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The International Firm Characteristics of Sustainable Performance

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Abstract

Sustainability is an important concept currently in society which encompasses social, economic and environmental aspects. Incorporating sustainability in business practices is important for society in order to reduce environmental pollution and to decrease social problems caused by firms. The focus of this research is on international firms because they directly and indirectly contribute to 20% of the pollution (Concalves, 2020) and cause social problems in countries they are active in. This research focusses on the environmental and social side of sustainability, and not the economic side. This research identifies relevant determinants of sustainable performance to contribute to the theoretical knowledge of sustainable performance and to give policy implications to increase sustainable performance. Six important determinants of sustainable performance are derived from the literature to see whether they apply to a sample of international firms. This sample consists of firms within the STOXX 600 Europe. A fixed effects regression model indicates that Innovative Capacity and Share of Female Directors has a positive significant effect on Sustainable Performance. Policy makers or CEO's can use these findings, for example to create policy that increases innovation or the presence of female directors in the board which then in turn also increases sustainable firm performance.

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1 **Introduction**

Firms differ in their path towards sustainability. Eventually all EU firms have to be carbon neutral in order to reach the goal of zero greenhouse gas emissions (European Commission, n.d. A). However, sustainability encompasses much more than environmental issues. One very common business practice in sustainability is the triple bottom line. It means focusing not just on profit (the standard bottom line) but also on social and environmental impact (Miller, 2020). The three P's belonging to the triple bottom line are people, planet and profit. Another way of thinking about sustainability is through the donut economy by Kate Raworth (2017). The donut has an inner line and an outer line. The inner line can be seen as the minimum living standard for people. If they fall inside the hole of the donut it means people fall short in certain living standards. The outer line represents the ceiling of what the earth can handle. We should not use too much resources and "overshoot" because that will lead to harmful effects such as climate change and air pollution. The place to be is between the inner and outer line, where a social foundation is present and where people do not surpass the ecological ceiling. In mostly earlier academic work, sustainability is used as a term for environmental sustainability (e.g. Wilkinson et al., 2001). In this thesis sustainability encompasses social sustainability and/or environmental sustainability. This means that firms can improve their sustainability by improving their social and/or environmental impact. Because this thesis focuses merely on sustainable performance in the sense of environmental and social sustainability, economic sustainability is not taken into account.
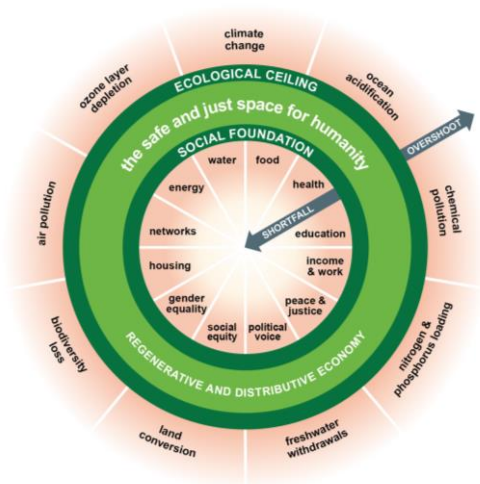

FIGURE 1 : THE DOUGHNUT ECONOMY

International firms are big polluters and it is estimated that 20% of global CO_2 emissions can be attributed to international firms, either by themselves or through their supply chain (Concalves, 2020). International firms are also faced with social issues such as child labor and human rights, these issues are often more prevalent when international firms operate in a weak state (Kolk, 2016). Furthermore, it is estimated that international firms shifted around $1 trillion of profit towards tax havens, resulting in a tax revenue loss worldwide of approximately $200-300 billion (Garcia-Benardo & Janský, 2021), showing that international firms do not always act according to what is socially expected from them. López et al. (2019) state that international firms have high economic power and together with their centralized and concentrated control they are potentially very big players in tackling climate change. This goes for environmental issues, but also for social issues. Sustainability is a concept that is becoming more and more important and international firms can play a large role in the solution, since they also play a big part in the cause.

1.1   Theoretical implications

This thesis is about "International Firm Characteristics of Sustainable Performance." The goal of this thesis is to identify what general characteristics international firms that score well on sustainable performance have in common. It would fill a gap in the literature since lots of relevant variables related to sustainable performance have an ambiguous effect. Some tendencies between relevant variables and sustainability performance are ambiguous. For example, in some studies the effect of leverage (debt/assets) is found to be insignificant (Artiach et al., 2010) while in other studies it is found to have a significant negative effect (Khaled et al., 2021) on sustainability performance. The same goes for the number of independent directors, where some research finds an insignificant effect (Eng & Mak, 2003 ; Naciti, 2019) while others find a positive effect of the number of independent directors on sustainable performance (Hussain et al., 2018). Furthermore, the number of women in the board of directors has a negative effect on sustainability disclosure (Muttakin et al., 2015), but a positive effect on sustainability performance (Naciti, 2019). Also, in the literature review it is stated that firms should design business plans that do not merely focus on short term profits to increase sustainable performance (Charter, 2006). On the contrary, profitable firms are found to have better sustainable performance (Artiach et al., 2010 ; Činčalová & Hedija, 2020). The relation between the independent variables and sustainable performance are elaborated more on in the hypothesis development.

Another research gap this thesis fills is related to the international firm. No quantitative research on sustainable performance determinants has been done that focuses on *International* firms. Research on sustainable performance determinants exclusively focuses on national samples (e.g. Činčalová & Hedija, 2020). This research will investigate whether the determinants found in other research with national samples also applies to international firms.

In summary, the research gap is the ambiguous relationship between relevant variables and sustainable performance. Additionally, this research also contributes by focusing on an international sample instead of a national sample.

1.2   Practical implications

The thesis has practical implications because it can help governments and international firms in achieving a better sustainability performance. When characteristics of international firms that score well on sustainability are known, international firms and governments can design policies that steer towards these characteristics to increase the sustainability performance. As mentioned in the introduction, international firms are huge polluters (Concalves, 2020) and are faced with social problems such as child labor (Kolk, 2016). These are already two good reasons for firms to increase their sustainability performance. In part *2.1 (Why firm sustainability is necessary)* more is elaborated on the essence of sustainability for international firms. Sustainability performance is important for the firm and for governments and this thesis helps in designing policies that increases sustainability performance.

1.3   General set-up

The remaining part of the thesis is structured in the following way. This research will *first* present a literature review in chapter 2 that focuses on why firm sustainability is necessary, what strategies firms use to pursue sustainability and how sustainability is linked to international firms. *Second*, the hypotheses are derived from relevant variables found in the literature in chapter 3. *Third*, the methodological approach will be explained in chapter 4 . *Fourth*, the regression results are presented in chapter 5. *Fifth*, a discussion of the results is given in chapter 6 and *lastly* a conclusion is presented in chapter 7. Chapter 2 up to and including chapter 6 end with a brief summary of that chapter.

2   **Literature review**

The view on what firm performance should entail has changed over the years. Milton Friedman (1970) stated that the only social obligation a firm has is to increase its profits. This came to be known as the *shareholder theory.* However, over time things have changed and the world has moved more towards the *stakeholder theory*. This means not only focusing on what shareholders want, which are profits, but also taking the interests of other relevant parties into account (Freeman et al., 2010). Sustainability has become, in addition to profits, one of the essential goals a firm has to pursue (Florea et al., 2013). Sustainability is about "*meeting the needs of the present without compromising the ability of future generations to meet their own needs"* (United Nations Documents 1987, no page). For a firm, that means not only performing in an economic sense in terms of profit but simultaneously on social and environmental goals (Hart & Milstein, 2003). This literature review *firstly* provides reasons why sustainability is important for firms (2.1), then *secondly* provides background information on how organizational sustainability is achieved (2.2). *Thirdly,* it explains why sustainability concerns matter especially for international firms (2.3).

2.1   **Why firm sustainability is necessary**

There are multiple reasons why a firm should pursue sustainability. *The first reason* is that stakeholders have certain expectations of firms and expect firms to act sustainably (Freudenreich et al., 2020). Helmig et al. (2016) find a causal relationship between stakeholder pressure and implementation of Corporate Social Responsibility (CSR) practices, showing that stakeholders have an impact on managerial decisions. Additionally, according to institutional theory firms (and individuals) want to conform to social norms since non-conformation often leads to punishments or social exclusion (Philippe & Durand, 2011). Firms thus want to conform to the sustainability norm so that they do not get penalized by society which will lead to lower sales or reputational damage. Compliance is very important to gain legitimacy. Legitimacy is defined as the perception that the behavior (of the firm) is deemed desirable, proper and appropriate by society (Bansal & Clelland, 2004). Legitimacy is essential because it determines whether relevant stakeholders such as investors or suppliers see the firm as a legitimate player in the market. Without legitimacy, it is very difficult for firms to operate in their market. Bansal & Clelland (2004) also find that firms that are deemed legitimate by society have less unsystematic risk with respect to their stock price, where

unsystematic risk is about the variability in the stock price due to events that only affect that firm (e.g. labor strike). This findings bridges towards the second reason for organizational sustainability. *The second reason* is that organizational sustainability is used to achieve a competitive advantage (Batista & Francisco, 2018). Organizations disclose their social and environmental performance which is followed by a reward or punishment by the shareholder (Antolín-López et al., 2016). Sustainability is used by firms to distinguish themselves from other firms. Wagner & Schaltegger (2003) state that firms can create a competitive advantage by pursuing sustainability through more efficient processes, higher productivity, lower compliance costs and access to new markets. An example is Vattenfall, a Swedish energy company that distinguishes itself from its competitors based on sustainability. Firms that belonged to the Dow Jones sustainability index outperformed firms in broader indexes (Savitz & Weber, 2006). However, Goyal et al. (2013) find no universal correlation between firm sustainability performance and financial performance. D'Amato & Falivena (2020) state that the inconsistent effect of CSR practices on financial performance is one of the most controversial problems within the CSR literature. *The third reason* why a firm should focus on sustainability is related to the environmental part of sustainability. The IPCC stated that "*It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.*" (IPCC, 2021, p.4). The report states that human influence is the cause of climate change, therefore human influence could also be a way to decrease the warming of the earth. One way through which human behavior can contribute to this decrease is organizational sustainability. Pollution also brings a lot of costs due to unpleasantness (e.g. bad air) and expenditures to reduce or remove the pollution (Courant & Porter, 1981). The OECD (2016) calculated that only air pollution will cause 6 to 9 million premature deaths per year and will cost 2.6 trillion dollar annually (equal to 1% of global GDP) by the year 2060. The costs are due to sick days, hospital costs and diminished agricultural yield. The effects of environmental pollution will not be spread equally since some actors or firms in different geographic areas will be affected more, but eventually everyone will be affected by it. Climate change poses a lot of threats to conducting business. Higher temperatures and extremer weather conditions due to climate change will result in more energy consumption due to more demand for air conditioning, necessary changes to infrastructure and buildings to protect them from storms or heavy rain and decline in tourism, for example in Austria where reduction in snowfall in the winter will negatively affect the winter sports industry (European commission, n.d. B)

2.2   Sustainability strategies

In order to achieve sustainability firms need to create a culture that embeds sustainability by incorporating it in the mission statement, organizational values such as goals and desired behavior, organizational strategy, recruitment of personnel and reward system (Galpin et al., 2015). Starik et al. (2012) use a framework to identify the important elements of implementing sustainability policies called the 7S framework. These are strategy, structure, systems, shared values, skills, staff and style. Tukker et al. (2008) state that radical innovative products & services and connected business model innovation are the best ways for a firm to respond to sustainability challenges. A business model can be defined as a plan that elaborates on the value creation and market orientation of an existing or new business (Osterwalder et al., 2005) Charter (2006) states that firms in their business models should not merely pursue the dominant goal of providing short term profits for their shareholders because it limits company decision making. As a possible solution it is suggested to go back to models of private ownership. Additionally, Wüstenhagen & Boehnke (2006) suggest that incorporating the cost of externalities into the business model is essential for sustainability practices. Alberti & Varon Garrido (2017) define two approaches to address sustainability challenges. One approach is to see sustainability goals and profit as a trade-off where a <u>choice</u> has to be made between either one of them. The second approach is to see profits and sustainability goals as <u>complementary</u>, firms that pursue this strategy are called hybrid organizations. The second approach becomes more feasible due to the growing sustainable products and service sector and a growing demand for socially responsible investments (Alberti & Varon Garrido, 2017). To successfully conduct this complementary approach three fundamental activities are presented. *Firstly*, firms need to have a social or environmental organizational objective. *Secondly*, firms need to establish relationships with stakeholders that are mutually advantageous. *Thirdly*, interaction with the market, competitors and relevant institutions is necessary to gain legitimacy and this legitimacy should be used to inspire new entrants instead of creating entry barriers for new players. Thus, in order for a firm to pursue a sustainability strategy a holistic approach is needed that encompasses firm processes, business plan revisions, company culture and relationships with other stakeholders.

2.3   International firms

As mentioned before, international firms are responsible for 20% of global emissions, either directly or indirectly (Concalves, 2020). International firms are also faced with social problems, especially when the firms operate in weak states (Kolk, 2016). Sustainability is becoming more and more important for international firms because it is clear that they contribute to problems challenging sustainability. Furthermore, from financial year 2024/2025 and onward the Corporate Sustainability Reporting Directive (CSRD) will be implemented. This means that all listed firms and firms that fulfil at least 2 of the 3 criteria in table 1 have to report on sustainability matters such as environmental pollution and human rights and have to let this be audited by an auditor. Its precursor, the Non-Financial Reporting Directive (NFRD) with looser criteria already obliged 12.000 European firms to report on sustainability. The implementation of CSRD will increase this number to over 50.000 companies (Verheijke et al., 2022). Thus, sustainability is highly relevant for international firms and this is highlighted by the problems international firms cause themselves, the tightened up sustainability reporting standards that are implemented and the beforementioned reasons why firms should pursue organizational sustainability (i.e. stakeholder pressure, competitive advantage, decreasing pollution).

