overall (Catalyst, 2020), the businesses included in the sample were compiled based on two different indices, combining the Standard & Poor's 500 (S&P 500) and the Financial Times Stock Exchange 100 (FTSE 100). The S&P 500 represents the 500 largest publicly traded companies in the US and is weighted according to the market capitalisation of those companies (Boulouta, 2013; Kenton, 2020). Therefore, the index acts as a broad representation of the US American business landscape. Additionally, the FTSE 100 contains the 100 largest companies on the London Stock Exchange, and it is the most popular and widely used stock market index in Europe (Young, 2019). The two different indices were used to ensure a sufficient representation of the female gender among the cases considered for the analysis and to achieve an international perspective for the study.

A five-year panel dataset was constructed based on ASSET4 and ORBIS data, following previous studies suggesting a five-year period as a reliable timeframe to account for changes within companies over time (Boulouta, 2013; Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016). To focus on the most recent developments within the companies and to account for the fact that the figures of women among executives are still evolving (Spencer, Blazek, & Orr, 2019; Lageberg & Schmidt, 2020), the sample is covering the five most recent years from 2015 to 2019. Removing those companies where the available data was not sufficient for conducting a proper analysis resulted in a sample of 412 companies and 2,060 observations. 73 of the companies are listed in the FTSE 100, making up for 17.72%. The remaining 82.28% of the companies in the sample (339 companies) are listed in the S&P 500 index. The distribution of male and female CEOs within the sample throughout the years being analysed can be found in Table 1. It can be observed that the share of female CEOs is increasing throughout the years in question and has doubled between 2015 and 2019, where the CEO is female in 28 (6.80%) of the companies represented in the two indices.

Table 1 Distribution of female and male CEOs among the sample

Year	Female CEOs		Male CEOs	
	Frequency	Percentage	Frequency	Percentage
2015	14	3.40	398	96.60
2016	17	4.13	395	95.87
2017	21	5.10	391	94.90
2018	23	5.58	389	94.42
2019	28	6.80	384	93.20

Focusing on the industry sectors according to the MSCI Global Industry Classification Standard (GICS), the three sectors with the largest representation within the sample are Consumer

Discretionary (Automobiles & Components, Consumer Durables & Apparel, Consumer Services, Retailing), Industrials (Capital Goods, Commercial & Professional Services, Transportation) as well as Information Technology (Software & Services, Technology Hardware & Equipment, Semiconductors & Semiconductor Equipment). The percentage shares and absolute numbers for each of the 11 GICS sectors can be derived from Table 2.

Table 2 Distribution of the sample according to GICS sector classifications

Sector		Frequency	Percentage	Cumulative Percent
10	Energy	23	5.58	5.58
15	Materials	32	7.77	13.35
20	Industrials	61	14.81	28.16
25	Consumer discretionary	68	16.50	44.66
30	Consumer staples	31	7.52	52.18
35	Health Care	43	10.44	62.62
40	Financials	9	2.18	64.81
45	Information Technology	58	14.08	78.88
50	Communication services	29	7.04	85.92
55	Utilities	29	7.04	92.96
60	Real Estate	29	7.04	100.00
Total		412	100.0	

3.4 Measurement

For the setup of an analysis focusing on the development of environmental sustainability within the companies in question, the scores which can be derived from the Thomson Reuters Eikon database for the category of environmental sustainability will be treated as dependent variables. Since the data on the environmental pillar (EP) in the database is reported as an overall value as well as with distinct values for each of the sub-categories of resource use (RU), emissions (EM) and environmental innovation (EI), a separate analysis will be conducted for each of the four dimensions as a dependent variable to achieve a holistic representation of the situation.

The gender of the chief executive officers of the companies incorporated within the analysis (CEOg) will be treated as the main independent variable of interest. Furthermore, board gender diversity (BGD) and executive member gender diversity (EMGD) will be added as additional measures for diversity on management level, since a more diverse board might indicate a tendency towards a more diverse selection of executives as well and increased executive diversity might also affect efforts concerning environmental sustainability within businesses (Boulouta, 2013; Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016).

Industry (GICS), firm size (SIZE), financial performance (ROE) and risk (RISK) will be used as control variables, since those were found to be related to corporate social performance in general (Margolis & Walsh, 2001; Manner, 2010; Boulouta, 2013).

Figure 1 presents the variable relations of the variables chosen for the subsequent statistical analysis. The codebook containing all variable definitions for dependent and independent variables is presented in Table 3.

