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# Understanding Sustainability Strategy

An Emprical Study of the Norwegian  
Manufacturing Industry

Master's thesis in Industrial Economics and Technology  
Management  
Supervisor: Arild Aspelund  
June 2022



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## **Thesis statement**

Companies are facing a rising pressure to incorporate sustainability into their strategies. The objective of this study is to explore the role of sustainability in a strategic context. As the field of corporate sustainability is still heavily fragmented, we seek to contribute to fundamental questions such as which companies are at the forefront, whether the increased competitiveness associated with sustainability results in higher growth ambitions, which growth strategies are used by sustainable companies, and how sustainable companies overcome the double externality problem.

## **Preface**

This study is a master thesis written by Kristina Aas and Frida Marie Pedersen at the department of Industrial Economics and Technology Management at the Norwegian University of Science and Technology. The thesis has been written during the spring of 2022.

The thesis is based on a correlation analysis and analysis of variance conducted in IBM SPSS on data gathered from the questionnaire “*NTNU's industry survey*” from 2022. The survey was supervised by the Norwegian University of Science and Technology. The authors of this thesis made the data collection. Company specific information gathered from the official registers of *Proff Forvalt* supplemented the questionnaire.

We would like to express our deepest gratitude to everyone who has assisted us with the master thesis. First and foremost, we wish to sincerely thank our supervisor professor Arild Aspelund for his invaluable advice and reflections, patience, optimism and highly pedagogical blackboard use. We also wish to thank Dag Håkon Haneberg for assisting us with the data collection, and Ann Elida Eide and Øystein Moen for their input on methodological questions.

Trondheim, 09.06.2022

Kristina Aas and Frida Marie Pedersen

## Abstract

Increasing attention on sustainability is leading firms to adopt sustainability practices at an ever-increasing pace. However, the field of corporate sustainability is highly fragmented, and fundamental questions about sustainability in a strategic context remain unanswered. Understanding which companies are at the forefront of implementing sustainability practices, why they are doing it and how, is vital to increase the understanding of one of the most important transitions of our time.

This study aims to explore these questions, and uncover which companies are most likely to be sustainable, whether they are more likely to have higher growth ambitions, and which growth strategies and tools sustainable companies use to realise their ambitions.

A questionnaire was sent to all companies in the manufacturing industry in Norway with NACE codes in the group “C - Manufacturing”. The survey data was combined with data retrieved from the official registers of *Proff Forvalt*. Correlation analysis with Spearman’s rho and analysis of variance (ANOVA) were used to uncover relationships between sustainability strategy and company characteristics, growth ambition, growth strategy, internationalisation and digitalisation.

The study finds that larger companies are more likely to be sustainability-oriented, while age is irrelevant. There is a strong, positive relationship between sustainability and growth ambition, suggesting that sustainability plays an important role in growth. We argue that this is likely a result of the increased competitiveness associated with sustainability. Furthermore, we find a positive relationship between sustainability strategy and growth through differentiation, but not with growth through lower costs, suggesting sustainability is mainly considered a differentiation strategy by Norwegian manufacturers. Lastly, we find positive relationships between sustainability and internationalisation, innovation and digitalisation and automation. We argue that more sustainable companies are more likely to utilise a variety of tools and strategies to conquer the double externality problem and increase the odds of success in spite of challenges associated with sustainability.

We contribute to theory by partaking in several unresolved discussions in the field, such as how internationalisation, innovation, and digitalisation are related to sustainability efforts. Furthermore, we contribute to an increased understanding of sustainability in a strategic context. This helps to shed light on how sustainability is implemented and how it is used by firms to gain competitiveness in practice. This information is vital for managers when incorporating sustainability into their strategies. Understanding how sustainable companies succeed can also help regulators implement laws and support schemes that help promote beneficial practices.