Criteria
More than 250 employees
More than 40 million turnover (€)
More than 20 million on balance sheet (€)

TABLE 1: CSRD CRITERIA

Another lens through which the transition towards sustainability can be seen is through the theory of planned behavior (TPB) by Icek Ajzen (1991). This theory has been used extensively in understanding sustainable behavior by individuals (e.g. Jiang et al. 2019 ; Allen and Marquart-Pyatt, 2018), yet can also be applied to international firms. The theory suggests that intention affects behavior and that behavior is affected by the attitude towards the behavior, the subjective norm and perceived behavior control. These are in turn affected each by behavioral beliefs, normative beliefs and control beliefs respectfully (see figure 2). Behavioral beliefs are about the perceived advantages and disadvantages of performing a certain behavior that is connected to conforming to a certain norm, normative beliefs are about the perceived pressure by the firm or

individual to comply to the norm and control beliefs are about the extent to which the individual or the firm has the idea that their behavior can actually make a difference (Yuriev et al. 2020). This framework helps to explain how sustainability has become and is becoming even more important for firms.
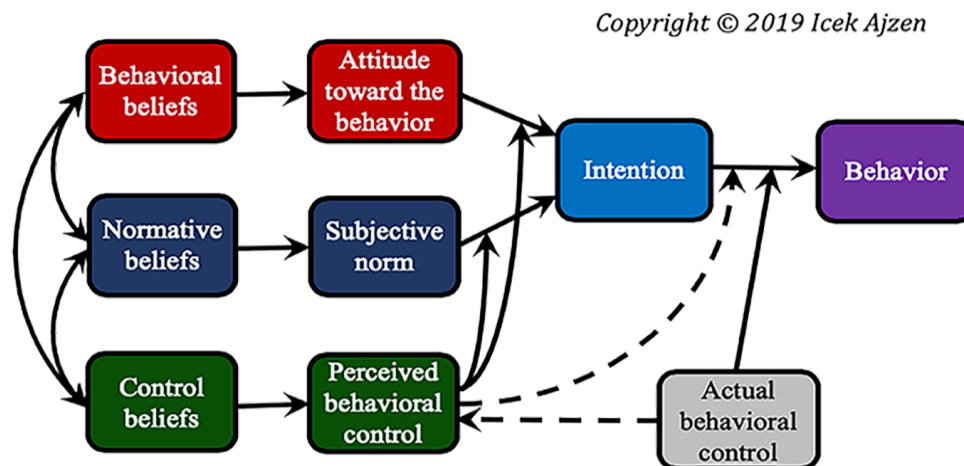
FIGURE 2: THEORY OF PLANNED BEHAVIOR.
SOURCE: AJZEN'S OFFICIAL WEBSITE HTTPS://PEOPLE.UMASS.EDU/AIZEN/TPB.DIAG.HTML (ACCESSED JUNE 13, 2022)

Using this framework, it can be explained that the intention and thus the behavior of firms with regard to sustainability is changing. *Firstly*, the attitude towards sustainable behavior has changed. As mentioned before in section 2.1 , sustainability can be used as a competitive advantage for firms. Instead of seeing sustainability as something that poses extra challenges for the firm, it can be used to distinguish oneself from competitors and draw new customers. The perceived advantage of firm sustainability has thus changed. This especially applies to international firms because they are active in multiple markets and thus have a lot of competition, so having and creating a competitive advantage is very important for international firms. *Secondly,* normative beliefs about firm sustainability has changed. Section 2.1 mentions that pressure from stakeholders can change firm behavior and that complying to stakeholder norms is important to gain legitimacy. The normative beliefs of the firm has thus changed and firms understand that society wants them to conduct their business in a sustainable way. International firms are often very large and active in multiple countries which translates to high visibility by the public (Artiach et al. 2010). International firms are thus more prone to the subjective norm of society. *Thirdly*, control beliefs of the firm have also changed. The introductory part of the literature review (section 2) mentions

the difference between shareholder and stakeholder theory and the notion that the world has moved more towards the stakeholder theory instead of the shareholder theory. From a shareholder theory perspective it makes less sense to act sustainably as a business since its only goal is to increase profits. Even if the firm wants to conduct sustainable business practices at a higher price for the product or service, it makes no economic sense because the competitors will not do the same and will offer the same product or service for a lower price. The firm is then somewhat forced into the less sustainable way and thus it has the idea that it has less control over the sustainability problems. The stakeholder theory however makes organizational sustainability more likely because more firms are pressured to act sustainably. It provides firms what a higher sense of control to increase their sustainability practices. Due to their scale and size, international firms can make a difference when they act sustainably, which increases the perceived control of sustainability problems. According to the TPB, these 3 drivers will increase the intention to act sustainably for firms and in turn increase sustainable behavior. The TPB explains how sustainability has become an important topic for firms and is especially important for international firms. When the attitude towards the behavior, the subjective norm and the perceived behavioral control changes more over time in the same direction, sustainable behavior by firms will become even more prevalent.

Summary

This chapter began by stating that the world is moving from a shareholder theory perspective towards a stakeholder perspective that incorporates social and environmental goals in firm performance. In section 2.1, three reasons why sustainability is important for firms are mentioned. These are meeting stakeholder expectations, creating a competitive advantage and decreasing environmental pollution. Section 2.2 explains the strategy that firms need to use to increase sustainable performance. A holistic approach is needed that encompasses firm processes, business plan revisions, company culture and relationships with other stakeholders. Section 2.3 explains why sustainability is especially important for international firms by mentioning the social and environmental problems they cause together with the implementation of the CSRD that requires more firms to report on sustainability. Then the TPB is introduced to explain how sustainability has already become an important topic for international firms and will become even more important in the future.

3   Hypothesis development

In most research, firm profitability is found to have a positive effect on sustainability performance. Činčalová & Hedija (2020) find a positive relationship between financial performance and sustainable performance and Muttakin et al. (2015) find a positive relationship between financial performance and sustainability disclosure. The positive relationship between financial performance and sustainable performance is confirmed by Artiach et al. (2010). They state that high financial performance lowers the external pressure of financial stakeholders which in turn gives room for sustainability issues. Financial stakeholders in this case are shareholders who desire dividend on their stock or an increase in stock price. But, during times of low financial performance the focus lies more on cutting costs and increasing profitability instead of concerns like sustainability issues. Furthermore, Artiach et al. (2010) state that financial performance increases investments in solutions for sustainability issues. Thus, the positive effect of financial performance on sustainable performance is explained by the stakeholder theory because high financial performance leads to less pressure from financial stakeholders and the resource based view because financial resources enable companies to invest in sustainability. Most research finds that firm profitability is positively related to sustainable performance. However, Charter (2006) states that in order for a company to develop a sustainable business plan, the company should not merely focus on pursuing short term profits for shareholders. Thus, profits can enable a firm to pursue sustainable performance but focusing too much on profit can have a negative effect on sustainable performance. One important aspect in the literature that is worth mentioning is that the relationship also works the other way around. In an extensive literature review of 132 works published in highly valued journals, Alshehhi et al. (2018) find that 78% of studies find a positive relationship of sustainable performance on financial performance. However, studies as the one by Goyal et al. (2013) find no correlation between firm sustainability and financial performance. Most research finds a positive relationship between financial performance and sustainability performance which is explained by stakeholder theory and the resource based view, leading to the following hypothesis:

H1: Ceteris Paribus, the higher the financial performance of the firm, the higher the sustainability performance.

Leverage can be defined as the amount of debt that a company uses to finance its assets (Hayes, 2022). Leverage is measured mostly by dividing the total amount of debt by the total amount of assets. A heavily indebted company receives pressure from the financial stakeholders such as the banks that loaned the money. Artiach et al. (2010) hypothesize that an increase in leverage would result in a lower sustainability performance because the management will be more oriented towards the interests of the lender and less oriented towards the interests of weaker stakeholders, such as society pressuring the company to pursue sustainable performance. Artiach et al. (2010) thus use a stakeholder theory to explain the tendency between leverage and sustainable performance. However, no significant effect of leverage is found by Artiach et al. (2010). Another research by Khaled et al. (2021) does find a negative effect of leverage on sustainable performance and they attribute this to the pressure of stakeholders in the same way as Artiach et al. (2010). Lourenço & Branco (2013) hypothesize that leverage will have a negative effect on sustainable performance. They explain this through the stakeholder theory in the same way as Artiach et al. (2010), but it is also stated that low debt companies have more financial flexibility to finance activities that are related to environmental and social goals (Ziegler & Schröder, 2010). Based on this the next hypothesis is constructed:

H2: Ceteris Paribus, the higher the leverage of the firm, the lower the sustainability performance

From a resource based view, larger firms should have more resources than smaller firms and therefore their performance should also be better than smaller firms. This applies to financial performance, but also to sustainability performance. This is confirmed by different research. Muttakin et al. (2015) find a positive relationship between firm size and sustainability disclosure. Činčalová & Hedija (2020) also find a positive relationship between firm size and sustainability practices. This is in line with what is found by Donaldson (2001). Here it is stated that larger firms have more absolute resources, better internal processes and more people that are involved in CSR practices and therefore larger firms have a better sustainability performance. Artiach et al. (2010) also find a positive relationship between firm size and sustainable performance. They state that it is because larger firms are often more visible for society and therefore larger firms receive more

societal pressure for sustainable performance. Furthermore, Artiach et al. (2010) state that larger firms are more likely to cause social and environmental problems due to the size and scale of their activities, which also translates to more societal pressure for sustainable performance. Big firms receive more scrutiny by society and experience external pressure to increase their sustainable performance. D'Amato & Falivena (2020) find that the positive relationship of CSR practices on firm financial performance is positively moderated by firm size. This means that larger firms receive more financial benefit from their CSR practices, which is an incentive for large firms to increase sustainable performance. The effect of firm size on sustainable performance is very straightforward in the literature. In most research, firm size is found to have a positive effect on sustainable performance which is explained by the resource based view. This leads to the following hypothesis:

H3: Ceteris Paribus, the larger the firm, the higher the sustainability performance.

According to Adams et al. (2016) sustainability oriented innovation can help realizing social and environmental value together with economic profits. Tukker et al. (2008) state that business model innovation together with radical product and service innovation increases sustainable performance. Hallenga-Brink and Brezet (2005) find that through network brainstorming sessions, entrepreneurs in the tourism industry jointly come up with innovation that increases sustainable performance, for example minimizing energy and water use in hotels. Innovation can have an effect on sustainability in multiple ways. Innovation can lead to gains in productivity which makes production more sustainable since less physical resources are needed (Ludbrook et al., 2019). From a resource based view, innovation provides a company with a resource that other firms do not possess, which translates to a competitive advantage. Innovation can also change consumer behavior, for example through technology that makes the sharing economy (e.g. car sharing) easier (Graessley et al., 2019). Another important innovation related to sustainability are sustainability indicators, which are monitoring tools that a firm can use to monitor how their firm is performing on sustainability (Nill and Kemp, 2009) such as reduction of emission. Tunçer & Kuhndt (2006) make a distinction between process innovations, product and service

innovations, organizational innovations and technological innovations to increase sustainability. Kuhl et al. (2016) make a distinction of sustainability based on the triple bottom line. They look at the separate effect of innovation on Economic, Social and Environmental sustainability and find a positive significant effect for all three. Kuzma et al. (2020) find that more innovative companies have higher levels of sustainable performance in a meta-analysis of 37 papers. Son et al. (2018) find that exploring new technologies leads to higher firm value, showing innovative firms are more successful over time. Based on previous research, the resource based view and the other ways that are mentioned through which innovation can affect sustainability, the following hypothesis is made:

H4: Ceteris Paribus, the higher the innovative capacity of the firm, the higher the sustainability performance.

Independent directors are directors in the board that do not have any material or monetary relationship with the company. The role of independent directors is very ambiguous in the sustainable performance literature. Significant effects of independent directors on sustainable performance are found in the negative and positive direction, but also insignificant effects are found on sustainability disclosure. According to Fama & Jensen (1983) a high number of independent directors is positively related to sustainable performance because independent directors are more inclined to speak out on behalf of minority stakeholders compared to dependent directors. Furthermore, independent directors are generally more concerned about corporate social responsibility (Zahra & Stanton, 1988). Jo & Harjoto (2011) also find that a higher share of independent directors is positively related to addressing social and environmental issues and issues of other stakeholders. This tendency is confirmed by Hussain et al. (2018) who find a positive relationship between the number of independent directors and sustainable performance. Hussain et al. (2018) explain the relationship through agency theory by stating that independent directors are less pressured by stakeholders such as managers and shareholders. For this reason, independent directors are more focused on long term value creation (Jizi et al., 2014) and feel a responsibility towards more than just the organization (Lim et al., 2007) which translates to more focus on sustainability. Additionally, Wang (2017) finds a positive relationship between the number of

independent directors and sustainability disclosure. However, there is also research that finds a negative relationship between the number of independent directors on sustainable performance. Naciti (2019) looks at the effects of board composition on the sustainable performance of the firm and hypothesize that the number of independent directors is positively related to sustainable performance. However, the results show that there is a negative relationship between the two variables. The same negative relationship is established by Eng & Mak (2003). A possible explanation is offered by Bansal et al. (2018). They state that potential reputation loss can also play a role for an independent director. Independent directors are afraid that sustainability choices now will be negative for their career and reputation in future jobs. Allegrini and Greco (2013) find no effect of number of independent directors on sustainable disclosure. Multiple studies find a positive relationship between number of independent directors and sustainable performance and some studies find a negative relationship (Naciti, 2019) while it was hypothesized that there would be a positive relationship. Additionally, fairly recent research (Hussain et al., 2018) finds a positive relationship and the relationship is properly grounded in agency theory, therefore the thesis makes the following hypothesis:

H5: Ceteris Paribus, the higher the share of independent directors in the total board of directors, the higher the sustainability performance.

The effect of female board directors on sustainable performance is also ambiguous. Muttakin et al. (2015) find a negative relationship between women in the board of directors on sustainability disclosure in Bangladesh. However, it should be noted that Bangladesh is a patriarchal society where the role of women is very limited (Chowdhury, 2009). This can have an effect on the decision freedom within a company that women in the Bangladesh society have. Naciti (2019) finds a positive relationship between board diversity in terms of gender and nationality and sustainable performance. More board diversity in a resource based theory perspective provides valuable resources and thus increases sustainable performance (Zhang et al., 2013). Furthermore, more women in the board of directors would lead to higher sustainable performance because women are overall more concerned about social problems than men are (Orij, 2010). However, Činčalová & Hedija (2020) find no relationship between gender board diversity and sustainable

performance in the Czech transportation and storage sector. Činčalová & Hedija (2020) did hypothesize that higher gender board diversity would lead to more sustainable performance. The hypothesis is made based on the research of Brush (1992), who states that female managers are better at and more focused on combining social and economic goals, while men are often more focused on merely economic goals. Because overall board diversity is related to better sustainable performance and because women overall have a tendency to be more oriented towards social problems, the following hypothesis is made:

H6: Ceteris Paribus, the higher the share of female directors in the total board of directors, the higher the sustainability performance.