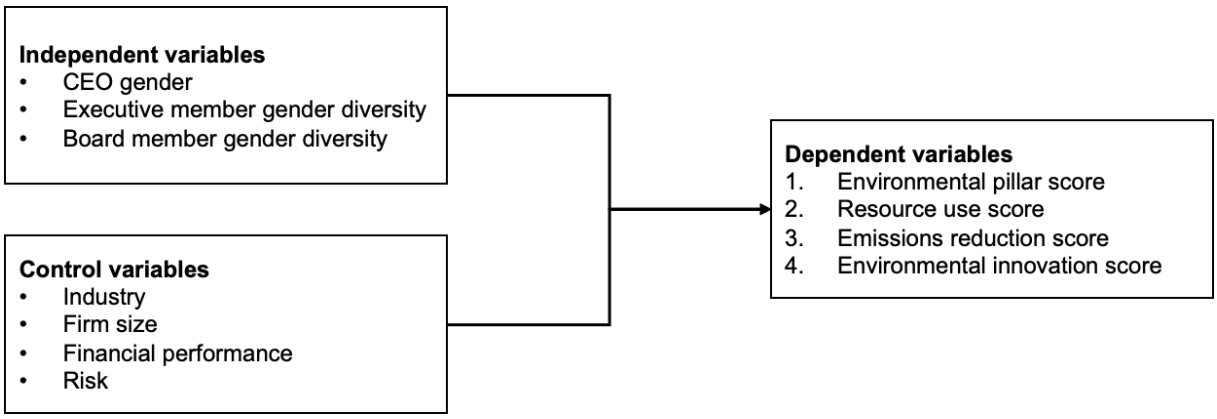

Figure 1 Variable relations

Table 3 Codebook and variable definitions

Variable	Code	Definition
Environmental sustainability		
Environmental pillar score	EP	Combines the relative sum of the category weights of emissions, resource use, and environmental innovation into an overall measurement score of environmental sustainability (Refinitiv, 2020)
Resource use score	RU	Reflects companies' efforts to reduce resource consumption, including water and energy as well as accomplishments in the development of sustainable packaging and an environmental supply chain (Refinitiv, 2020)
Emissions reduction score	EM	Focuses on the topics of emissions, waste, biodiversity and environmental management systems and measures companies' commitment towards the reduction in production and operations (Refinitiv, 2020)
Environmental innovation score	EI	Incorporates a company's achievements in reducing the environmental costs and burdens for its customers through environmental product innovation as well as green revenues, research and development and capital expenditures (Refinitiv, 2020)
Gender diversity		
CEO gender	CEOg	Represented through an indicator variable taking 1 for female and 0 for male chief executive officers following Manner (2010)
Executive member gender diversity	EMGD	Measured as the number of female members of the executive board compared to the overall size of the executive board expressed in percent.
Board member gender diversity	BMGD	Expressed as the number of female board members compared to the overall board size in percent (Galbreath, 2011)
Control variables		
Industry	GICS	Defined as the two-digit GICS industry sector code covering the companies listed in the S&P 500 index as well as those listed in the FTSE 100
Firm size	SIZE	Measured as the natural logarithm of total assets following Manner (2010)
Financial performance	ROE	Measured based on the companies' return on equity in percent in accordance with the study of Boulouta (2013)
Risk	RISK	Defined as the ratio of long-term debt to total assets (Manner, 2010)

3.5 Data analysis

Using SPSS Statistics Version 26.0 as the main analytical tool, the analysis will test the hypotheses regarding the increasing inclusion of environmental sustainability concerns in corporate strategy in general and the effect of CEO gender on strategic initiatives regarding environmental sustainability in particular. To be able to control for omitted or unobservable variables an analysis of a panel dataset as a hybrid of cross-sectional and longitudinal data will be applied. In this type of analysis, the behaviour of the companies included can be repeatedly measured on an outcome over time, accounting for individual heterogeneity (Torres-Reyna, 2007; Boulouta, 2013; Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016; Crowson, 2019). Two methods which are typically adopted to model the data include fixed effects analysis and random effects analysis (Crowson, 2019).

The fixed effects analysis focuses on the exploration of the relationship between predictor and outcome variables within an entity (e.g. company) based on the assumption that the variables may be impacted through the individual characteristics of the entity, which needs to be controlled for. Furthermore, the fixed effects model assumes that these time-invariant characteristics are unique to the entity and should therefore not be correlated with other individual characteristics (Torres-Reyna, 2007).

In contrast to the fixed effects model, the random effects model is based on the assumption that the variation across entities is random and not correlated with the regressors included in the model (Greene, 2008, p. 183). As a consequence, a random effect model allows for time invariant variables, such as gender, to act as explanatory variables and it enables drawing conclusions beyond the sample utilised in the model (Torres-Reyna, 2007; Greene, 2008, p. 183).

The Hausman test for endogeneity is used to determine which model is applicable for the dataset in question, testing if the unique errors are correlated with the regressors (Torres-Reyna, 2007). For this test, the underlying null hypothesis states that the unique errors are uncorrelated with the regressors and therefore the random effects model is applicable (Greene, 2008). According to the assessment, the P values for each of the variables under investigation are above 0.05 (P values 0.53 for environmental pillar, 0.10 for environmental innovation, 0.31 for emissions and 0.56 for resource use). These results allow for the null hypothesis to be accepted accordingly and the data will be modelled using random effects panel regression. A more detailed overview of the test results of the Hausman test for each of the four dependent variables can be found in the appendix.

4 Results

4.1 Descriptive statistics and correlations

The descriptive statistics for the dataset are presented in Table 4. The mean value for board gender diversity (BGD) is 23.05%, with a standard deviation of 9.54%. The minimum and maximum values are 0% and 62.50%, respectively. For executive member gender diversity (EMGD), the mean value is 16.10% and therefore slightly lower than for BGD. Moreover, the standard deviation (13.10%) is higher than for BGD, showing greater volatility in the numbers, which also reflects in the minimum (0.00%) and maximum (100.00%) values.
Focusing on the descriptive statistics of the sustainability indicators, the mean for the EP score is 52.16 with a standard deviation of 27.06, a minimum value of 0.00 and a maximum value of 98.53. For RU, EM, and EI the means are 60.54, 57.66, and 32.72, respectively. The standard deviations for all three indicators are ranging around 31 with a minimum value of 0.00 and a maximum value close to 100.

Table 4 Descriptive statistics

Variable	*M*	*SD*	Min.	Max.
Board Gender Diversity	23.05	9.54	0.00	62.50
Executive Member Gender Diversity	16.10	13.10	0.00	100.00
Long term Debt / Total Assets	0.64	0.31	0.06	7.76
Return on Equity - Actual	0.24	1.66	-53.33	26.05
Firm size (Natural log of TA)	23.55	1.21	18.12	27.70
Environmental Pillar Score	52.16	27.06	0.00	98.53
Resource Use Score	60.54	31.51	0.00	99.79
Emissions Score	57.66	31.09	0.00	99.83
Environmental Innovation Score	32.72	31.75	0.00	99.70

The correlation coefficients can be derived from Table 5, with statistically significant correlations indicated at the 5% and 10% levels. The correlation matrix demonstrates statistically significant positive relationships between board gender diversity (BGD) and executive member gender diversity (EMGD), as well as between BGD and CEO gender (CEOg). This is in line with the findings of Matsa and Miller (2013), indicating that expanding the female representation on corporate boards is likely to trigger similar changes in the gender composition on the executive level. Additionally, ROE is significantly and positively correlated to both BGD and EMGD, underlining observations from previous studies detecting a positive relationship between the presence of women on company boards and financial performance (Adams & Ferreira, 2009; Kassinis, Panayiotou, Dimou, & Katsifaraki, 2016). For the RISK variable there were no significant relationships found to any of the other independent variables in question in

this study. Further significant and positive coefficients are demonstrated for SIZE and the gender diversity indicators BGD, EMGD, and CEOg, providing weak evidence that larger firms pay more attention towards a gender diverse composition of supervisory and executive boards.