## Sammendrag

Det økte fokuset på bærekraft har ledet til at selskaper tar i bruk bærekraftige strategier i et stadig økende tempo. Samtidig er bærekraft i forretningsammenheng et fragmentert felt der mange grunnleggende spørsmål fortsatt er ubesvart. Det er avgjørende å forstå hvilke selskaper som driver det grønnet skiftet, hvorfor det gjør det og hvordan dersom vi skal komme i mål med en av vår tids viktigste omveltninger.

Denne studien har som mål å utforske disse temaene, og avdekke hvilke selskaper som er mest bærekraftsorienterte, hvorvidt disse selskapene har høyere vekstambisjoner, og hvilke vekststrategier og verktøy de bruker for å realisere disse ambisjonene.

Et spørreskjema ble sendt ut til alle bedrifter i Norsk vareproduserende industri. Denne dataen ble kombinert med data hentet fra registrene til *Proff Forvalt*. Korrelasjonsanalyse med Spearman's rho og variansanalyse (ANOVA) ble benyttet for å avdekke sammenhengene mellom bærekraftsstrategi og bedrifts karakteristikk, vekstambisjoner, vekststrategier, internasjonalisering og digitalisering.

Studien finner at det er en korrelasjon mellom størrelse og bærekraftssatsning, mens alder ikke har en signifikant effekt. Det er en sterk, positiv sammenheng mellom bærekraft og vekstambisjon, noe som tyder på at bærekraft spiller en viktig rolle i vekst. Vi argumenterer for at dette sannsynligvis er et resultat av økt konkurranseevne tilknyttet bærekraft. Videre finner vi en positiv sammenheng mellom bærekraftsstrategi og vekst gjennom differensiering, men ikke med vekst via lavere kostnader, noe som tyder på at bærekraft hovedsakelig anses som en differensieringsstrategi av norske produsenter. Til slutt finner vi sterke sammenhenger mellom bærekraft og internasjonalisering, innovasjon og digitalisering og automatisering. Vi argumenterer for at bærekraftsorienterte selskaper er flinkere til å ta i bruk en rekke verktøy og strategier for å overvinne problemet med dobbel eksternalitet, og dermed øker sjansene for suksess til tross for utfordringer knyttet til bærekraft.

Vi bidrar til teori ved å delta i flere uavklarte diskusjoner i feltet, blant annet hvordan internasjonalisering, innovasjon og digitalisering henger sammen med bærekraftige satsinger. Videre bidrar vi til økt forståelse av bærekraft i en strategisk kontekst. Dette bidrar til å belyse hvordan bærekraft implementeres og hvordan det brukes av bedrifter for å oppnå konkurransekraft i praksis. Denne informasjonen er viktig for ledere for å bedre forståelsen av hvordan de kan innlemme bærekraft i sine strategier. Å forstå hvordan bærekraftsorienterte selskaper lykkes kan også hjelpe lovgivere med å implementere lover og støtteordninger som bidrar til å fremme fordelaktig praksis.



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# 1 Introduction

The urgency to tackle the climate crisis is growing, with immediate implications for the Norwegian manufacturing industry. The latest report published by the Intergovernmental Panel on Climate Change (IPCC) on February 28th paints a grim picture of rising weather and climate extremes. Public attention on the issue is mounting and consumers are demanding action, leading to increased stakeholder pressure on manufacturing firms to be more sustainable (Carter & Easton, 2011; Gonzales-Perez, 2013). Furthermore, politicians are making increasingly ambitious pledges – the Norwegian government has promised to reduce emissions by 55 % by 2030 compared to 1990 levels (Regjeringen, 2021). Internationally, the pressure to be green is also rising. Mounting regulation from the EU is pushing companies to adapt, and in COP26, 200 countries pledged to reduce coal emissions, cut methane emissions and reduce deforestation (United Nations, 2021).