Summary

This chapter explained how the 6 mentioned variables affect sustainable performance and based on that a hypothesis was made. **Financial performance** is hypothesized to have a positive effect on sustainable performance because high financial performance reduces the pressure of shareholders and creates room for sustainable investments. **Financial leverage** should in theory have a negative effect on sustainable performance because it increases the external pressure from lenders and decreases financial flexibility. **Firm size** is supposed to have a positive effect on sustainable performance because larger firms have more resources and thus more capabilities while also receiving more benefits from CSR practices. Also, larger firms are more visible by society and cause more environmental and social problems due to their scale, which results in more pressure to increase sustainable performance. **Innovation** should have a positive effect on sustainable performance because it creates a competitive advantage. But also through other ways such as monitoring capabilities and the ability to change consumer behavior. **The share of independent directors** is theorized to have a positive effect on sustainable performance because of characteristics of independent directors such as an increased long term view and a higher probability of addressing social and environmental problems. **The share of female directors** is expected to have a positive effect on sustainable performance because women are more concerned about social and environmental problems and because they are better at combining economic goals with social and environmental goals. Also, board diversity can be seen as a competitive advantage.

4   Data and methods

4.1   Sample and time frame

The sample size consists of firms in Europe that belong to the STOXX Europe 600 index. Because the thesis focuses on international firms, all firms without a foreign subsidiary will be left out. The choice for Europe is made because in European countries sustainability is something of high concern compared to the rest of the world. This is visible in the Global Sustainability Index, 16 of the first 20 countries are from the European Union and 19 out of the first 20 are from Europe (Sustainable Development Report, 2021). The dataset consists of all international firms within the STOXX Europe 600 index, which consists of large, medium and small cap companies. This includes companies from Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and the UK. Companies without a foreign subsidiary will be excluded. The choice for the STOXX 600 Europe is made because it entails companies from multiple countries in Europe and from multiple sectors, which increases the generalizability of the outcomes.

The thesis will use panel data from the period 2010-2020. The dependent variable is sustainable performance and will be measured by the ESG scores of companies (Environmental, Social and Governance) and the independent variables are derived from the literature. More on measurement of the variables will be explained in section 4.2. The statistical analysis is done by using the 17th edition of Stata.

This section will first explain how missing data has been tackled(4.1.1.). Second, an explanation is given per (in)dependent variable on how it is measured and whether this is in line with other research(4.2). Third, the regression model will be explained (4.3.) and fourth, relevant robustness checks are conducted to see if there are any problems with the data(4.4.).

4.1.1   Missing data points

Inherent to quantitative data research with a large dataset, some datapoints are missing. There are multiple ways to solve this, such as deleting certain companies with a lot of missing data points and filling up the data points with average values and closest values. The solutions to the missing data points are discussed in this section.

The dataset consists of 600 firms. Of these firms, 39 are deleted because they have no foreign subsidiary and are thus not international firms, leaving them outside the scope of this research. Seven more firms are deleted because the entire dependent variable is missing and these seven firms all have at least two other variables that are completely missing (see appendix A for an extensive explanation of the deleted firms). This leaves the dataset with 554 companies. These 554 companies had missing data points. To solve this, the value from a year ago or a year later was chosen to fill it up, depending on the situation. There are multiple cases where the data was filled up:

When a company had a missing value for a certain year, the value of the next year was entered to fill it up. So if for example the year 2013 is the only one missing, the value of the year 2014 is chosen. The choice for the next year instead of the last year is made because the first years in the dataset often had the most missing data points, so there was no last year available. To be consistent, it was decided that the next year was prioritized over the last year if both were available.

When a company has multiple missing years attached to each other, it gets filled up with the closest value that is known. For example, when year 2013 and 2014 are missing, the year 2013 receives the 2012 value and the year 2014 receives the 2015 value. If an uneven number of years are missing, the middle one receives the value of the newest year. For example, when year 2013, 2014 and 2015 are missing, year 2013 receives the 2012 value and 2014 and 2015 receive the 2016 value.

When a company misses multiple values in the beginning, so for example the period 2010-2014, the 2015 value is chosen to substitute the missing values in the period 2010-2014. The same goes when the end period is missing. Missing data points in the period 2018-2020 are then filled up with the 2017 value.

The variable "innovative capacity", measured through the number of patents received, is filled up in the same way as mentioned above. However, the variable had only values for the period

2013-2020 due to database restrictions. To solve the gap in the 2010-2012 period, the values of 2013 are used. This means that firms have the same number of patents received in the years 2010-2013. By filling up the 2010-2012 period, 1662 (554 companies * 3 years) datapoints are filled up. After this intervention, there were still 848 missing data points for the "Innovative Capacity" variable in the 2013-2020 period. These missing data points were all present due to certain firms not having any data on patents granted, so using the method explained before where the value of the last or next year is used to fill the gaps could not be used for the "Innovative Capacity" variable. To fill these missing data points up, the average number of patents received was calculated per year, excluding the outliers with more than 500 patents received in a year. The firms with missing values then received the average value of that certain year. Table 2 summarizes the average number of patents per year, which are used to fill the blanks.

Year	Calculated average number of patents, excluding firms with >500 patents
2013	59
2014	57
2015	56
2016	54
2017	51
2018	44
2019	33
2020	23

TABLE 2: AVERAGE NUMBER OF PATENTS EXCLUDING OUTLIERS

Table 3 summarizes per variable how many data points are filled up through the method that is mentioned above. After the deletion of the non-international firms and the deletion of firms without sustainability performance values, the filling up method using the closest known value, the filling up method of using 2013 values for the 2010-2012 period for the "Innovative Capacity" variable and using the averages to fill up the remaining missing data points for the "Innovative Capacity" variable, the dataset is fully complete and there are no missing data points anymore.

Variable	Missing data points* (% of total data points)
Sustainability performance	1038 (17,03%)
Financial performance	470 (7,71%)
Firm size	391 (6,42%)
Financial leverage	316 (5,19%)
Innovative capacity	1662 (27,27%) + 848 (13,92%) = 2510 (41,19%)
Share of independent directors	1056 (17,33%)
Share of female directors	1052 (17,26%)

TABLE 3: MISSING DATA POINTS PER VARIABLE

*The missing data points and the percentages are calculated after the deletion of the 46 firms

4.2   Dependent and independent variables

In this research the following independent variables will be investigated: Financial performance, firm size, financial leverage, innovative capacity, share of independent directors and share of female directors. In table 4 all variables are mentioned together with how they will be measured in the research. The variables will be collected mostly through the database Eikon, the data on innovative capacity is gathered through Orbis IP. The Orbis database is used to determine the number of foreign subsidiaries. This information was not available in Eikon.

(In)dependent variable	Way of measurement
Sustainability performance	*ESG scores*
Financial performance	Return On Assets (ROA)
Firm size	Number of employees
Financial Leverage	Total Debt/ Total Assets
Innovative capacity	Number of patents granted
Share of independent directors	(Number of independent directors / total directors) *100
Share of female directors	(Number of female directors / total directors) * 100

TABLE 4: MEASUREMENT METHOD PER VARIABLE

4.2.1   ESG scores / dependent variable

The choice for ESG scores is made because it summarizes in one number how good a company performs on environmental and social issues, and how ethically the company is governed by their directors. The governance part for example entails corruption and lobbying done by companies. A big advantage of the ESG score is that it measures the extent to which a company is sustainable. In the research by Artiach et al. (2010), the dependent variable is binary. It receives a 0 if it is not on the Dow-Jones sustainability index and a 1 if it is on the index. The ESG score method is in line with the research of Naciti (2019), who derived the method from other research (Hillman and Keim, 2001 ; Surroca et al., 2010). Naciti (2019) uses the ESG score made by the company Sustaynalitics, while in this research the ESG score in the database Eikon will be used. The ESG score in the Eikon Database is created by the company Refinitiv. Both Sustaynalitics and Refinitiv generate ESG scores ranging from 0 to 100 and both take sector and country characteristics into account. Therefore, there is no reason to assume that these databases differ substantially from each other.

4.2.2   Financial performance

In Muttakin et al. (2015) financial performance is measured by the return on assets (ROA). They take the earnings before taxes and interests and divide this by the total assets. The same is done by Artiach et al. (2010). Artiach et al. (2010) replace the ROA by the return on equity (ROE) , which is calculated as net income divided by common equity, as a sensitivity check to see whether the variable financial performance remains significant. They find that the ROA is insignificant and that the ROE is significant. They use the stakeholder theory to explain this difference. They state that ROA is about the return of all financial stakeholders (including loans from banks for example), while ROE represents the return for all shareholders. They then state that in stakeholder theory financial stakeholders are often deemed more important for the company than social stakeholders, while also stating that shareholders are often the most important financial stakeholders. Thus, when the ROE is high, shareholders are happy. The shareholders, who are the most important stakeholder, put less pressure on the board because they are content with the return, this enables the firm to focus more on sustainability practices. Alshehhi et al. (2018) assess in their literature review the multiple financial measures used in the sustainability literature. They state that accounting measures, such as ROA, ROE, return on investment (ROI) and earnings per share are most used. Of these measures, ROA is used in almost half of the 132 articles they review. After

that ROE is the most used in almost a quarter of the reviewed articles. ROA is a measure that is used very frequently within the literature and is deemed very appropriate by researchers. Furthermore, it measures financial performance while taking firm size differences into account, since the returns are divided by total assets. This is not possible if one focuses just on profits for example. Therefore, financial performance will be measured by the ROA in this research.

4.2.3   Financial Leverage

Leverage in a financial sense comes in many forms. Financial leverage is about how much debt is used to finance the total amount of assets. The financial leverage shows how indebted a company is. Similar as in Artiach et al. (2010) and Khaled et al. (2021), leverage is defined as total debt (long & short term) divided by the total worth of assets on the balance sheet.

4.2.4   Firm size

Firm size is often measured by the number of employees a company has. Artiach et al. (2010) and Muttakin et al. (2015) measure firm size as the log of total assets of a firm. Činčalová & Hedija (2020) measure firm size by the number of employees. In this research, firm size is measured by number of employees because it is deemed a more reliable measure of firm size. Tech companies often use services instead of owning all assets they use (Libert et al., 2016). Tech companies are also present within the sample that is used, which is the STOXX 600 Europe index. Using (the log of) assets would then give a skewed image of the real size of the company. Therefore, size will be measured by the number of employees.

4.2.5   Innovative capacity

In the literature, multiple ways of measuring innovative capacity are mentioned. Jalles (2010) suggests that number of patents and the score on the Intellectual Property Rights Index are positively related to innovation in a country, suggesting that both are a good proxy for innovation within a country. The number of patents can also be used to measure innovative capacity of firms. The Intellectual Property Rights Index applies to countries and not to firms, so it cannot be used to measure firm innovative capacity. In the databases that were accessible for this thesis, no "Innovation Rating per Firm" of some sort was found. Another way of measuring innovation is suggested Van Dijk et al. (1997), who measure innovation by looking at R&D intensity. They measure R&D intensity by looking at the FTE's that are engaged in R&D compared to the total

number of FTE's. The amount of patents received tells more about a company's innovative output, while R&D intensity focuses more on innovative input. According to the literature (e.g. Kuzma et al., 2020), innovative output is essentially what drives higher sustainable performance. Therefore, innovation will be measured by the number of patents granted. Additionally, R&D expenditure data is often not present and has lots of missing data points, while patent data is relatively well documented. This is another benefit of using patent data to measure innovative capacity.

4.2.6   Share of independent directors

Naciti (2019) uses the Board Independence Variable to measure the independent directors. This is a scale of 0 to 100 where a score of 0 is provided when there are no independent directors and a score of 100 when 2/3 of the board consists of independent directors. Wang (2017) uses the ratio of independent directors, meaning they divide the number of independent directors by the number of total directors. Eng & Mak (2003) and Hussain et al. (2018) use the percentage of independent directors compared to total number of directors. For the sake of interpretation of the results this research will also use the percentage of independent directors. If the variable is found to be significant, one can state that a 1% increase in female directors has a X increase/decrease in sustainable performance.

4.2.7   Share of female directors

Naciti (2019) looks at board diversity in terms of gender and nationality. A board diversity score is used called BDIVR. The score is between 0 and 100 where 0 represents a non-diversified board where all directors are men and all directors are from the same country as the company is from. A score of 100 means the board is diversified, i.e. at least 2/3 of all directors is female and 2/3 of all directors are foreign. Činčalová & Hedija (2020) use the percentage of women in the total board of directors, the same is done by Muttakin et al. (2015). This research will also use the percentage of women in the board of directors because board diversity scores have no added value compared to the percentage of women in the board method. Additionally and similar to the share of independent directors variable, it makes interpretation of the coefficient easier .

4.2.8   Year

Similar to Artiach et al. (2010), the variable "Year" will also be included to take into account time trends and temporal effects. A dummy variable is made for each year, where the first year (2010) will serve as base year. Adding the "Year" variable also provides information on how ESG scores change over time. A positive significant sign would indicate that overall ESG scores are increasing throughout the years. This would be in line with Florea et al. (2013) who state that sustainability is one of the essential goals a firm has to pursue, which would be translated into higher ESG scores.

4.2.9   Lagged variables

All independent variables will be lagged by 2 years. There are two reasons for this lag. First of all, it takes time for the independent variables to have an effect on the dependent variable. Taking firm profitability as an example, profits do not translate to higher sustainability performance in one instance. According to Artiach et al. (2010), high profitability lowers pressure from financial stakeholders and enables firms to focus on other issues such as sustainability issues. It takes time for this focus to translate to actions and eventually to visible results in sustainability performance. Second of all, using lagged variables partially solves the endogeneity problem. Endogeneity consists of multiple problems and one of those is simultaneity, which is also known as reverse causality (Antonakis et al., 2014). The variable Y can never have an effect on variable X-2 because variable Y happens 2 years later than variable X-2. The variable X-2 however can have an effect on Y. This is especially important for the financial performance variable, since it was mentioned that the effect also works the other way around, i.e. sustainable performance having an effect on financial performance (Alshehhi et al., 2018). Thus, lagging the variables solves the simultaneity problem. More on endogeneity is explained in section 4.4.4 (Endogeneity). The main model will use lags of 2 years. Additionally, 2 models will be created with lags of 1 year and no lags, to see if the relationship between the independent variable and the dependent variable still holds. The lagging of the variables is similar to Činčalová & Hedija (2020), who also use 2 year lags for their independent variables. Other similar research such as Artiach et al. (2010) and Lourenço & Branco (2013) do not make use of lagged variables.