Table 5 Correlation matrix

		1	2	3	4	5	6	7	8	9	10
1	GICS										
2	BGD	.003									
3	EMGD	.067**	.357**								
4	CEOg	.062**	.199**	.182**							
5	RISK	-.041	.005	-.006	-.017						
6	ROE	.020	.053*	.068**	.033	-.014					
7	SIZE	.040	.135**	.077**	.068**	.036	-.098**				
8	EP	-.088**	.281**	.136**	.010	-.018	-.021	.408**			
9	RU	-.064**	.277**	.198**	.044*	-.003	-.001	.375**	.879**		
10	EM	-.062**	.286**	.163**	.016	-.010	-.003	.392**	.880**	.790**	
11	EI	-.079**	.116**	-.028	-.056*	-.057**	-.036	.224**	.631**	.377**	.358**

*** $p < 0.01$, * $p < 0.05$, two-tailed.*

Focusing on the dependent variables including environmental pillar score (EP), resource use score (RU), emissions score (EM), and environmental innovation score (EI) chosen for the representation of environmental sustainability for the sample, significant correlations can be observed for some of the explanatory variables. The correlation coefficients for RISK and ROE do not present significant correlations to any of the explaining variables, except for EI and RISK, showing a weak negative correlation. Significant and positive correlations were found for SIZE and all dependent variables however, illustrating a tendency for large firms to focus more on issues of environmental sustainability than smaller firms.

Moreover, the correlation coefficients for all four outcome variables and BGD are positive and significant. A similar observation can be made for EMGD, even though the correlation is weaker in this case. Additionally, the EI variable presents an exception, since it is negative but also insignificant. Drawing the attention to CEO gender as the main explanatory variable of interest presents a slightly different image. The coefficients for both EP and EM are insignificant. The only variable presenting a weak positive correlation to CEOg is RU, which is significant at the 5% level. The other variable positing a result which is significant at the 5% level is EI, with a weak negative correlation coefficient. Overall, it can be derived that, according to the correlation matrix for the underlying sample, the correlations between CEO gender and the indicators for environmental sustainability are very weak, if existent at all.

4.2 Implementation of environmental sustainability in corporate strategy

To test H1 developed throughout the theoretical framework in chapter 2, stating that *"There is an overall increase in strategic considerations of environmental sustainability among for-profit business in developed countries",* a closer look will be taken at the development of the environmental pillar score and its three constituents throughout the years included in the observation. Figure 2 visualises the development of all four indicators from 2015 to 2019, showing an upward trend for all three constituents of the environmental pillar score and, consequently, the EP score itself. The graph reveals a relatively large discrepancy between the environmental innovation score and the two other environmental pillar subdimensions. This gap can partly be explained due to a slightly lower weighting of this score in the environmental sustainability category (Refinitiv, 2020). However, this finding also indicates a potential lack in focus on this topic, which includes research and development expenditures for environmental innovation efforts, among others.

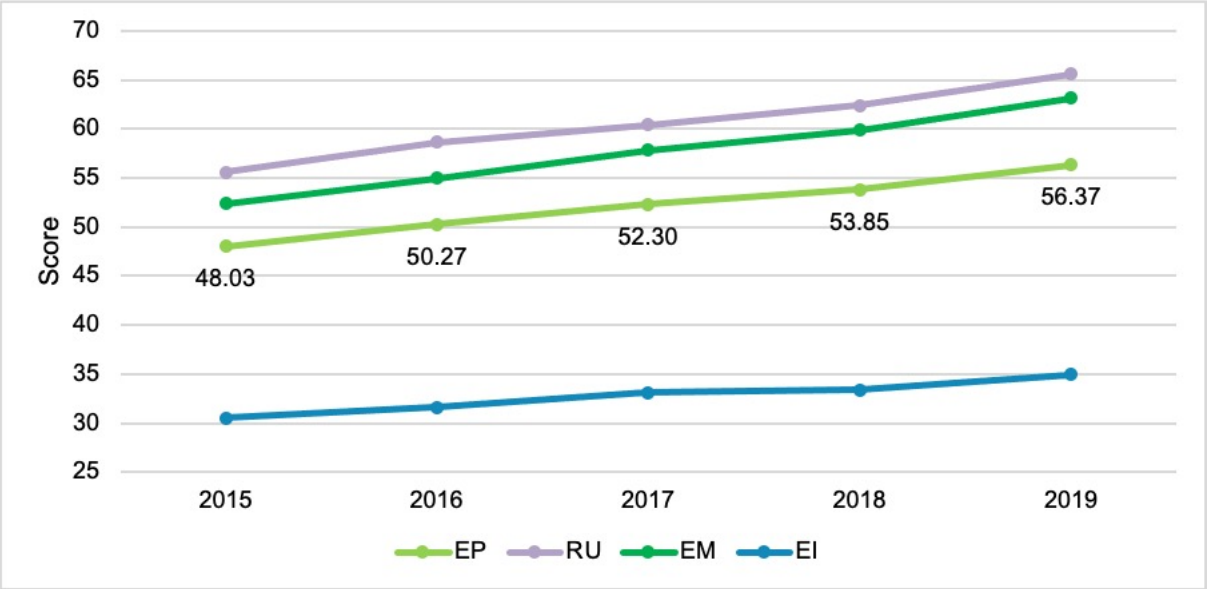

Figure 2 Development of environmental sustainability scores 2015-2019

To supplement the observations from the graphical representation of the scores, Table 6 presents the mean values and percentage changes for all four indicators on a year to year basis. The numbers exhibit a percentage increase between 3.54% and 5.5% for each score and for each of the consecutive years taken into consideration for the sample. Furthermore, it can be observed that the main driver for this increase is the emissions reduction score with an average year-on-year increase of 4.79%, followed by resource use (4.23%) and environmental innovation (3.45%). The environmental pillar score combining all three dimensions discloses an average increase of 4.52% between 2015 and 2019.

Table 6 Development of environmental sustainability scores 2015-2019

Score	2015	2016	2017	2018	2019	*M*
EP	48.03	50.27 (+4.68%)	52.30 (+4.03%)	53.85 (+4.68%)	56.37 (+4.68%)	53.2 (+4.52%)
RU	55.59	58.65 (+5.50%)	60.44 (+3.05%)	62.43 (+3.30%)	65.58 (+5.04%)	61.8 (+4.23%)
EM	52.38	55.00 (+5.01%)	57.86 (+5.20%)	59.88 (+3.49%)	63.16 (+5.48%)	59 (+4.79%)
EI	30.54	31.62 (+3.54%)	33.11 (+4.72%)	33.37 (+0.78%)	34.96 (+4.77%)	33.3 (+3.45%)

As a consequence, it can be concluded that hypothesis 1 holds true for the sample throughout the given years and there is indeed an increase in strategic considerations of environmental sustainability. This development is particularly driven by efforts for the reduction of emissions and waste in production and operations. Moreover, the scores indicate that there is relatively less focus on the inclusion of aspects of environmental innovation in corporate strategy compared to resource use and the reduction of emissions.