4.2.10 Outliers

Outliers can drastically change the results of the regression analysis and can lead to over- or underestimation of certain coefficients. Furthermore, it can increase the variance in such a way that it would make certain variables insignificant. In order to reduce the effect of outliers, the option winsor2 is used in Stata. This option does not delete the outliers, but instead replaces them. It looks at values in a variable that are below the 1st percentile and above the 99th percentile. It replaces all the values smaller than the 1st percentile by the value of the 1st percentile and all values bigger than the 99th percentile by the value of the 99th percentile. The big advantage of this intervention is that no observations are being deleted and the outliers are still tackled. The winsor2 option is used for all independent variables. See appendix C for the descriptive statistics of the data after the winsor2 intervention.

4.3   Model choice

In order to determine what model is most suitable for the research, two tests are done. The first one is the Breusch Pagan Lagrange Multiplier test to determine whether a random effects model or a pooled Ordinary Least Squares (OLS) regression is most suitable for the data. As seen below in table 5, the 0 hypothesis is rejected. The 0 hypothesis in this test is that there are no significant differences across the units of observations, which are the companies in this case. The 0 hypothesis is rejected, meaning there are significant differences among the companies and a random effects model is thus more suitable than an OLS model. Intuitively, this also makes sense because the assumption that all firms in the dataset are the same is a very broad assumption. In table 8 in section 5.1 (descriptive statistics) the variance of the variables across companies is visible through the mean, SD, minimum value and maximum value.

Now that it is determined that a random effects model is more suitable than an OLS model, another test needs to be done to decide between random effects and fixed effects. The fixed effects model assumes that the effect of independent variables on the dependent variable is correlated with time invariant characteristics of the entity, in this case the company. The random effects model assumes that variation across entities is random and not correlated with the time invariant characteristics of the entity. To decide between the two, a Hausman test is performed. The result

can be seen in table 5. The Hausman test shows there is a systematic difference in the coefficient of the predictor across entities, which means that the fixed effects model is more suitable. Hence, the Breusch-Pagan Lagrange Multiplier test together with the Hausman test determine that the fixed effects model is the best suitable model for the dataset.

Test	H0	Prob > chibar2	Conclusion
Breusch Pagan Lagrange Multiplier test	No significant differences across the units of observations	0.00	H0 rejected, random effects is more suitable than pooled OLS regression.
Hausman test	No significant differences in coefficients across entities	0.00	H0 rejected, fixed effects is more suitable than random effects regression

TABLE 5: TESTS TO DETERMINE CORRECT MODEL

4.3.1   Regression equation

The fixed effects model as described above translates to the following regression equation:

$$ESG\ Score_{i,t}$$
$$= \beta_0 + \beta_1\ ROA_{i,t-2} + \beta_2\ LEV_{i,t-2} + \beta_3\ EMP_{i,t-2} + \beta_4\ PAT_{i,t-2} + \beta_5\ IND_{i,t-2} + \beta_6\ GEN_{i,t-2}$$
$$+ \sum_{K=1}^{11} \gamma k\ Year + u_{i,t}$$

Where $ESG\ Score_{i,t}$ represents the ESG score of firm i in time t. β_0 equals the intercept where all the variables are equal to 0. β_0 is more theoretical than practical, since there are no firms that have value 0 for all variables. $\beta_1\ ROA_{i,t-2}$ represents firm profitability and is measured by the return on assets per firm i in year t-2. As mentioned before, a lag of 2 years is included, which is the reason the regression has a t-2 sign instead of t. $\beta_2\ LEV_{i,t-2}$ is the financial leverage of the firm, again with

the lag of 2 years, which is imposed on all independent variables. $\beta_3\ EMP_{i,t-2}$ represents the size of the firm and is measured by the number of employees of a firm. $\beta_4\ PAT_{i,t-2}$ stands for the innovative capacity of the firm and is measured by patents granted. $\beta_5\ IND_{i,t-2}$ represents the percentage of independent directors within the total board of the firm. $\beta_6\ GEN_{i,t-2}$ equals the percentage of women directors within the total board of directors. $\sum_{K=1}^{11} \gamma k\ Year$ represents a dummy variable for each year in the dataset. The dataset consists of data in the 2010-2020 period, therefore a total number of 11 dummies are created. $u_{i,t}$ equals the error term for company i in time t.

4.4 Robustness checks

4.4.1 Heteroskedasticity

Heteroskedasticity is a common problem in statistics and happens when the standard errors of a certain variable are not constant over time, which is troubling for the regression model. In order to test for heteroskedasticity, a Breusch-Pagan/ Cook Weisberg test is done together with a Wald test. Both tests rejected the 0 hypothesis of constant error terms, showing that there is heteroskedasticity within the data. In order to solve that, robust standard errors will be used. This solution is similar to the one presented by Činčalová & Hedija (2020). They also use heteroskedastic-consistent standard errors. However, Činčalová & Hedija (2020) use an OLS regression rather than a fixed effects regression. In similar research on determinants of sustainable performance such as Artiach et al. (2010) and Lourenço and Branco (2013) nothing is mentioned about heteroskedasticity.

Test	H0	Prob > chi²	Conclusion
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	H0: Variance is constant	0.00	There is heteroskedasticity within the dataset
Wald test for heteroskedasticity in fixed effects regression model	H0: Variance is constant	0.00	There is heteroskedasticity within the dataset

TABLE 6: HETEROSKEDASTICITY TESTS

4.4.2   Multicollinearity

The Variance Inflation Factor (VIF) test shows that there is no multicollinearity in the data. All VIF's are relatively low, showing there is no correlation among the independent variables. There is no exact critical value that suggests a VIF is too high, but in most research a value between 5 and 10 is used (Craney and Surles, 2002). Because all VIF's are below 5, multicollinearity should not play any role in this research. Artiach et al. (2010) look at the correlation between variables and use the rule of thumb where a correlation of more than 0,8 suggests a serious problem, based on work by Gujarati (1995). Činčalová & Hedija (2020) also use the VIF and conclude, similar to Artiach et al. (2010), that multicollinearity does not play a role in their research.

Variable	VIF score
ROA	1.09
Leverage	1.13
Number of employees	1.10
Number of patents	1.06
Independent directors	1.02
Female directors	1.04

TABLE 7: VIF TEST FOR MULTICOLLINEARITY

4.4.3   Autocorrelation

```
Durbin-Watson d-statistic( 7, 6094) = 1.952308
```

FIGURE 3: DURBIN WATSON STATISTIC FOR AUTOCORRELATION

In order to see whether there is autocorrelation within the data, a Durbin-Watson test is performed. The test outcome can reach from 0 to 4, where a value of 0 represent very high positive autocorrelation and a value of 4 means that there is very high negative autocorrelation (Kenton, 2021). The place to be is around the number 2 (Kenton, 2021) , which shows there is almost no autocorrelation. The test statistic for the data is equal to 1,95, as can be seen in figure 3. This means that autocorrelation is not a problem within the dataset.

4.4.4   Endogeneity

Endogeneity is a problem within econometric models where the error term is correlated with one or more of the independent variables which causes biases in the results (Wooldridge, 2010). Omitted variables, simultaneity (i.e. reverse causality) and omitted selection are the main causes of endogeneity (Antonakis et al., 2014). Of course, it is impossible to incorporate all relevant variables when researching the determinants of sustainable performance due to practical reasons, meaning that some kind of omitted variable bias will always persist. However, by incorporating the most important variables found in the literature this risk is mitigated. Furthermore, the control variable "Year" also decreases the omitted variable bias. Also, a fixed effects model is used which controls for unobservable heterogeneity in each entity, which solves the omitted variable bias for stable effects in time and lowers the correlation between the error term and the independent variables (Nikolaev & van Lent, 2005). In order to solve simultaneity, lagged variables will be used. This solution is presented by Činčalová & Hedija (2020). By using lagged variables, the reverse causality problem is solved, since lagged values can affect present values but not the other way around, which then solves the problem of simultaneity. According to Antonakis et al. (2014), omitted selection can happen when a) A treatment group is compared to another nonequivalent control group , b) Groups are compared where selection to that group is endogenous and/or c) The sample is non-representative for the population or is subject to self-selection. These three conditions do not apply to this research since no groups are being compared together with the fact that the sample is representative and chosen from an index, so no self-selection is prevalent.

Yet, the relationship between the ESG score and the independent variables can still be endogenous to some extent. It cannot be excluded that simultaneity or omitted variable bias plays no role in the interpretation of the results of this research. However, the risk of endogeneity is mitigated adequately by incorporating relevant independent variables together with a control variable (Year), using a fixed effects model and lagging the independent variables.

4.4.5   Conclusion robustness checks

In this chapter 4 robustness checks were done. Heteroskedasticity, multicollinearity , autocorrelation and endogeneity were all discussed. For the first three statistical tests were done that indicated whether the problem was present in the dataset. A VIF-test for multicollinearity and a Durbin-Watson test for autocorrelation indicated that both problems were not present within the dataset. Heteroskedasticity however was present in the dataset, which was shown by the Breusch-

Pagan/ Cook-Weisberg test and the Wald test. To solve this problem, robust standard errors will be used in the fixed effects model. Endogeneity was also discussed, no empirical test exists to see whether endogeneity is present in the data. However, the risk of endogeneity is mitigated through the implementation of relevant independent variables, the use of a control variable (Year), using a fixed effects model and lagging the independent variables. Thus, the only problem in the dataset was heteroskedasticity and this is satisfactorily solved by using robust standard errors.

Summary

This chapter began by introducing the sample and the time frame. A sample of STOXX 600 Europe is used because sustainability is an important topic in Europe and the timeframe used is the period 2010-2020. The dataset was incomplete at first and section 4.1. explains how these missing data points were handled. To solve the missing data points 46 companies were deleted, missing data points were filled up with values from last or next year and only for the variable "Innovative Capacity" averages were calculated to fill up missing data points where the last or next year were not available. In section 4.2. an explanation on measurement per dependent and independent variable is given. The control variable "Year" is also included. Section 4.2.9. explains that the independent variables are lagged by 2 years because it solves simultaneity (a problem which is part of endogeneity) and because it takes time for the independent variables to have an effect on the dependent variable. The Winsor2 intervention to limit the effect of outliers is explained in section 4.2.10. Section 4.3. explains how the Breusch-Pagan-Lagrange Multiplier test together with the Hausman test imply that a fixed effects model is most suitable. The regression equation is also presented. The chapter ends with section 4.4. which discusses relevant robustness checks. Four robustness checks were done on heteroskedasticity, multicollinearity, autocorrelation and endogeneity. Only heteroskedasticity was a problem and this is solved by using robust standard errors in the fixed effects model.

5   Results

5.1   Descriptive statistics

VARIABLES	N	mean	SD	min	max
ESG	6,094	59.47	19.96	0.430	95.06
ROA	6,094	6.608	9.242	-121.0	128.4
LEVERAGE	6,094	0.616	0.227	-0.0793	2.829
EMPLOYEES	6,094	42,778	75,885	0	671,205
PATENTS	6,094	159.0	474.4	0	5,171
INDEPENDENT	6,094	59.52	24.11	0	100
GENDER	6,094	25.73	13.53	0	75
ASSETS*	6,094	74.47	233.7	0.000414	2,496
LIABILITIES*	6,094	65.00	221.5	-0.000329	2,377

TABLE 8: DESCRIPTIVE STATISTICS

Assets and liabilities are given in millions

Table 5 presents the descriptive statistics of the variables. Based on the minimum and the maximum value of each variable it can be seen that there is much variation across the firms. Assets and liabilities are not variables that are included in the analysis. Assets and liabilities are used to calculate the leverage. They are incorporated in this table as background information. The N is 6094 for all variables because there are no missing values after the interventions that are mentioned in section 4.1.1 (Missing Data Points). There are 11 years and 554 companies, which translates to 6094 (11*554) data points.

The ESG score can be between 0 and 100, where 0 indicates the worst score and 100 the best score. Based on the minimum and the maximum, there are firms that perform really good on sustainability and firms with a score close to 0, meaning that they perform very bad on sustainability. The average score of 59 indicates a relatively good and above average score of the companies in the STOXX 600. The ROA goes from negative to positive , showing there are highly profitable firms in the dataset together with firms that make big losses. As seen in table 8, leverage is in most cases a positive number but can also have a negative value. This happens when a company has negative debt, i.e. more debtors than creditors. The number of employees ranges from 0 to 671.205 employees. The companies with 0 employees are holding companies. Of course there are people working for the company, however they are working for one of the daughter companies

of the holding company, which explains why there are no employees directly working for the holding company. Innovative capacity, measured by the number of patents, varies a lot between the companies. There are companies that do not receive any patents and there are very innovative companies such as Siemens and Philips that receive around 5.000 patents per year. On average, more than half of the board consists of independent board members. Some companies only have independent board members, others have not even one independent board member. Furthermore, the mean score for the variable gender is approximately 25, meaning that on average 25% of the total board is female for the companies in the dataset. The minimum score of 0 indicates that there are boards that consists only of men. The maximum score of 75 means that there are no boards where there are only women in the board, 75% is the highest. Assets and liabilities are given in millions in table 5, meaning there are companies in the dataset with over 2 billion in assets, but also in liabilities.

5.2 Models

Table 9 shows the results of the fixed effects model. Table 11 shows the effects of the variable "Year". The main model uses lags of 2 years. Additionally, 2 models are added with one model having lags of 1 year and one model having no lags at all. The models in table 9 are all exactly the same, with exception of the lags that are being used. Table 11 thus shows the corresponding effects of the variable "Year" for the three models. Appendix B shows the results of the random effects and the pooled OLS regression, also with lags of 2, 1 and 0 years. The R^2 for the main model is relatively high with 0.426, meaning the model has explanatory power. It should be noted that the higher R^2 for the 1 year lag model and the 0 year lag model does not mean they are the superior models. These models have more observations, which increases the R^2. This is due to the fact that more lags added results in more lost observations. The 2 year lag model remains the main model because it takes time for independent variables to have an effect on the dependent variable, as suggested by Činčalová & Hedija (2020) who state that a 2 year lag is most suitable. Furthermore, the F test for all 3 models equals 0.00. This means that the H0:"All coefficients of the variables jointly equal zero" is rejected and that the model is useful in predicting ESG scores. Furthermore, the constant of the main model, which is equal to 51.55, is just a little lower than the average ESG score, which is equal to 59. This normal value of the constant, i.e. probable within this context,

also indicates that the model is a good fit. If for example the constant would have a negative value or a value over 100, this would indicate that the model is less of a good fit, since ESG scores cannot go below 0 or over 100.

In this section, the results of the fixed effects model will be used to see if the hypotheses made in chapter 3 of the research are correct or not. To assess this, the main model where the variables are lagged by 2 years will be the leading model. The other 2 models with 1 year lags and no lags will be used to back up the claims made by the main model.

	Lag2 ESG-score	Lag1 ESG-score	Lag 0 ESG-score
ROA	0.0620	0.0380	0.0293
	(1.79)	(1.05)	(0.91)
Leverage	-3.212	-1.808	-1.938
	(-1.06)	(-0.61)	(-0.75)
Employees	0.0000188	0.0000258	0.0000353
	(1.29)	(1.47)	(1.60)
Patents	0.00443***	0.00484***	0.00438***
	(4.21)	(5.66)	(5.69)
Independent	0.0291	0.0579**	0.0885***
	(1.64)	(3.02)	(4.42)
Gender	0.0875***	0.131***	0.172***
	(3.80)	(5.51)	(7.15)
Observations	4986	5540	6094
R^2 (within)	0.426	0.431	0.448

t statistics in parentheses
$^{*} p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

TABLE 9: REGRESSION OUTPUT FIXED EFFECTS MODEL

5.3   Hypothesis rejection / acceptance

Hypothesis 1 stated that: " Ceteris Paribus, the higher the financial performance of the firm, the higher the sustainability performance." Based on the models presented above, this hypothesis has to be rejected. The coefficients are positive in all three models, as hypothesized before. However, the coefficients are not significant, according to the model. In the main model, the Z

score is equal to 1.79, which means it is almost significant on a 0.05 P-value, for which it has to be at least 1.96. Still, it is not significant. This indicates that financial performance does not have a significant effect on sustainable performance and leads to the rejection of hypothesis 1.

The second hypothesis stated: "Ceteris Paribus, the higher the leverage of the firm, the lower the sustainability performance." Similar to hypothesis 1, the sign of the coefficient is correct. However, the coefficient is not significant, not in the main model and not in the two other models. Based on this hypothesis 2 also needs to be rejected and it can be stated that high debt levels do not translate to lower sustainable performance for firms. The model suggests that leverage is not an important variable when it comes to sustainable performance.

The third hypothesis is: "Ceteris Paribus, the larger the firm, the higher the sustainability performance." Once again, the coefficient has the right sign, but is not significant. The T statistic for the three models is relatively close to 1.96, which would mean that it is significant on a 0.05 level. However, the T statistic is below that value of 1.96, indicating that firm size does not have a significant effect on sustainable performance. Therefore, hypothesis 3 also needs to be rejected.

Then on to the fourth hypothesis, which is: "Ceteris Paribus, the higher the innovative capacity of the firm, the higher the sustainability performance." This variable turned out to be highly significant when it comes to sustainable performance with a P value lower than 0.001. In the main model a positive coefficient is shown, the 2 other models also show a positive significant sign. This means that hypothesis 4 is accepted. The more innovative a company is, the higher their sustainable performance will be. It should be noted that the effect of innovation is relatively small. The coefficient of 0.00443 means that for every 100 patents, the ESG score increases by 0.443. Given that the ESG score is measured with values between 0 and 100, this is not a very large effect. Given that the mean of the patents granted was equal to 159, the average firm only receives approximately 0.7 ESG score points due to innovative capacity of a possible 100 point score. So innovative capacity has a positive effect on sustainable performance, even though the effect is not massive.

The fifth hypothesis *:"* Ceteris Paribus, the higher the share of independent directors in the total board of directors, the higher the sustainability performance" is a little bit odd when it comes to the results. In the main model the coefficient is positive, but not significant. In the lag 1 model, the coefficient is positive and significant on a 0.01 P value level and without lags it is even significant on a 0.001 P value level. Hence, the three models give contradicting results. To better

assess the effect of independent directors on sustainable performance, three other models were made where independent directors is lagged by 3,4 and 5 years. The other independent variables held the 2 years lag in all three models. As can be seen in table 10, the 3 year lag is also insignificant. With the 4 year lag model the coefficient turns negative but remains insignificant. With the 5 year lag the negative coefficient becomes significant. This means that depending on the lag, the effect of independent directors can either be positive, negative or insignificant. This shows that there is no definitive effect of independent directors on sustainable performance, which means that hypothesis 5 needs to be rejected.

Independent directors	Coefficient	T statistic
Independent directors (3 years lag)	0.0024	0.15
Independent directors (4 years lag)	-0.0165	-1.18
Independent directors (5 years lag)	-0.0336	-2.60

TABLE 10: EFFECT OF INDEPENDENT DIRECTORS WITH LAGS OF 3,4 AND 5 YEARS.

The last hypothesis is hypothesis 6, stating: "Ceteris Paribus, the higher the share of female directors in the total board of directors, the higher the sustainability performance." This hypothesis is accepted based on the positive coefficient and the high T statistic, making the variable significant on a 0.001 P value level. This means that having women in the board of directors of a company significantly improves the sustainability performance of that company. The effect can be considered as quite large. The coefficient of 0.0875 means that a company with 100% female board members (which was not present in the dataset) would increase their ESG score by almost 9 points out of a 100 (0.0875*100 = 8.75). So, the positive relationship between female directorship and ESG score is established in the model which enables the acceptance of hypothesis 6 and the effect of female directorship on ESG scores can be considered quite large.

Looking at the R^2 of 0.426 in the main model, it can be stated that this is similar to other research and maybe even quite high, considering the large number of companies (554). Činčalová & Hedija (2020) present multiple models in their research where the highest one is equal to 0.5163. It should be noted that their dataset consists of only 24 Czech companies. A lower number of

companies means a lower variance, which in turn enables a higher R^2. Lourenço & Branco (2013) work with a larger dataset of 233 Brazilian firms, the highest R^2 they reach is 0.350. Artiach et al. (2010) have a dataset consisting of 1511 US firms and the highest R^2 they reach is 0.179. Comparing the R^2 of this research given the relatively large N to the three papers mentioned before, one can state this R^2 is relatively high and that this once again shows the strength of the model. Additionally, the other three papers only focused on one country, where this thesis focuses on a total of 17 countries. Firms from different countries are in different stages with respect to sustainable performance and their attitude towards sustainable performance, which also increases the variance and makes it harder to reach an adequate R^2. However, this posed no real thread to the model and the R^2 is very satisfactory.

To summarize, of all hypotheses only 2 of the 6 are accepted. This means that only the variables "Innovative Capacity" and "Share of Female Board Members" have a positive effect on sustainable performance. For the variables "Financial Performance", "Firm Size" and "Financial Leverage" the signs of the coefficient were correct. However, the results turned out to be insignificant. The variable "Share of Independent Board Members" showed different results depending on the lag that was being used, which shows there is no conclusive effect of this variable on sustainable performance. The R^2 is very satisfactory compared to similar research , especially given the large dataset of this research.

5.4   Time trend

Adding the variable "Year" through the dummies allowed the model to take time trends into account. Finding a time trend was not part of the main research question. No hypothesis was made for the variable "Year". However, significant results of the variable "Year" in the fixed effects model indicate that the variable is important in predicting ESG scores for the companies. For this reason, this result section will also dedicate a part to the time trend. Based on the literature, it would be expected that time would have a positive effect on sustainable performance. On the one hand due to the plans of the European Union to reach climate neutrality in 2050 (European Commission, n.d. A) and on the other hand because sustainability is becoming more and more important in society and way of thinking, of which the doughnut Economy of Kate Raworth (2017) and the Triple Bottom Line are clear examples. Firms cannot ignore this way of thinking, since

sustainability has become one of the most important goals of firms, next to profits (Florea et al., 2013). Next to normative and cultural pressure, there is also some sort of regulative pressure. As mentioned before in this research, the Corporate Sustainability Reporting Directive (CSRD) will be implemented. This increases the number of firms in Europe that have to report on their sustainable performance. Of course, this does not mean that the European Commission places coercive pressure on the firms to increase sustainability, but by obliging firms to report on sustainability an incentive is created to increase sustainability to make (potential) shareholders content. It has been established that disclosing social and environmental performance can either have a positive effect on shareholders or a negative effect, depending on how good the sustainability score is (Antolín-López et al., 2016). Good sustainable performance will be rewarded through higher share prices while bad sustainable performance will be punished through lower share prices. Sustainability is also gaining momentum, firms in China (Chang et al., 2018) and Mexico (Aigner & Lloret, 2013) for example state that sustainability is becoming more and more important for the firm. Thus, it has been established that normative, cognitive and regulative pressure directs firms towards sustainability and that this trend is becoming more important.

The results in this research are in line with the trend on sustainability as described above. Similar to the "Hypothesis acceptance/rejection" part, the main model is the one with 2 year lagged independent variables and the other two models are used to back up the claims. As can be seen in table 11 , almost all dummy variables for each year are positive and significant for all three models. Note that not each year in the dataset (2010-2020) is included in the table because the first year serves as base year and 1 or 2 years are missing due to the implementation of the lagged variables. Some year variables in the period 2011-2013 are insignificant. In the year 2014 all variables are significant on at least a P-value of 0.05 and from 2015 to 2020 all years are positively significant on a 0.001 P value. Another notable finding is that the effect of the years is increasing over time. In the main model, the 2014 coefficient (the first significant year on a 0.001 P value) is equal to 0.890, while in 2020 the coefficient is equal to 14.39. Based on the increasing effect of time on ESG scores, it can be stated that sustainable performance for companies has become more important during the 2010-2020 period.

	Lag2 ESG-score	Lag1 ESG-score	Lag 0 ESG-score
Year=2010			0
			(.)
Year=2011		0	0.667**
		(.)	(2.80)
Year=2012	0	0.153	0.753*
	(.)	(0.60)	(2.56)
Year=2013	0.415*	0.474	0.866*
	(2.04)	(1.69)	(2.58)
Year=2014	0.890***	0.768*	0.970*
	(3.32)	(2.14)	(2.50)
Year=2015	3.088***	2.807***	2.939***
	(9.23)	(6.88)	(6.57)
Year=2016	4.242***	3.892***	3.873***
	(10.54)	(8.36)	(7.59)
Year=2017	6.394***	5.910***	5.773***
	(13.11)	(11.16)	(10.12)
Year=2018	8.854***	8.251***	8.297***
	(16.11)	(14.14)	(13.38)
Year=2019	10.97***	10.56***	10.43***
	(18.13)	(16.53)	(15.37)
Year=2020	14.39***	13.87***	13.67***
	(21.31)	(19.77)	(18.35)
Observations	4986	5540	6094
R^2	0.426	0.431	0.448

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 11: REGRESSION OUTPUT FIXED EFFECTS MODEL FOR VARIABLE "YEAR"

Summary

This chapter began with section 5.1 which showed the descriptive statistics of the dataset. Big differences in minima and maxima indicated that there were large differences between the firms in the dataset. In section 5.2 the model was introduced. The main model used a lag of 2 years for the independent variables and in addition a 1 year lag model and a 0 year lag model was introduced. This was done in order to better assess the results and to support the findings in the main model. The main model is a good fit because of the relatively high R^2 and a constant that is probable within the context of the research. In section 5.3 the hypotheses are discussed. Only hypothesis 4 (Innovative Capacity) and hypothesis 6 (Share of Female Directors) are accepted. The other 4 hypotheses were rejected due to insignificant coefficients. This means that only Innovative Capacity and Share of Female Directors are significant predictors for sustainable performance. For both independent variables a positive relation exists with the dependent variable. Additionally, a time trend was observed. The dummy variable year showed significant results where the coefficient increased over time.

6   Discussion

The discussion will consist of the following parts. *First of all,* the results of the research will be discussed by delving into the theory, making comparisons with other research and discussing the implications of the findings (6.1). All relevant variables will be discussed one by one. *Second,* the limitations of the research will be discussed (6.2) and *third,* recommendations for further research will be presented (6.3).

6.1   Results discussion

In this section, all independent variables will be discussed one by one. The first variable is Financial Performance. As discussed in the "Results" section, this variable turned out to be an insignificant predictor for ESG scores, a result similar to Goyal et al. (2013), who also find an insignificant relationship between the variables. This is quite an ordinary finding, since most research establishes a positive relation between financial performance and sustainable performance (Artiach et al., 2010 ; Činčalová & Hedija, 2020) and a positive relationship between financial performance and sustainability disclosure (Muttakin et al., 2015). This positive effect is explained through the stakeholder theory. Less external pressure of financial stakeholders (such as shareholders) results in more room for sustainability issues (Artiach et al., 2010). Furthermore, financial performance enables a firm to make the necessary investments needed for sustainable performance (Artiach et al., 2010 ; Činčalová & Hedija, 2020). Based on the investment argument, it could well be possible that it takes more than two years for investments to have an effect on sustainable performance. A company might invest in finding new, more environmentally- and people-friendly supply chains, but it might take years before the company can actually use the new supply chain. In order to see whether it could take more than 2 years for financial performance to have an effect on sustainable performance, 3 new regressions are presented with lags of 3,4 and 5 years while the other independent variables keep the lag of 2 years. It can be seen that the higher the lag, the bigger the T statistic. After a lag of 4 years, the coefficient becomes significant on a 0.05 level. After 5 years, the coefficient is highly significant on a 0.001 level. This could indicate that it takes more time for financial performance to translate to higher sustainability performance. The fact that ROA only becomes significant after 4 years could be a sign that it takes more time for financial performance to have an effect on sustainable performance, which could be due to

investments needing a longer time period to have an effect on sustainable performance. The same goes for the stakeholder argument. When financial performance allows action on sustainability, it could take multiple years before this focus translates to higher sustainable performance.   Due to changes in society, the external pressure of financial stakeholders might also change. Artiach et al. (2010) suggest that sustainability issues can only be addressed if the financial performance allows for it. However, times are changing. Sustainability is an important business goal (Florea et al., 2013) and can be used to achieve a competitive advantage (Batista & Francisco, 2018). Financial stakeholders might demand that a company pursues sustainability in order to remain successful or create more profits. In this view, sustainability is more of an enabler of financial growth instead of an obstacle that needs to be tackled only if financial results allow it.

ROA	Coefficient	T-statistic
ROA (0 years lag)	0.0293	0.91
ROA (1 year lag)	0.0380	1.05
ROA (2 years lag)	0.0620	1.79
ROA (3 years lag)	0.0629	1.95
ROA (4 years lag)	0.0772[*]	2.35
ROA (5 years lag)	0.1311[***]	4.04

TABLE 12: EFFECT OF ROA USING MULTIPLE LAGS

The second variable that will be discussed here is <u>leverage</u>. The literature suggests a negative relationship with sustainability performance explained by the stakeholder theory and financial flexibility. Again, the stakeholder theory plays a role in this relationship. A highly leveraged company is more prone to external pressure from financial stakeholders such as banks (Artiach et al., 2010 ; Khaled et al., 2021 ; Lourenço & Branco, 2013). Another reason for the negative relationship is financial flexibility. Highly indebted firms have less financial flexibility to finance activities that contribute to environmental and social goals (Ziegler & Schröder, 2010). The results however indicated insignificant results, which means these two reasons do not apply to the companies in the dataset. A possible reason that the stakeholder theory argument does not apply to this dataset may be that these companies are so big that it is harder for banks to pressure them.