Looking at the results at the industry sector level presented in Table 7, it can be observed that the consumer staples and the materials sectors achieve the highest average scores for the environmental pillar score overall. The lowest average scores reported are those in the communication services and financial sectors. Concerning the latter, it has to be acknowledged however, that there are only nine firms operating in the financial sector included in the sample, with a share of 2.18% of the sample overall (see Table 2). Due to the small sample size for this sector, the results have to be interpreted with some caution. Focusing on the sector-wise development of the scores throughout the years reveals the highest average increase in the financials (27.91%) and health care (8.58%) sectors. Again, due to the small sample size for the financial sector, this result has to be interpreted carefully, since very few companies can account for large changes in the analysis of these ratios.

Table 7 Overview of environmental pillar score development on sector level

GICS Sector	2015	2016	2017	2018	2019	*M*
Consumer staples	64.48	67.95 (+5.38%)	68.75 (+1.18%)	69.76 (+1.47%	70.65 (+1.27%)	68.31 (+2.33%)
Materials	61.29	62.11 (+1.34%	63.66 (+2.50%)	63.59 (-0.11%)	66.34 (+4.32%)	63.40 (+2.01%)
Utilities	53.43	55.33 (+3.55%)	57.21 (+3.40%)	60.95 (6.54%)	62.11 (+1.91%)	57.80 (+3.85%)
Energy	53.64	55.09 (+2.72%)	56.74 (+3.00%)	60.39 (+6.44%)	61.28 (+1.47%)	57.43 (+3.40%)
Real Estate	48.48	54.03 (+11.46%)	57.71 (+6.81%)	59.60 (+3.27%)	61.56 (+3.29%)	56.27 (+6.21%)
Industrials	48.68	49.54 (+1.78%)	50.79 (+2.52%)	51.80 (+1.98%)	53.17 (+2.65%)	50.80 (+2.23%)
Consumer discretionary	47.25	48.56 (+2.77%	50.78 (+4.57%)	52.10 (+2.60%)	53.63 (+2.94%)	50.47 (+3.22%)
Health care	42.60	46.40 (8.93%)	49.12 (+5.85%)	51.01 (+3.86%)	59.02 (+15.69%)	49.63 (+8.58%)
Information technology	43.30	45.34 (+4.71%)	47.78 (+5.37%)	48.90 (+2.34%)	51.72 (5.77%)	47.41 (+4.55%)
Communication services	34.17	35.60 (+4.17%)	37.03 (+4.02%)	39.05 (+5.48%)	40.79 (+4.46%)	37.33 (+4.53%)
Financials	13.43	22.08 (+64.31%)	25.80 (+16.89%)	26.65 (+3.29%)	33.89 (+27.14%)	24.37 (+27.91%)

The smallest average increase is reported for the materials (2.01%) and industrials (2.23%) sectors. Considering that the materials sector is one of the sectors in which the overall scores are already quite high on average, smaller average-percentage-increases are coherent with this observation. The industrials sector has a rather low average EP score (50.80), which is why larger increases could be expected. The comparably small improvements in environmental sustainability matters in this area are likely to be based on the fact that it is a rather traditional sector with a relatively large share within the sample (14.81%; see Table 2). As a consequence, the maturity of the industrials sector might result in longer lag times for improvements to become visible.

4.3 CEO gender and environmental sustainability

To test H2 regarding the impact of CEO gender on environmental sustainability, the random effects panel regression was carried out using four distinct models with a different dependent variable to account for all four dimensions of environmental sustainability available in the dataset. The estimates of fixed effects for the environmental pillar score as the overall score

combining the three subdimensions RU, EM, and EI are presented in Table 8, the estimates of covariance parameters can be found in Table 9.

Table 8 Estimates of fixed effects (dependent variable: EP score)

Parameter	*Est.*	*SE*	*df*	*F*	*t*	*p*	95% CI	
							Lower Bound	Upper Bound
Intercept	-123.558	15.881	1324.718	61.294	-7.780	.000	-154.713	-92.403
[CEOg=0]	.705	2.223	2031.323	.101	.317	.751	-3.655	5.064
[CEOg=1]	0[a]	0	.		.	.	.	.
GICS	-.191	.076	408.791	6.354	-2.521	.012	-.340	-.042
BGD	.256	.038	1881.561	44.607	6.679	.000	.181	.331
EMGD	.095	.032	1941.400	8.621	2.936	.003	.032	.159
RISK	.025	1.166	1877.815	.000	.022	.983	-2.261	2.311
ROE	.000	.001	1706.646	.029	.170	.865	-.003	.003
SIZE	7.388	.664	1340.140	123.974	11.134	.000	6.086	8.690

[a] *This parameter is set to zero because it is redundant.*

Table 9 Estimates of covariance parameters (dependent variable: EP score)

Parameter		*Est.*	*SE*	*Wald Z*	*p*	95% CI	
						Lower Bound	Upper Bound
Repeated measures	Variance	76.070	2.654	28.665	.000	71.043	81.453
Intercept [subject = ID]	Variance	500.989	36.173	13.850	.000	434.880	577.147

Even though the results presented in Table 8 indicate significant and positive effects for BGD (Est. 0.256, $p < 0.01$) and EMGD (Est. 0.095, $p < 0.01$), no significant effect of the CEO gender variable on the EP score was found. Testing the model without the EMGD variable to rule out potential correlation effects due to the link between EMGD and CEOg yielded similar results. Moreover, the results of the Wald Z statistic (Wald Z = 13.85, $p < 0.01$) included in Table 9 suggest that there are important unmeasured variables and therefore a random effect is needed (Seltman, 2018).

Table 10 Estimates of covariance parameters (RU, EM, EI)

Parameter	RU	EM	EI
Intercept	-142.389***	-171.117***	-62.446***
[CEOg=0]	3.371	-.432	.924
[CEOg=1]	0[a]	0[a]	0[a]
GICS	-.172*	-.172**	-.181*
BGD	.339***	.361***	.115**
EMGD	.146***	.169***	-.035
RISK	-1.459	1.218	-.332
ROE	.001	.001	-.002
lnTA	8.332***	9.473***	4.183***
Wald Z	28.676***	28.683***	28.668***

*[a]This parameter is set to zero because it is redundant; * p < 0.1, ** p < 0.05, *** p < 0.01*

Rerunning the model with the three subdimensions of the environmental pillar score to achieve a more distinct illustration of the potential relationships between the variables yielded similar results, which are reported in Table 10. The models for the resource use, emissions reduction, and environmental innovation also revealed that the estimated coefficient for the CEO gender variable is insignificant, confirming the results for the overall environmental pillar score from the previous model. However, also for the three models containing the EP subdimensions the estimates for BGD and EMGD are positive and significant. An exception can be observed for the environmental innovation score though, disclosing a weaker estimate (Est. 0.115, $p < 0.05$) for the board gender diversity variable than RU and EM, and an insignificant estimate for executive member gender diversity.

As a consequence, based on the results of the four different random effects models for the underlying sample, H2 regarding the positive impact of female CEOs has to be rejected. Nonetheless, the models still reveal a positive impact of overall executive member gender diversity on environmental sustainability and its subdimensions. In addition, findings from previous studies concerning the positive impact of board member gender diversity are substantiated based on the outcome of this study.

5 Discussion and conclusion

5.1 Key findings

In support of hypothesis 1, the results from the empirical study emphasise an increasing focus of for-profit companies in developed countries on the aspect of environmental quality in the triple bottom-line throughout recent years. The numbers presented for the environmental pillar score reported by the Thomson Reuters Eikon database are drawing an image of increasing materialisation of the necessity to include environmental sustainability in business strategy. Taking a look at the constituents of the environmental pillar score delivers further justification for this observation: it appears that the companies in question are placing all aspects of a more environmentally friendly way of conducting business on corporate agendas.

Even though these results present a positive development in the field of environmental sustainability, it also becomes apparent that there is still considerable room for improvement in certain areas. First of all, the scores imply that environmental innovation is an area within environmental sustainability which is still rather neglected in strategy formation compared to efforts for the improvement of resource use and the reduction of emissions. In this context, visualising what the dimension of environmental innovation encompasses offers a possible explanation. It “reflects a company’s capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed products” (Refinitiv, 2020, p. 22). This consists of green revenues, research and development, as well as capital expenditures – arguably areas which have the potential to be accompanied by substantially higher costs than other fields of sustainable strategy. As a consequence, companies focused on profits and in fear of a negative return on investment might tend to choose comparatively easier and less cost intensive approaches to environmental sustainability. The lack of sufficient incentives apart from a marketing advantage towards environmentally conscious customers act as benefactors in this case.

Secondly, especially in large and rather traditional industries, such as the industrials sector, the sustainability scores are still relatively low and only show a marginal year-on-year increase. This finding emphasises the necessity for ongoing focus on the promotion of the positive triple-bottom-line effect inherent in the integration of environmental sustainability in business strategy. Among the measures which can be taken, placing the right people in the positions with decision-making authority concerning more environmentally friendly business practices plays a crucial role. The question whether these “right” people tend to be female rather than male remains unanswered based on the underlying analysis, since hypothesis 2 could not be confirmed.

According to the theories introduced in the first part of the thesis the missing relationship between environmental sustainability and CEO gender seems counterintuitive and offers room for interpretation. The combination of this finding with the link between executive member gender diversity and environmental sustainability detected in the empirical analysis provides some support for the theories developed by Kanter (1977a,b). In the critical mass theory, it is claimed that one woman is a token, two is a presence, and three is a voice (Kanter, 1977b). This finding describes the effect the presence of women has on decision-making in corporate boards. Even though this was mainly researched in the context of board gender diversity, these results likely also have relevance for the executive suite. In this case, women in leadership positions actually place a bigger emphasis on environmental sensitivity and related policymaking (Kanter, 1977a). However, the mere presence of a woman as a chief executive officer will not have the desired positive effect on environmental strategy formation unless these efforts are supported by other female leaders present in the executive suite. This is in line with the upper echelon theory and the moderating influence of managerial discretion. Although chief executive officers and their attributes are considered a driving force for organisational strategy-making, there is a potential alleviation of this impact depending on the environmental or firm context and the perceived discretion of the manager (Hambrick & Mason, 1984; Hambrick, Upper Echelons Theory, 2018; Gupta, Nadkarni, & Mariam, 2019). Since gender role theory claims that women have a tendency to put the needs of their surroundings above their own needs (Nielsen & Huse, 2010), this might result in a perceived lack of discretion of female CEOs in favour of the interests of other organisational actors around them. As a consequence, the gender stereotype approach also offers a plausible explanation for the missing link in this study.

Another important aspect to account for in the interpretation of the results is that this study was not able to overcome the sample bias of Manner's (2010) previous study. The imbalance of the sample concerning the ratio of male and female CEOs and the low overall number of female CEOs in the sample have to be considered as a lack in the database. The underrepresentation of female leaders is an ongoing issue in businesses and the paradigm shift takes more time than the interest groups affected would hope for (Catalyst, 2020). Nonetheless, Manner's findings could be extended in so far, as a positive link between the gender diversity of the executive level and sustainability could be detected. Consequently, continuously advancing gender diversity among executive members is likely to support placing environmental sustainability matters in the centre of corporate strategy. Furthermore, it is also acting as an encouragement for female leaders to become CEOs, since filling executive roles with competent women places them in the right position for subsequent promotions.

Finally, for the research question *"to what extent does CEO gender have an impact on the adoption of environmentally sustainable practices among for-profit businesses in developed countries?"* no definite answer can be found based on the results of this study. From the limited

data on female CEOs in the sample, it cannot be observed that gender significantly impacts strategy formation in favour of environmental sustainability. However, it appears that for environmental sustainability to become an essential part of corporate strategy, the whole executive suite needs to buy in. In this case, placing a fair share of women in executive roles does positively impact sustainable business practices, which is likely based on the increased environmental sensitivity female leaders bring to the table.

5.2 Limitations

The most apparent limitation of this study is the sample size, especially concerning the representation of female chief executive officers within the sample. Even though this might partially be overcome by extending the study to countries beyond those covered by the S&P 500 and FTSE 100 indices, this will probably not fix the main underlying issue. Since the gender imbalance on the executive level is still a large concern, the underrepresentation of women among chief executive officers will remain an issue for research purposes.