Companies in the STOXX 600 Europe are of course large and a lot of banks want to provide financial capital to them, since they can be considered as stable (i.e. less risk for the bank) and they require large sums of financial capital. For example, a bank wants to lend money to a company and wants to include a covenant that says the company should have at least 10 million in liquid assets. This lowers the company's ability to make investments in sustainability. Because the company is large and stable, they can easily find a different source of funding that enables them to get the loan without the covenant. This line of thinking can also be applied to the financial flexibility argument. Companies in the STOXX 600 Europe are large enough to attain funding for sustainability practices, even when they are already indebted. Of course, this applies to a certain extent. How much capital a company can loan depends on its performance and its future perspective, among others. Banks will not provide endless funding just because the company is large and stable. However, this relationship may change when an economic recession kicks in and banks are more careful with providing capital. The implication of the insignificant result is that debt is not a constraint for sustainable performance.

The third variable is firm size. As mentioned in the results section, this variable turned out to be insignificant. Based on the resource based view, larger firms should have more resources, personnel and better internal processes to conduct sustainability practices (Donaldson, 2001). This relationship is confirmed by Činčalová & Hedija (2020). Artiach et al. (2010) explain the relationship between firm size and sustainable performance through a stakeholder theory by saying that large firms are more visible for society, which in turn creates more external pressure to pursue environmental and social goals. A possible explanation for the insignificant result is the fact that the companies in the dataset are already large. The companies in the dataset belong to the STOXX 600 Europe, consisting of small, medium and large cap companies. To be included in the STOXX 600 Europe, a company has to have a certain size. Even though small cap suggests a "small" company, small cap companies are mostly defined as high growth potential companies with a market capitalization between $300 million to $2 billion (Jackson & Schmidt, 2021). It could possibly be that there is some sort of threshold level for which greater firm size does not translate to higher sustainable performance. In light of the argument of Donaldson (2001) mentioned before, there could be some sort of threshold level where more resources, more personnel leads to coordination problems, and thus not towards better internal processes. This idea is confirmed by Dougherty (1992), who stated that innovation and organizational learning is difficult in large firms

due to organizational routine and interpretive barriers. Similarly, the same line of thought can be applied to the argument by Artiach et al. (2010) on visibility of the firm. The firms in the STOXX 600 Europe are already listed and thus already visible for the public. The visibility argument by Artiach et al. (2010) could apply when a small company of 50 employees is compared to a large listed company with over 5000 employees, but at a certain size this comparison does not hold, which is validated by the insignificant result.

The fourth variable is <u>innovative capacity</u>. Innovative capacity has a positive significant effect on sustainable performance. This is in line with Tukker et al. (2008) who state that radical product and service innovation in combination with business model innovation is a very effective way to tackle sustainability issues. Innovation can have an effect on sustainable performance in many different ways. It can decrease the physical resources needed to make a product (Ludbrook et al., 2019), it can change consumer behavior (Graessly et al., 2019) and indicators can be created that help monitoring the firm's sustainability performance (Nill and Kemp, 2009). Because no distinction is made with regards to the patents, it is not possible to determine how companies use innovation to increase sustainable performance. However, it can be established that more innovative firms perform better on sustainability. A distinction based on the type of innovation would be valuable. This will be discussed further on in the "Recommendations for Further Research" part. Firms can increase their sustainable performance through the beforementioned reasons, but it could also be that another reason plays a part. Another reason can be that there is a third variable that is influencing both variables. Firms with a more progressive attitude could be more willing to invest in innovation and could also be more inclined to pursue sustainability goals. However, the meta-analysis by Kuzma et al. (2020) finds strong support for the hypothesis that innovation has a positive effect on sustainable performance.

The fifth variable is <u>Independent Directors.</u> Similar to results found in the literature, the effect of independent directors is very ambiguous. Based on the lags insignificant, significant positive and significant negative coefficients were found, showing the effect of independent directors on sustainable performance is unclear. Based on the literature, a positive relationship should exist because independent directors are more inclined to speak out on minority shareholder interests (Fama & Jensen, 1983) and because they are usually more concerned about corporate social responsibility (Zahra & Stanton, 1988). Hussain et al. (2018) explain through stakeholder theory that independent directors receive less pressure from managers and shareholders, which

enables them to focus on sustainability issues. In theory independent directors should be more inclined to sustainability issues, but in practice they do not. A possible explanation for this is that the company decides what kind of directors they attract. They can for example demand that in order to be a director, one has to have at least X amount worth of shares of the company. This is often done to give an incentive to the directors to increase shareholder value. However, according to Gerety et al. (2001) this incentive does not increase shareholder value. But, it could very much be that the choice to be an independent director is often times not a choice at all. A company culture where director ownership is common is hard to break. Furthermore, it is questionable to what extent independent directors can affect the company. An independent director can be more inclined to speak out on minority shareholder interests and concerned about corporate social responsibility, but if the company culture is not favorable towards speaking out on sustainability issues, it is hard for independent directors (or any director) to make a change. The effect of independent directors might be dependent on context, which explains why the sign and the significance of the coefficient changes depending on what research is examined.

The sixth variable is gender. Similar to Naciti (2019) the coefficient is positive and significant. This can be explained by the resource based view, where having women in the board of directors can be seen as a competitive advantage and a resource that is not held by most competitors (Zhang et al., 2013). Certain general characteristics of women, such as a better ability to combining social and economic goals (Brush, 1992) and being more concerned overall with social problems (Orij, 2010) compared to men also explain the positive coefficient. However, it should be noted that similar to the argument in the innovative capacity part above, a third variable could be in place here. More progressive companies might be more inclined to hire women directors and increase their sustainable performance. However, quantitative studies such as Naciti (2019) and Zhang et al. (2013) also indicate positive significant results, showing that their definitely is a relationship between gender and sustainable performance. Still, a limited number of studies have researched the relationship between gender and sustainable performance, something that will be discussed further on in the "Recommendations for Further Research" part.

Based on the results, it was stated that Financial Performance, Financial Leverage, Firm Size and Share of Independent Directors were insignificant determinants for sustainable performance for international firms. However, the literature suggested that these should be significant determinants. The insignificance of the variables could be attributed to the sample used

in this research, which are international firms. The findings imply that relevant determinants in the literature, where mostly national firm samples are used, might not apply to international firms. International firms can be a different kind of firm when it comes to sustainable performance. As mentioned before in this discussion, this is partly explained by the size of the firm, since the STOXX 600 already includes large firms and because international firms are almost always larger firms (Calof, 1983).

6.2   Research limitations

In this section, multiple limitations of the research will be summed up. *The first limitation* is the missing data points. They were solved structurally and based on estimated guesses. However, the number of missing data points was quite high, especially for the innovative capacity variable. For this variable roughly 40% (see table 3) had to be filled in based on previous and next values and estimated guesses. This was mostly due to the gap in the 2010-2012 period. Database restrictions meant that no other viable solution was possible. A possible solution is to use a different database. However, because this master thesis is written for the Radboud University, the only available database that had data on intellectual property was Orbis IP. Another solution would be to use the Research & Development (R&D) costs of the company. A benefit of this is that it would give a more complete image of total innovation, since not all innovation is patented. However, R&D data was not accessible for most of the companies in the EIKON database, which made patents received the best way to measure innovative capacity. *The second limitation* is the sample chosen. The sample consists of the STOXX 600 Europe, i.e. small, mid and large cap companies within Europe. The choice for this index could bias the results. As mentioned before, small cap still means companies with a market capitalization between 300 million and 1 billion (Jackson & Schmidt, 2021). This means that the sample still consists of mostly large firms. This could have had an effect on the results, especially for a variable as firm size. However, to receive trustworthy data one almost always has to choose listed firms in the sample, especially with a large sample. It would be interesting to include a more diverse set of companies, but due to data restrictions it is difficult not to choose listed firms. Furthermore, the research is about international firms, which by definition means larger firms because larger firms have more abilities and resources to internationalize (Calof, 1983). So, the sample chosen cannot be considered a mistake because it is

a good representative image of international firms. However, the choice for the STOXX 600 index did possibly have an effect on the results due to the size of the companies. Additionally, the dataset also included holding companies, which does not give a complete image of the true size and activities of the company. This was already visible in the descriptive statistics, which showed that some companies have 0 employees. In the dataset used (after excluding 46 companies) there are 17 companies that had "Holding" included in their company name. Of course, there could be more holding companies in the dataset that do not have "Holding" in their company name. *A third limitation* is that no distinction is made based on the industry the company is active in, which would give extra information on how each industry is doing on sustainable performance. The distinction based on industry was made in the research by Artiach et al. (2010). This distinction does not matter however for the result of the research, since the ESG score takes industry into account. Shell for example still receives high ESG scores between 85 and 90, while its pollution is huge. Note that ESG scores comprise not only environmental, but also social and governance aspects. The Shell example is given because it shows that a company that performs badly on 1 pillar can still receive a very high score, showing that industry really matters for the ESG score. Adding the industry as a dummy variable would result in lots of dummies due to the large dataset. Furthermore, a lot of companies in the dataset are active in multiple industries, which would complicate adding the dummies. So, adding the dummies for the industry would provide additional information but is not essential for this research. *A fourth limitation* is the lags that are used. This decreases the number of data points available. This could be partially solved by using a longer time frame. However, adding lags will always result in less data points. Furthermore, it could take longer for the independent variable to have an effect on the ESG scores, which was explained in section 6.1 for the variable "Financial Performance". With a 2 year lag, the effect of the ROA on ESG scores was insignificant. However, with a 4 year lag the variable was significant (P < 0,05) and with a 5 year lag it was very significant (P<0.001). This could indicate that it takes more time than 2 years for Financial Performance (or any other independent variable) to have an effect on sustainable performance.

6.3   Recommendations for further research

This section will present multiple directions for further research. The first recommendation is to conduct more qualitative research on the determinants of sustainable performance to identify more relevant determinants. It is very plausible that there are more relevant determinants that are yet to be discovered in the academic field. For example, the effect of government subsidies on sustainable performance can be examined. One can also investigate what the effect is of certain board characteristics on sustainable performance. This would be an extension of the work of Naciti (2019) who investigates the effect of board size, board independence and board diversity on sustainable performance. It could for example be interesting to see whether board interlocks would have an effect on sustainable performance. The second recommendation is that more quantitative research is done on determinants of sustainable performance since the effect of some determinants is still very unclear, for example the effect of independent directors. Also, the effect of Gender on sustainable performance is not researched much in quantitative studies. Especially quantitative research on international firms would be interesting because no research has been done using international firm samples. Additionally, the quantitative research should of course include new determinants that are found in qualitative research to see whether they are statistically significant. A practical recommendation for more quantitative research is a research design similar to the one in this thesis where a distinction is made based on the three types of sustainability. Based on the three pillars of the triple bottom line, three scores could be created to see the effect of the independent variables on economic, social and environmental sustainability. In this thesis, sustainability encompasses social and environmental sustainability to give an overview of the determinants relevant for sustainable performance. Similar to Kuhl et al. (2016), who researched the effect of innovation on all three forms of sustainability, a research design could be made that looks at the three pillars of the triple bottom line individually to gain a deeper understanding of the effect. The determinants for social sustainability could be different from the determinants of environmental sustainability. This was not done in this thesis because this thesis does not include economic sustainability and looks at the Corporate Social Responsibility side of firm performance, which encompasses social and environmental performance.

The third recommendations is to create a more in depth view of how the variables actually effect sustainable performance. As mentioned before, it may be possible that there is some sort of threshold level for which larger firm size does not translate to higher sustainable performance due

to coordination problems. It would be very interesting to know what this threshold level is. Also, it was evident that financial performance did not have an effect on sustainable performance in the main model, but when the lags were extended to 4 years the effect was significant. A deeper understanding of the effect of these variables is needed so that the correct lag can be used. The lagged effects differ per variable. For example, it could be that financial performance takes much more time to affect sustainable performance than the share of women in the board of directors takes. The fourth recommendation is to research whether some endogeneity exists for the variables that were found significant, which are Innovative Capacity and Gender. As mentioned before, it could be that a third variable affects innovative capacity, gender and sustainable performance. It is possible that more progressive or future oriented companies are more inclined to innovate, hire women as directors and increase their sustainable performance. Research on this possible endogeneity would increase the understanding of the causal relationship established in this research between Innovative Capacity and Gender on Sustainable Performance.. A fifth recommendation is to make a distinction based on the type of innovation to see what type of innovations affect sustainable performance the most. The innovations can for example be divided according to Tunçer & Kuhndt (2006), who make a distinction between process innovations, product and service innovations, organizational innovations and technological innovations that all have a positive effect on sustainability. A quantitative study with this distinction would be interesting because it would provide information on what type of innovation has the biggest effect on sustainable performance and it would deepen the understanding of the effect that innovation has on sustainable performance.

Summary

In chapter 6.1 all variables are discussed one by one and a link is made to the theory in the literature review. When variables are insignificant, an explanation is given why the variable is insignificant. A prominent explanation for insignificant results is firm size. An important concept in the discussion is the time that it takes for an independent variable to have an effect on the dependent variable. The threshold value that is mentioned is also important, which means that at a certain value the coefficient has no or less effect. In section 6.2 the limitations are mentioned. Missing data points, the sample chosen, the absence of industry distinctions and the lags used are mentioned as limitations. In chapter 6.3 recommendations are given for future research. A recommendation is given for more quantitative research, for example exploring new board characteristics of sustainable performance. A recommendation for qualitative research is also given where a distinction based on the three pillars of sustainability is suggested. Also, a more in depth view of the correct lags and threshold values is worth researching. Possible endogeneity, where a third variable affects the significant variables "Innovative Capacity" and "Share of Female Board Members", could be present and it would be interesting to investigate this. The last recommendation made is to make a distinction of the types of innovation to see what type of innovation has the most effect on sustainable performance.

7   Conclusion

This research investigated whether 6 determinants derived from the literature would have an effect on sustainable performance. These determinants are Financial Performance, Leverage, Firm Size, Innovative Capacity, Share of Independent Directors and Share of Female Directors. All independent variables were lagged by 2 years and a dummy variable for each year was added. The sample used were all international firms in the STOXX 600 Europe index. Out of 600 companies, 39 were deleted because they had no foreign subsidiary and 7 more companies were deleted due to missing data, leaving 554 companies for the analysis. Multiple tests were done to identify the correct regression model. A fixed effects model turned out to be the most suitable. Relevant robustness checks were conducted. It turned out that only heteroskedasticity was a real problem, to solve this robust standard errors were used. It turned out that innovative capacity together with share of female directors has a positive effect on sustainable performance. The other variables turned out to be insignificant. Together with these two positively significant variables, a time trend was visible that showed that sustainable performance increased overall over time, showing that corporate sustainability is becoming more important throughout the years.