Moreover, the results are limited to the perspective of the two indices chosen for the analysis. Extending the sample towards the inclusion of a more diverse set of countries and indices could improve the quality of the results in regard to their cultural dependence. Especially countries where gender stereotypical beliefs are less apparent due to a high degree of gender equality might have an impact on the outcome of the study.

Furthermore, there might be a reverse causality bias regarding the link between executive member gender diversity and environmental sustainability. This would imply that a focus on strategy development for environmental sustainability leads to the appointment of more female executives, and not the other way around. Qualitative interviews supporting the quantitative study serve as a potential tool to overcome this limitation by providing a deeper insight into the processes for strategy development and implementation.

Considering that the reliability and transparency of CSR rankings is a topic of ongoing discussion (see Chapter 1), the choice of the Thomson Reuters Eikon database poses another limitation. The inclusion of further rankings particularly focusing on environmental sustainability could therefore serve as additional leverage to supplement the findings from this study.

5.3 Future research

Environmental sustainability and gender diversity are topics of ongoing discussions and it is likely that the pressure towards the inclusion of both in business strategy will continuously increase. The effect of women in leadership positions on environmental sustainability offers various directions for future research, accordingly. Especially the research concerning the potential differences between the genders in the executive chair should be extended once a more

profound information base is available. The introduction of quotas following recent legislation in various countries around the world will assist in increasing the share of women throughout company boards and the executive suite (Mensi-Klarbach & Seierstad, 2020). Thus, this will support the increase of the sample size and the improvement of the sample quality for forthcoming studies.

Furthermore, the choice of one particular index for the measurement of environmental sustainability always limits the reliability of the results to that particular index (see Chapter 5.4). Extending the study to a greater variety of environmental sustainability indices would offer insights on the validity of the findings, accordingly. Considering that environmental sustainability is often measured as a part of overall CSR rankings (see Chapter 1.2), the decomposition of those rankings towards the sustainability aspect has to be done with caution.

Lastly, getting a glance beyond the rankings might be another interesting direction for future research. A qualitative study focusing on actual measures companies are taking regarding the implementation of sustainable strategy might offer another perspective on what it means for businesses to become greener.

5.4 Practical implications

From a managerial perspective, this study provides new impulses regarding the drivers of sustainability and the advancement of gender diversity within the organisation. The empirical analysis emphasised the positive effect of both board gender diversity and executive member gender diversity on environmental sustainability. At the same time, the consumer buying behaviour is increasingly shifting towards environmentally conscious purchases and the beneficial impact of a green strategy offensive on the bottom line cannot be neglected (White, Hardisty, & Habib, 2019). As a consequence, the results contribute further leverage towards the introduction of measurements for the increase of diversity to secure business success. It becomes apparent that it is not sufficient to appoint women as tokens, as it appears that changes only become evident once a critical mass of voices is achieved. Therefore, the promotion of diversity should include policy initiatives specifically targeting gender diversity on all organisational levels. After all, enabling access for women to executive and board positions occurs to be necessary for the manifestation of environmental sustainability considerations in corporate strategy. As an additional effect, designating more female leaders as decision-makers will place them in the pipeline for the executive chair, bearing positive implications for the numbers of female chief executive officers in the future.

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Appendix

Appendix A – Codebook

GICS

		Value	Count	Percent
Standard Attributes	Label	GICS Sector Code		
	Type	Numeric		
	Measurement	Nominal		
	Role	Input		
Valid Values	10	Energy	115	5.6
	15	Materials	160	7.8
	20	Industrials	305	14.8
	25	Consumer Discretionary	340	16.5
	30	Consumer Staples	155	7.5
	35	Health Care	215	10.4
	40	Financials	45	2.2
	45	Information Technology	290	14.1
	50	Communication Services	145	7.0
	55	Utilities	145	7.0
	60	Real Estate	145	7.0

YEAR

		Value	Count	Percent
Standard Attributes	Label	Index Variable		
	Type	Numeric		
	Measurement	Nominal		
	Role	Input		
Valid Values	1	2019	412	20.0
	2	2018	412	20.0
	3	2017	412	20.0
	4	2016	412	20.0
	5	2015	412	20.0

BGD

			Value
Standard Attributes		Label	Board Gender Diversity %
		Type	Numeric
		Measurement	Scale
		Role	Input
N		Valid	2060
		Missing	0
Central Tendency and Dispersion		*M*	23.047
		SD	9.538
		Percentile 25	16.667
		Percentile 50	22.222
		Percentile 75	28.571

EMGD

		Value
Standard Attributes	Label	Executive Member Gender Diversity %
	Type	Numeric
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	16.0994
	SD	13.10233
	Percentile 25	7.6923
	Percentile 50	14.2857
	Percentile 75	25.0000

CEOg

		Value	Count	Percent
Standard Attributes	Label	CEO Gender		
	Type	Numeric		
	Measurement	Nominal		
	Role	Input		
Valid Values	0	Male	1957	95.0
	1	Female	103	5.0

RISK

		Value
Standard Attributes	Label	Long term Debt / Total Assets
	Type	Numeric
	Format	F19.2
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	0.642
	SD	0.309
	Percentile 25	0.498
	Percentile 50	0.631
	Percentile 75	0.746

ROE

		Value
Standard Attributes	Label	Return on Equity - Actual
	Type	Numeric
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	24.228%
	SD	166.055%
	Percentile 25	11.325%
	Percentile 50	19.255%
	Percentile 75	30.685%

SIZE

		Value
Standard Attributes	Label	Natural logarithm of Total Reported Assets
	Type	Numeric
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	23.553
	SD	1.212
	Percentile 25	22.713
	Percentile 50	23.515
	Percentile 75	24.335

EP

		Value
Standard Attributes	Label	Environmental Pillar Score
	Type	Numeric
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	52.164
	SD	27.056
	Percentile 25	31.164
	Percentile 50	58.121
	Percentile 75	74.790

RU

		Value
Standard Attributes	Label	Resource Use Score
	Type	Numeric
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	60.538
	SD	31.509
	Percentile 25	39.245
	Percentile 50	69.343
	Percentile 75	87.323

EM

		Value
Standard Attributes	Label	Emissions Score
	Type	Numeric
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	57.655
	SD	31.093
	Percentile 25	36.197
	Percentile 50	64.286
	Percentile 75	84.024

EI

		Value
Standard Attributes	Label	Environmental Innovation Score
	Type	Numeric
	Measurement	Scale
	Role	Input
N	Valid	2060
	Missing	0
Central Tendency and Dispersion	*M*	32.718
	SD	31.749
	Percentile 25	0.0000
	Percentile 50	28.000
	Percentile 75	56.937

Appendix B – Results Hausman test

Correlated Random Effects - Hausman Test

Test cross-section random effects; *Dependent variable: EP*

Test summary	**χ^2**	**χ^2 df**	**Fixed**	**Random**	**Var (Diff.)**	***p***
Cross-section random	0.394	1	4.935	4.378	0.786	0.530

Test cross-section random effects; *Dependent variable: RU*

Test summary	**χ^2**	**χ^2 df**	**Fixed**	**Random**	**Var (Diff.)**	***p***
Cross-section random	0.337	1	2.366	3.077	1.481	0.562

Test cross-section random effects; *Dependent variable: EM*

Test summary	**χ^2**	**χ^2 df**	**Fixed**	**Random**	**Var (Diff.)**	***p***
Cross-section random	0.995	1	8.982	7.768	1.481	0.319

Test cross-section random effects; *Dependent variable: EM*

Test summary	**χ^2**	**χ^2 df**	**Fixed**	**Random**	**Var (Diff.)**	***p***
Cross-section random	2.704	1	3.097	0.977	1.662	0.100

Appendix C – Results random effects model

Dependent variable: Environmental pillar score

Model Dimension[a]

		Number of Levels	**Covariance Structure**	**Number of Parameters**	**Subject Variables**	**Number of Subjects**
Fixed Effects	Intercept	1		1		
	CEOg	2		1		
	GICS	1		1		
	BGD	1		1		
	EMGD	1		1		
	RISK	1		1		
	ROE	1		1		
	SIZE	1		1		
Random Effects	Intercept	1	Variance Components	1	ID	
Repeated Effects	YEAR	5	Identity	1	ID	412
Total		15		10		

a. Dependent Variable: Environmental Pillar Score.

Information Criteria[a]

-2 Log Likelihood	16221.236
Akaike's Information Criterion (AIC)	16241.236
Hurvich and Tsai's Criterion (AICC)	16241.344
Bozdogan's Criterion (CAIC)	16307.541
Schwarz's Bayesian Criterion (BIC)	16297.541

The information criteria are displayed in smaller-is-better form.

a. Dependent Variable: Environmental Pillar Score.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator *df*	Denominator *df*	*F*	*p*
Intercept	1	1302.404	61.294	0.000
CEOg	1	2031.323	0.101	0.751
GICS	1	408.791	6.354	0.012
BGD	1	1881.561	44.607	0.000
EMGD	1	1941.400	8.621	0.003
RISK	1	1877.815	0.000	0.983
ROE	1	1706.646	0.029	0.865
lnTA	1	1340.140	123.974	0.000

a. Dependent Variable: Environmental Pillar Score.

Estimates of Fixed Effects[a]

Parameter	*Est.*	*SE*	*df*	*t*	*p*	95% CI	
						Lower Bound	Upper Bound
Intercept	-123.558	15.881	1324.718	-7.780	0.000	-154.713	-92.403
[CEOg=0]	0.705	2.223	2031.323	0.317	0.751	-3.655	5.064
[CEOg=1]	0[b]	0					
GICS	-0.191	0.076	408.791	-2.521	0.012	-0.340	-0.042
BGD	0.256	0.038	1881.561	6.679	0.000	0.181	0.331
EMGD	0.095	0.032	1941.400	2.936	0.003	0.032	0.159
RISK	0.025	1.166	1877.815	0.022	0.983	-2.261	2.311
ROE	0.000	0.001	1706.646	0.170	0.865	-0.007	0.003
lnTA	7.388	0.664	1340.140	11.134	0.000	6.086	8.690

a. Dependent Variable: Environmental Pillar Score.

b. This parameter is set to zero because it is redundant.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		*Est.*	*SE*	*Wald Z*	*p*	95% CI	
						Lower Bound	Upper Bound
Repeated Measures	Variance	76.070	2.654	28.665	0.000	71.043	81.453
Intercept [subject = ID]	Variance	500.989	36.173	13.850	0.000	434.880	577.147

a. Dependent Variable: Environmental Pillar Score.

Random Effect Covariance Structure (G)[a]

	Intercept | ID
Intercept | ID	500.989

Variance Components

a. Dependent Variable: Environmental Pillar Score.

Dependent variable: Resource use score

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	CEOg	2		1		
	GICS	1		1		
	BGD	1		1		
	EMGD	1		1		
	RISK	1		1		
	ROE	1		1		
	SIZE	1		1		
Random Effects	Intercept	1	Variance Components	1	ID	
Repeated Effects	YEAR	5	Identity	1	ID	412
Total		15		10		

a. Dependent Variable: Resource Use Score.

Information Criteria[a]

-2 Log Likelihood	17137.066
Akaike's Information Criterion (AIC)	17157.066
Hurvich and Tsai's Criterion (AICC)	17157.173
Bozdogan's Criterion (CAIC)	17223.370
Schwarz's Bayesian Criterion (BIC)	17213.370

The information criteria are displayed in smaller-is-better form.

a. Dependent Variable: Resource Use Score.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator *df*	Denominator *df*	*F*	*p*
Intercept	1	1181.554	54.210	0.000
CEOg	1	2052.904	1.465	0.226
GICS	1	410.105	3.788	0.052
BGD	1	1909.501	49.248	0.000
EMGD	1	1977.269	12.853	0.000
RISK	1	1912.243	0.985	0.321
ROE	1	1718.890	0.252	0.616
lnTA	1	1207.645	106.721	0.000

a. Dependent Variable: Resource Use Score.

Estimates of Fixed Effects[a]

Parameter	*Est.*	*SE*	*df*	*t*	*p*	95% CI	
						Lower Bound	Upper Bound
Intercept	-142.388	19.297	1204.711	-7.379	0.000	-180.248	-104.528
[CEOg=0]	3.371	2.785	2052.904	1.210	0.226	-2.091	8.832
[CEOg=1]	0[b]	0.000					
GICS	-0.172	0.088	410.105	-1.946	0.052	-0.346	0.002
BGD	0.339	0.048	1909.501	7.018	0.000	0.245	0.434
EMGD	0.146	0.041	1977.269	3.585	0.000	0.066	0.226
RISK	-1.459	1.471	1912.243	-0.992	0.321	-4.344	1.425
ROE	0.001	0.002	1718.890	0.502	0.616	-0.003	0.005
lnTA	8.332	0.806	1207.645	10.331	0.000	6.749	9.914

a. Dependent Variable: Resource Use Score.

b. This parameter is set to zero because it is redundant.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		*Est.*	*SE*	*Wald Z*	*p*	95% CI	
						Lower Bound	Upper Bound
Repeated Measures	Variance	122.856	4.284	28.676	0.000	114.739	131.546
Intercept [subject = ID]	Variance	676.042	49.026	13.789	0.000	586.469	779.295

a. Dependent Variable: Resource Use Score.