This research made a theoretical contribution by establishing that the variables "Innovative Capacity" and "Share of Women Directors" are positively related to sustainable performance for international firms. These findings are in line with other research. However, the other 4 variables turned out insignificant while the literature suggests that they should be significant. The insignificance of some variables is partially explained by the size of the firm in the discussion, since international firms are in most cases large firms (Calof, 1983). The thesis also makes a theoretical contribution by establishing that relevant variables for sustainable performance do not apply to international firms, showing that international firm determinants of sustainable performance might differ from national firm determinants of sustainable performance.

The research also gives practical contributions to policy makers and company directors/CEO's. Policy makers can kill two birds with one stone when incorporating the findings of this research. They can create policy that increases innovation, for example through subsidies or tax reduction. By increasing the level of innovation within companies they indirectly also increase sustainable performance. Policy makers can also design subsidies especially for innovation meant to increase sustainable performance. Policy makers can also create policies to increase the number

of women in the board of directors and thus also increase corporate sustainability, for example through a women's quota in the board. Because the research is about international firms that are active in multiple countries, this policy recommendation does not only apply to national governments, but also on a higher level to for example the European Union. Member states should work together to tackle environmental pollution and social issues instead of every country designing its own policy. Company directors or CEO's that want to increase their sustainable performance to create a competitive advantage might choose to hire more women in the board and increase their R&D expenditure to become more innovative. Innovative capacity and share of female directors can thus be used as tools to increase sustainable performance.

References

Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented innovation: a systematic review. *International Journal of Management Reviews*, *18*(2), 180–205.

Aigner, D. J., & Lloret, A. (2013). Sustainability and competitiveness in Mexico. *Management Research Review*, *36*(12), 1252–1271. https://doi-org.ru.idm.oclc.org/10.1108/MRR-06-2013-0138k

Alberti, F. G., & Varon Garrido, M. A. (2017). Can profit and sustainability goals co-exist? new business models for hybrid firms. *Journal of Business Strategy*, *38*(1), 3–13. https://doi-org.ru.idm.oclc.org/10.1108/JBS-12-2015-0124

Allegrini, M., & Greco, G. (2013). Corporate boards, audit committees and voluntary disclosure: Evidence from Italian listed companies. *Journal of Management & Governance*, *17*(1), 187-216.

Allen, S., & Marquart-Pyatt, S. T. (2018). Workplace energy conservation at Michigan state university. *International Journal of Sustainability in Higher Education*, 19(1), 114-129

Alshehhi, A., Nobanee, H., & Khare, N. (2018). The impact of sustainability practices on corporate financial performance: Literature trends and future research potential. *Sustainability*, *10*(2), 494.

Antolín-López Raquel, Delgado-Ceballos, J., & Montiel, I. (2016). Deconstructing corporate sustainability: a comparison of different stakeholder metrics. *Journal of Cleaner Production: Part A*, *136*, 5–17. https://doi-org.ru.idm.oclc.org/10.1016/j.jclepro.2016.01.111

Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2014). Causality and endogeneity: Problems and solutions. *The Oxford handbook of leadership and organizations*, *1*, 93-117.

Artiach, T., Lee, D., Nelson, D., & Walker, J. (2010). The determinants of corporate sustainability performance. *Accounting & Finance*, *50*(1), 31-51.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179-211.

Bansal, P., & Clelland, I. (2004). Talking trash: legitimacy, impression management, and unsystematic risk in the context of the natural environment. *The Academy of Management Journal*, *47*(1), 93–103.

Bansal, S., López-Perez, M. V., & Rodriguez-Ariza, L. (2018). Board independence and corporate social responsibility disclosure: The mediating role of the presence of family ownership. *Administrative Sciences*, *8*(3), 33.

Batista, A., & Francisco, A. (2018). Organizational sustainability practices: a study of the firms listed by the corporate sustainability index. *Sustainability*, *10*(1), 226. https://doi-org.ru.idm.oclc.org/10.3390/su10010226

Brush, C. G. (1992). Research on women business owners: Past trends, a new perspective and future directions. *Entrepreneurship Theory and Practice*, *16*(4), 5-30.

Calof, J. L. (1993). The impact of size on internationalization. *Journal of Small Business Management*, *31*(4), 60–69.

Courant, P. N., & Porter, R. C. (1981). Averting expenditure and the cost of pollution. *Journal of Environmental Economics and Management*, *8*(4), 321-329.

Craney, T. A., & Surles, J. G. (2002). Model-dependent variance inflation factor cutoff values. *Quality engineering*, *14*(3), 391-403.

Chang, R. D., Zuo, J., Zhao, Z. Y., Soebarto, V., Lu, Y., Zillante, G., & Gan, X. L. (2018). Sustainability attitude and performance of construction enterprises: A China study. *Journal of Cleaner Production*, *172*, 1440-1451.

Charter, M. (2006). Sustainable Consumption & Production, Business and Innovation. In Andersen, M.M. & Tukker, A (Reds) *Perspectives on Radical Changes to Sustainable Consumption and Production (SCP)* (243-252). Routledge

Chowdhury, F. D. (2009). Theorising patriarchy: the Bangladesh context. *Asian Journal of Social Science*, *37*(4), 599-622.

Činčalová, S., & Hedija, V. (2020). Firm characteristics and corporate social responsibility: The case of Czech transportation and storage industry. *Sustainability*, *12*(5), 1992.

Concalves, A. (2020, October 6). Multinational Companies Emit Nearly 20% of Global CO2 Emissions. Retrieved March 16, 2022, from *YouMatter:* https://youmatter.world/en/multinational-companies-global-emissions/

D'Amato, A., & Falivena, C. (2020). Corporate social responsibility and firm value: Do firm size and age matter? Empirical evidence from European listed companies. *Corporate Social Responsibility and Environmental Management*, *27*(2), 909-924.

Donaldson, L. (2001). The contingency theory of organizations. London: Sage. https://doi.org/10.4135/ 9781452229249

Eng, L. L., & Mak, Y. T. (2003). Corporate governance and voluntary disclosure. *Journal of Accounting and Public Policy*, *22*(4), 325-345.

European Commission. (n.d. A). Long Term Strategy for 2050. Retrieved March 16, 2022, from *European Commission*: https://ec.europa.eu/clima/eu-action/climate-strateiges-targets/2050-long-term-strategy_nl

European Commission. (n.d. B) Consequences of Climate Change. Retrieved June 13, 2022 from *European Commission:* https://ec.europa.eu/clima/climate-change/consequences-climate-change_en

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *Journal of Law and Economics*, *26*(2), 301-325.

Florea, L., Cheung, Y. H., & Herndon, N. C. (2013). For all good reasons: role of values in organizational sustainability. *Journal of Business Ethics*, *114*(3), 393–408.

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & De Colle, S. (2010). *Stakeholder theory: The state of the art.* Cambridge. Cambridge University Press

Freudenreich, B., Lüdeke-Freund, F., & Schaltegger, S. (2020). A stakeholder theory perspective on business models: value creation for sustainability. *Journal of Business Ethics*, *166*(1), 3–18. https://doi-org.ru.idm.oclc.org/10.1007/s10551-019-04112-z

Friedman, M. (September 13, 1970) *A Friedman Doctrine: The social responsibility of Businesses is to increase its profits".* The New York Times, P17.

Galpin, T., Whittington, J. L., & Bell, G. (2015). Is your sustainability strategy sustainable? creating a culture of sustainability. *Corporate Governance (Bingley)*, *15*(1), 1–17. https://doi-org.ru.idm.oclc.org/10.1108/CG-01-2013-0004

Garcia-Bernardo, J., and P. Janský. (2021). Profit shifting of multinational corporations worldwide. *Working Papers IES*, *14/2021*, 1–76.

Gerety, M., Hoi, C.-K., & Robin, A. (2001). Do Shareholders Benefit from the Adoption of Incentive Pay for Directors? *Financial Management*, *30*(4), 45–61. https://doi.org/10.2307/3666258

Goyal, P., Rahman, Z., & Kazmi, A. A. (2013). Corporate sustainability performance and firm performance research: literature review and future research agenda. *Management Decision*, *51*(2), 361–379. https://doi-org.ru.idm.oclc.org/10.1108/00251741311301867

Graessley, S., Horak, J., Kovacova, M., Valaskova, K., & Poliak, M. (2019). Consumer attitudes and behaviors in the technology-driven sharing economy: Motivations for participating in collaborative consumption. *Journal of Self-Governance and Management Economics*, *7*(1), 25-30.

Gujarati, D. N., 1995, Basic Econometrics, 3rd edition. Singapore. McGraw-Hill

Hallenga-Brink, S., & Brezet, J. C. (2005). The sustainable innovation design diamond for micro-sized enterprises in tourism. *Journal of Cleaner Production*, *13*(2), 141-149.

Hart, S. L., & Milstein, M. B. (2003). Creating sustainable value. *Academy of Management Executive*, 17, 56–69.

Hayes, A. (March 17,2022) Leverage. *Investopedia.* Retrieved April 13 , 2022 from https://www.investopedia.com/terms/l/leverage.asp

Helmig, B., Spraul, K., & Ingenhoff, D. (2016). Under positive pressure: how stakeholder pressure affects corporate social responsibility implementation. *Business and Society*, *55*(2), 151–187. https://doi-org.ru.idm.oclc.org/10.1177/0007650313477841

Hillman, A. J., & Keim, G. D. (2001). Shareholder value, stakeholder management, and social issues: what's the bottom line?. *Strategic Management Journal*, *22*(2), 125-139.

Hussain, N., Rigoni, U., & Orij, R. P. (2018). Corporate governance and sustainability performance: Analysis of triple bottom line performance. *Journal of Business Ethics*, *149*(2), 411-432.

IPCC. (2021) Climate Change 2021. The physical science basis, summary for policymakers. Retrieved March 7, 2022, from https://www.ipcc.ch/report/ar6/wg1/#FullReport

Jackson, A.L. , Schmidt, J. (2021, October 14th) Investing Basics: Small-Cap Stocks. *Forbes.* Retrieved May 24,2022 from https://www.forbes.com/advisor/investing/small-cap-stocks/

Jalles, J.T. (2010). How to measure innovation? new evidence of the technology-growth linkage. *Research in Economics*, *64*(2), 81–96. https://doi-org.ru.idm.oclc.org/10.1016/j.rie.2009.10.007

Jiang, X., Ding, Z., & Liu, R. (2019). Can chinese residential low-carbon consumption behavior intention be better explained? the role of cultural values. *Natural Hazards : Journal of the International Society for the Prevention and Mitigation of Natural Hazards*, *95*(1-2), 155–171. https://doi.org/10.1007/s11069-018-3461-2

Jizi, M., Salama, A., Dixon, R., & Stratling, R. (2014). Corporate governance and corporate social responsibility disclosure: Evidence from the US Banking Sector. *Journal of Business Ethics*, 125(4), 601–615. doi:10.1007/s10551-013-1929-2

Jo, H., & Harjoto, M. A. (2011). Corporate governance and firm value: The impact of corporate social responsibility. *Journal of Business Ethics*, *103*(3), 351-383.

Kenton, W. (2021, August 4) Durbin Watson Statistic Definition. *Investopedia.* Retrieved 9-05-2022, from https://www.investopedia.com/terms/d/durbin-watson-statistic.asp

Khaled, R., Ali, H., & Mohamed, E. K. (2021). The Sustainable Development Goals and corporate sustainability performance: Mapping, extent and determinants. *Journal of Cleaner Production*, *311*, 127599.

Kolk, A. (2016). The social responsibility of international business: From ethics and the environment to CSR and sustainable development. *Journal of World Business*, *51*(1), 23-34.

Kuhl, M. R., Da Cunha, J. C., Maçaneiro, M. B., & Cunha, S. K. (2016). Relationship between innovation and sustainable performance. *International Journal of Innovation Management*, *20*(06), 1650047. https://doi.org/10.1142/S136391961650047X3

Kuzma, E., Padilha, L. S., Sehnem, S., Julkovski, D. J., & Roman, D. J. (2020). The relationship between innovation and sustainability: A meta-analytic study. *Journal of Cleaner Production*, *259*, 120745.

Libert, B. , Beck, M. , Wind, Y. (September 29, 2016) Investors Today Prefer Companies with fewer Physical Assets. *Harvard Business Review.* Retrieved April 18, 2022 from https://hbr.org/2016/09/investors-today-prefer-companies-with-fewer-physical-assets

Lim, S., Matolcsy, Z., & Chow, D. (2007). The association between board composition and different types of voluntary disclosure. *European Accounting Review*, 16(3), 555–583. doi:10.1080/ 09638180701507155

López, L. A., Cadarso, M. Á., Zafrilla, J., & Arce, G. (2019). The carbon footprint of the US multinationals' foreign affiliates. *Nature Communications*, *10*(1), 1-11.

Lourenço, I. C., & Branco, M. C. (2013). Deteᵣminants of corporate sustainability performance in emerging markets: the Brazilian case. *Journal of Cleaner Production*, *57*, 134-141.

Ludbrook, F., Michalikova, K. F., Musova, Z., & Suler, P. (2019). Business models for sustainable innovation in industry 4.0: Smart manufacturing processes, digitalization of production

systems, and data-driven decision making. *Journal of Self-Governance and Management Economics*, *7*(3), 21-26.

McWilliams, A., & Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification?. *Strategic Management Journal*, *21*(5), 603-609.

Miller, K (2020, December 8). The triple bottom line: What it is and why it is important. Retrieved March 16, 2022, from *Harvard Business School Online*:

https://online.hbs.edu/blog/post/what-is-the-triple-bottom-line

Muttakin, M. B., Khan, A., & Subramaniam, N. (2015). Firm characteristics, board diversity and corporate social responsibility. *Pacific Accounting Review*, *27*(3), 353–372. https://doi-org.ru.idm.oclc.org/10.1108/PAR-01-2013-0007

Naciti, V. (2019). Corporate governance and board of directors: The effect of a board composition on firm sustainability performance. *Journal of Cleaner Production*, *237*, 117727.

Nikolaev, V., & Van Lent, L. (2005). The endogeneity bias in the relation between cost-of-debt capital and corporate disclosure policy. *European Accounting Review*, *14*(4), 677-724.