Random Effect Covariance Structure (G)[a]

	Intercept | ID
Intercept | ID	676.042

Variance Components

a. Dependent Variable: Resource Use Score.

Dependent variable: Emissions score

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	CEOg	2		1		
	GICS	1		1		
	BGD	1		1		
	EMGD	1		1		
	RISK	1		1		
	ROE	1		1		
	SIZE	1		1		
Random Effects	Intercept	1	Variance Components	1	ID	
Repeated Effects	YEAR	5	Identity	1	ID	412
Total		15		10		

a. Dependent Variable: Emissions Score.

Information Criteria[a]

-2 Log Likelihood	17031.992
Akaike's Information Criterion (AIC)	17051.992
Hurvich and Tsai's Criterion (AICC)	17052.099
Bozdogan's Criterion (CAIC)	17118.296
Schwarz's Bayesian Criterion (BIC)	17108.296

The information criteria are displayed in smaller-is-better form.

a. Dependent Variable: Emissions Score.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator *df*	Denominator *df*	*F*	*p*
Intercept	1	1190.956	84.241	0.000
CEOg	1	2051.840	0.025	0.874
GICS	1	410.905	3.956	0.047
BGD	1	1907.908	58.787	0.000
EMGD	1	1975.057	18.013	0.000
RISK	1	1910.182	0.722	0.395
ROE	1	1718.763	0.440	0.507
lnTA	1	1217.770	144.596	0.000

a. Dependent Variable: Emissions Score.

Estimates of Fixed Effects[a]

Parameter	*Est.*	*SE*	*df*	*t*	*p*	95% CI	
						Lower Bound	Upper Bound
Intercept	-171.117	18.849	1214.062	-9.078	0.000	-208.097	-134.136
[CEOg=0]	-0.432	2.714	2051.840	-0.159	0.874	-5.755	4.892
[CEOg=1]	0[b]	0.000					
GICS	-0.172	0.087	410.905	-1.989	0.047	-0.342	-0.002
BGD	0.361	0.047	1907.908	7.667	0.000	0.269	0.454
EMGD	0.169	0.040	1975.057	4.244	0.000	0.091	0.247
RISK	1.218	1.433	1910.182	0.850	0.395	-1.592	4.028
ROE	0.001	0.002	1718.763	0.663	0.507	-0.002	0.005
lnTA	9.473	0.788	1217.770	12.025	0.000	7.927	11.018

a. Dependent Variable: Emissions Score.

b. This parameter is set to zero because it is redundant.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		*Est.*	*SE*	*Wald Z*	*p*	95% CI	
						Lower Bound	Upper Bound
Repeated Measures	Variance	116.467	4.060	28.683	0.000	108.774	124.703
Intercept [subject = ID]	Variance	648.899	46.990	13.809	0.000	563.038	747.853

a. Dependent Variable: Emissions Score.

Random Effect Covariance Structure (G)[a]

	Intercept | ID
Intercept | ID	648.899

Variance Components

a. Dependent Variable: Emissions Score.

Dependent variable: Environmental innovation score

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	CEOg	2		1		
	GICS	1		1		
	BGD	1		1		
	EMGD	1		1		
	RISK	1		1		
	ROE	1		1		
	SIZE	1		1		
Random Effects	Intercept	1	Variance Components	1	ID	
Repeated Effects	YEAR	5	Identity	1	ID	412
Total		15		10		

a. Dependent Variable: Environmental Innovation Score.

Information Criteria[a]

-2 Log Likelihood	17412.832
Akaike's Information Criterion (AIC)	17432.832
Hurvich and Tsai's Criterion (AICC)	17432.940
Bozdogan's Criterion (CAIC)	17499.137
Schwarz's Bayesian Criterion (BIC)	17489.137

The information criteria are displayed in smaller-is-better form.

a. Dependent Variable: Environmental Innovation Score.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator *df*	Denominator *df*	*F*	*p*
Intercept	1	1215.578	9.044	0.003
CEOg	1	2047.753	0.096	0.756
GICS	1	409.166	3.517	0.061
BGD	1	1900.820	4.963	0.026
EMGD	1	1966.608	0.644	0.422
RISK	1	1901.588	0.045	0.832
ROE	1	1714.606	0.678	0.410
lnTA	1	1244.910	23.138	0.000

a. Dependent Variable: Environmental Innovation Score.

Estimates of Fixed Effects[a]

Parameter	*Est.*	*SE*	*df*	*t*	*p*	95% CI	
						Lower Bound	Upper Bound
Intercept	-62.446	20.809	1238.553	-3.001	0.003	-103.271	-21.621
[CEOg=0]	0.924	2.976	2047.753	0.311	0.756	-4.911	6.760
[CEOg=1]	0[b]	0.000					
GICS	-0.181	0.096	409.166	-1.875	0.061	-0.371	0.009
BGD	0.115	0.052	1900.820	2.228	0.026	0.014	0.216
EMGD	-0.035	0.044	1966.608	-0.803	0.422	-0.120	0.050
RISK	-0.332	1.568	1901.588	-0.212	0.832	-3.407	2.743
ROE	-0.002	0.002	1714.606	-0.824	0.410	-0.006	0.002
lnTA	4.183	0.870	1244.910	4.810	0.000	2.477	5.889

a. Dependent Variable: Environmental Innovation Score.

b. This parameter is set to zero because it is redundant.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		*Est.*	*SE*	*Wald Z*	*p*	95% CI	
						Lower Bound	Upper Bound
Repeated Measures	Variance	139.014	4.849	28.668	0.000	129.828	148.851
Intercept [subject = ID]	Variance	806.857	58.470	13.799	0.000	700.024	929.994

a. Dependent Variable: Environmental Innovation Score.

Random Effect Covariance Structure (G)[a]

	Intercept | ID
Intercept | ID	806.857

Variance Components

a. Dependent Variable: Environmental Innovation Score.