Nill, J., & Kemp René. (2009). Evolutionary approaches for sustainable innovation policies: from niche to paradigm? *Research Policy*, *38*(4), 668–680. https://doi-org.ru.idm.oclc.org/10.1016/j.respol.2009.01.011

OECD (2016), The Economic Consequences of Outdoor Air Pollution, OECD Publishing, Paris. Retrieved June 13, 2022 from https://read.oecd-ilibrary.org/environment/the-economic-consequences-of-outdoor-air-pollution_9789264257474-en#page1

Orij, R. (2010). Corporate social disclosures in the context of national cultures and stakeholder theory. *Accounting, Auditing & Accountability Journal*. 23(7), 868-889

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying business models: Origins, present, and future of the concept. *Communications of the association for Information Systems*, *16*(1), 1-25

Philippe, D., & Durand, R. (2011). The impact of norm-conforming behaviors on firm reputation. *Strategic Management Journal*, *32*(9), 969–993.

Rao, K., & Tilt, C. (2016). Board diversity and csr reporting: an australian study. *Meditari Accountancy Research*, *24*(2), 182–210. https://doi-org.ru.idm.oclc.org/10.1108/MEDAR-08-2015-0052

Raworth, K. (2017). *Doughnut economics: seven ways to think like a 21st-century economist*. Hartford. Chelsea Green Publishing.

Savitz, A.W. and Weber, K. (2006), The Triple Bottom Line: How Today's Best-Run Companies Are Achieving Economic, Social and Environmental Success – And How You Can Too, , San Francisco, Jossey-Bass

Son, I., Kim, J., Park, G., Kim, S., 2018. The impact of innovative technology exploration on firm value sustainability: the case of Part Supplier management. *Sustainability* (10), 3632. https://doi.org/10.3390/su10103632.

Starik, M., Holliday, S. and Paton, B. (2012), "Strategic environmental sustainability management: highlighting the need and opportunities to recognize environmentally hidden economic sectors", *International Journal of Business Insights & Transformation*, 4(3), 8-15.

Surroca, J., Tribó, J. A., & Waddock, S. (2010). Corporate responsibility and financial performance: The role of intangible resources. *Strategic Management Journal*, *31*(5), 463-490.

Sustainable Development Report. (2021). Rankings: The overall performance of all 193 UN Member States. Retrieved March 17, 2022, from *Sustainable Development Report*: https://dashboards.sdgindex.org/rankings

Tukker, A., Emmert, S., Charter, M., Vezzoli, C., Sto, E., Andersen, M., Geerken, T., Tischner, U. & Lahlou, S. (2008). Fostering change to sustainable consumption and production: an evidence based view. *Journal of Cleaner Production*, 16(11), 1218–1225.

Tunçer, B., & Kuhndt, M. (2006). Elements of System Innovations for Sustainable Consumption & Production. In Andersen, M.M. & Tukker, A (Reds) *Perspectives on Radical Changes to Sustain-able Consumption and Production (SCP)* (445-460). London. Routledge

United Nations Documents. (1987). Report of the world commission on environment and development: Our common future. Retrieved March 7, 2022, from http://www.un-documents.net/ocf-02.htm#I.

Van Dijk, B., Den Hertog René, Menkveld, B., & Thurik, R. (1997). Some new evidence on the determinants of large- and small-firm innovation. *Small Business Economics*, *9*(4), 335–343.

Verheijke, E., van Rijssel, M. , Grünberg, G. (2022, March 17) CSRD verplicht duizenden bedrijven tot duurzaamheidsrapportage. *Grant Thornton*. Retrieved April 5, 2022 from

https://www.grantthornton.nl/insights/themas/duurzaamheid/csrd-verplicht-duizenden-bedrijven-tot-duurzaamheidsrapportage/

Wagner, M., & Schaltegger, S. (2003). Introduction: How does sustainability performance relate to business competitiveness?. *Greener Management International*, (44), 5-16.

Wang, M. C. (2017). The relationship between firm characteristics and the disclosure of sustainability reporting. *Sustainability*, *9*(4), 624-624 https://doi-org.ru.idm.oclc.org/10.3390/su9040624

Wiklund, J. (1999). The sustainability of the entrepreneurial orientation—performance relationship. *Entrepreneurship theory and practice*, *24*(1), 37-48.

Wilkinson, A., Hill, M., & Gollan, P. (2001). The sustainability debate. *International Journal of Operations & Production Management*. 21(12), 1492-1502

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. Cambridge. MIT press.

Wüstenhagen, R., & Boehnke, J. (2006). Business models for sustainable energy. In Andersen, M.M. & Tukker, A. (Reds) *Perspectives on Radical Changes to Sustainable Consumption and Production (SCP)* (253-258). Routledge.

Yuriev, A., Dahmen, M., Paillé Pascal, Boiral, O., & Guillaumie, L. (2020). Pro-environmental behaviors through the lens of the theory of planned behavior: a scoping review. *Resources, Conservation & Recycling*, *155*. 1-12 https://doi-org.ru.idm.oclc.org/10.1016/j.resconrec.2019.104660

Zahra, S. A., & Stanton, W. W. (1988). The implications of board of directors composition for corporate strategy and performance. *International Journal of Management*, *5*(2), 229-236.

Zhang, J. Q., Zhu, H., & Ding, H. B. (2013). Board composition and corporate social responsibility: An empirical investigation in the post Sarbanes-Oxley era. *Journal of Business Ethics*, *114*(3), 381-392.

Ziegler, A., & Schröder, M. (2010). What determines the inclusion in a sustainability stock index?: A panel data analysis for european firms. *Ecological Economics*, *69*(4), 848-856.

8   Appendices

8.1   Appendix A : Dataset

> 600 Companies from the Stoxx 600 Europe
>
> Companies from Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and the UK.

Only companies that have a foreign subsidiary are included because the thesis focuses on international firms. Through Orbis, a list is made with the number of foreign subsidiaries. Only subsidiaries where the firm controls over 50% are included. This is because the thesis only wants to look at firms that operate internationally. Owning a majority subsidiary shows real commitment and strong presence in entering foreign markets. Minority stakes in a foreign subsidiary can also be done as a way for the company to invest, meaning that they have no interests in entering that new foreign market. Therefore, majority stakes in at least one foreign subsidiary is a good way to filter for international companies. In the STOXX 600, there are 39 companies who have no foreign subsidiary, according to the latest data from 2021.

This leads to the exclusion of the following companies.

Company Name	ISIN code
DAIMLER TRUCK HOLDING AG	DE000DTR0CK8
UNIVERSAL MUSIC GROUP N.V.	NL0015000IY2
JDE PEET'S N.V.	NL0014332678
BARRATT DEVELOPMENTS PLC	GB0000811801
ASR NEDERLAND NV	NL0011872643
AKER BP ASA	NO0010345853
BELLWAY PLC	GB0000904986
TRYG A/S	DK0060636678
DINO POLSKA SA	PLDINPL00011
VISTRY GROUP PLC	GB0001859296
L E LUNDBERGFORETAGEN AB	SE0000108847
AENA S.M.E, S.A.	ES0105046009
BANK POLSKA KASA OPIEKI SA	PLPEKAO00016
VIRGIN MONEY UK PLC	GB00BD6GN030

SALMAR ASA	NO0010310956
GREGGS PLC	GB00B63QSB39
LEG IMMOBILIEN SE	DE000LEG1110
PENNON GROUP PLC	GB00B18V8630
INFRASTRUTTURE WIRELESS ITALIANE S.P.A.	IT0005090300
HARGREAVES LANSDOWN PLC	GB00B1VZ0M25
LAND SECURITIES GROUP PLC	GB00BYW0PQ60
GECINA	FR0010040865
SWISS PRIME SITE AG	CH0008038389
ALLREAL HOLDING AG	CH0008837566
NETCOMPANY GROUP A/S	DK0060952919
KOJAMO OYJ	FI4000312251
DERWENT LONDON PLC	GB0002652740
PSP SWISS PROPERTY AG	CH0018294154
RIGHTMOVE PLC	GB00BGDT3G23
AVANZA BANK HOLDING AB	SE0012454072
UNITE GROUP PLC	GB0006928617
AUTOSTORE HOLDINGS LTD	BMG0670A1099
FABEGE AB	SE0011166974
WALLENSTAM AB	SE0007074844
BIG YELLOW GROUP PLC	GB0002869419
LONDONMETRIC PROPERTY PLC	GB00B4WFW713
WISE PLC	GB00BL9YR756
INDUSTRIVARDEN AB	SE0000190126
SOFTCAT PLC	GB00BYZDVK82

TABLE 13: COMPANIES WITHOUT A FOREIGN SUBSIDIARY

Furthermore, there were companies in the dataset that had no values for the dependent variable "ESG Score". These companies will also be deleted since the independent variables cannot make a prediction when there is no value. This leads to the deletion of the following 7 companies:

Company name	ISIN Code	Other missing variables
ALLFUNDS GROUP	GB00BNTJ3546	Share of female directors, share of independent directors
BRIDGEPOINT GROUP	GB00BND88V85	Share of female directors, share of independent directors
DR MARTENS	GB00BL6NGV24	Share of female directors, share of independent directors
OXFORD NANOPORE TECHNOLOGIES	GB00BP6S8Z30	Share of female directors, share of independent directors
SIG GROUP N	CH0435377954	Share of female directors, share of independent directors
VANTAGE TOWERS N (XET)	DE000A3H3LL2	All variables
VOLVO CAR B	SE0016844831	Share of female directors, share of independent directors

TABLE 14: DELETED COMPANIES DUE TO MISSING VALUES

A big advantage of deleting these companies is that these companies are also the ones that have no values for other variables, as can be seen in table 13. By deleting these companies, together with the filling up methods of the data that are explained in the thesis, this makes the dataset complete.

This leaves the dataset with 600 – 39 – 7 = 554 companies.

8.2   Appendix B: OLS and random effects regression

	Random effects ESG	OLS ESG
ROA	0.0507	-0.118
	(1.55)	(-1.52)
Leverage	-0.205	12.10[***]
	(-0.07)	(3.86)
Employees	0.0000472[**]	0.0000780[***]
	(3.09)	(7.00)
Patents	0.00621[***]	0.00858[***]
	(6.09)	(4.46)
Independent	0.0402[*]	0.119[***]
	(2.45)	(4.42)
Gender	0.0982[***]	0.206[***]
	(4.37)	(4.27)
Year=2012	0	0
	(.)	(.)
Year=2013	0.348	-0.00216
	(1.71)	(-0.01)
Year=2014	0.805[**]	0.220
	(2.99)	(0.66)
Year=2015	3.015[***]	2.223[***]
	(8.87)	(4.96)
Year=2016	4.124[***]	3.044[***]
	(10.15)	(5.52)
Year=2017	6.239[***]	4.813[***]
	(12.76)	(7.27)
Year=2018	8.655[***]	6.852[***]
	(15.67)	(8.77)
Year=2019	10.79[***]	8.986[***]
	(17.73)	(10.11)

Year=2020	14.23***	12.24***
	(21.03)	(12.40)
Constant	47.52***	33.40***
	(20.94)	(11.79)
Observations	4986	4986
R^2	0.423	0.304

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 15: RANDOM EFFECTS AND OLS REGRESSION WITH 2 YEARS LAG

	Random effects ESG	OLS ESG
ROA	0.0282	-0.123
	(0.82)	(-1.56)
Leverage	0.575	12.40***
	(0.21)	(3.99)
Employees	0.0000497**	0.0000786***
	(2.99)	(7.06)
Patents	0.00585***	0.00884***
	(6.95)	(4.54)
Independent	0.0654***	0.126***
	(3.67)	(4.72)
Gender	0.138***	0.234***
	(5.95)	(4.81)
Year=2011	0	0
	(.)	(.)
Year=2012	0.101	-0.198
	(0.40)	(-0.72)
Year=2013	0.410	-0.0926
	(1.46)	(-0.28)
Year=2014	0.719*	0.0500
	(1.99)	(0.11)
Year=2015	2.725***	1.818**

	(6.61)	(3.26)
Year=2016	3.781***	2.582***
	(8.07)	(3.91)
Year=2017	5.765***	4.252***
	(10.80)	(5.49)
Year=2018	8.120***	6.648***
	(13.83)	(7.53)
Year=2019	10.43***	8.825***
	(16.19)	(9.00)
Year=2020	13.72***	11.79***
	(19.42)	(10.71)
Constant	44.72***	31.87***
	(19.38)	(11.31)
Observations	5540	5540
R^2	0.428	0.311

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 16: RANDOM EFFECTS AND OLS REGRESSION WITH 1 YEAR LAG

	Random effects ESG	OLS ESG
ROA	0.0214	-0.135
	(0.69)	(-1.74)
Leverage	0.0850	12.65***
	(0.04)	(4.10)
Employees	0.0000541**	0.0000787***
	(2.81)	(7.07)
Patents	0.00502***	0.00907***
	(6.63)	(4.72)
Independent	0.0930***	0.133***
	(4.94)	(5.00)
Gender	0.177***	0.257***
	(7.47)	(5.25)

Year=2010	0	0
	(.)	(.)
Year=2011	0.629**	0.387
	(2.66)	(1.58)
Year=2012	0.709*	0.300
	(2.41)	(0.90)
Year=2013	0.839*	0.325
	(2.49)	(0.76)
Year=2014	0.920*	0.246
	(2.36)	(0.46)
Year=2015	2.871***	1.970**
	(6.38)	(3.09)
Year=2016	3.781***	2.645***
	(7.38)	(3.51)
Year=2017	5.695***	4.706***
	(9.94)	(5.46)
Year=2018	8.215***	7.170***
	(13.20)	(7.50)
Year=2019	10.33***	9.043***
	(15.12)	(8.36)
Year=2020	13.55***	11.84***
	(18.12)	(9.77)
Constant	41.89***	29.95***
	(19.07)	(10.76)
Observations	6094	6094
R^2	0.447	0.316

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 17: RANDOM EFFECTS AND OLS REGRESSION WITHOUT LAGS

8.3   Appendix C: Descriptive statistics after outlier intervention

VARIABLES	N	mean	SD	min	max
ROA	6,094	6.670	7.241	-13.45	37.93
LEVERAGE	6,094	0.614	0.212	0.118	1.072
EMPLOYEES	6,094	41,801	69,857	30	423,092
PATENTS	6,094	144.8	367.4	0	2,395
INDEPENDENT	6,094	59.52	24.11	0	100
GENDER	6,094	25.70	13.43	0	57.14

TABLE 18:DESCRIPTIVE STATISTICS AFTER WINSOR2 INTERVENTION