As a result of this, companies are facing increasing pressure to be sustainable, driven by regulations, customer pressures, competitor pressures and social responsibilities (Markard, Raven & Truffer, 2012; Wu & Pagell, 2011). This has led to widespread adoption of sustainability practices (Bossle, de Bercellos, Vieira & Sauvée, 2016; Evans, Vladimirova, Holgado, van Fossen, Yang, Silva & Barlow, 2017; Kleindorfer, Singhal & Wassenhove, 2005). However, research is still lacking on how sustainability plays into our current understanding of strategy, as the field is still young and fragmented (Balasubramanian, Shukla, Mangla & Chanchaichujit, 2020; Cañizares, 2021).

Indeed, many researchers argue that the nature of corporate sustainability is fundamentally different from the established literature on business, management and innovation (Adams, Jeanrenaud, Bessant, Denyer & Overy, 2016; Hermundsdottir, Eide & Aspelund, 2021; Markard et al., 2012). Sustainable companies face the double externality problem, which reduces incentives for firms to invest in sustainable innovations (Rennings, 2000), as they cannot fully appropriate the social returns as private returns. In order to overcome this issue, sustainable companies likely have to employ other tools to reach their goals, such as innovation, internationalisation and digitalisation. The debate on how sustainability is correlated with these fields is highly divided (Moeuf, Pellerin, Lamouri, Tamayo-Giraldo & Barbaray 2018; Zhang & Xu, 2019).

The double externality problem is only one of many dimensions that adds to the complexity of sustainability (Markard et al., 2012). This complexity creates a need for a fundamental mapping of how sustainability affects company success, both in terms of competitiveness, strategy and execution. This study aims to contribute by identifying and exploring which companies are driving the sustainability transition and how. It will do so by researching the characteristics of

highly sustainable Norwegian manufacturers in terms of general characteristics, growth ambitions, and growth strategies, and by examining how sustainable companies can overcome the double externality problem through other strategic growth paths.

Consequently, with this study, we make both theoretical and empirical contributions. We add to the discussion of which companies are driving the sustainability transition by identifying the common characteristics of sustainable companies. Thereafter, we contribute to the understanding of how sustainability plays into the current understanding of strategy and competitiveness, which is currently unclear. Thus, our research helps mature the field and move the field beyond *whether* sustainability is linked to strategic growth and towards understanding *under what conditions and how* sustainability can be a strategic growth path.

A deeper understanding of the strategies employed by more sustainable companies could help other companies follow their lead to focus their sustainability strategies and increase competitiveness. More knowledge on what works and why can help managers make sustainability an ingrained part of their strategies, and use it to fuel growth and gain an increasing market share. Furthermore, regulators could use this information when implementing laws and support schemes in such a way that they support the strategies most likely to reduce emissions without having a negative impact on performance. This is vital for the Norwegian economy to remain strong.

## **1.1 Research question**

This paper addresses the following research question:

*Which companies are driving the sustainability transition, and how are they doing it?*

The research question is used to develop seven hypotheses in the following chapter.

## **1.2 Structure of the thesis**

The master thesis is structured as follows: First, the theoretical background is presented, covering relevant knowledge in the fields of sustainability strategy and its intersections with digitalisation and internationalisation. This section also includes relevant theoretical frameworks. Seven hypotheses are developed based on the literature. Second, the methodology used in the study is presented. The study uses statistical “tools” such as correlation analysis and ANOVA to examine the relationships between sustainability strategy and the other variables of interest. It is based on survey data from Norwegian manufacturing companies and publicly available financial data about these firms. Third, the empirical results are presented, before they are subsequently

discussed in light of existing theory. Implications for theory and practice are also discussed along with limitations and suggestions for further research. Lastly, concluding remarks are presented.

## **2 Theoretical background**

This chapter presents the theoretical background of the study. First, the concept of corporate sustainability is presented. Then, we discuss relevant theory on how sustainability affects strategy, which type of generic strategy sustainability belongs to, and which practices are adopted by sustainable companies to succeed. Based on this, we develop seven hypotheses.

### **2.1 Corporate sustainability**

In 1987, the UN Brundtland Report defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987, p. 37). This report is considered the origin of sustainability as a policy concept. In the course of time, the term sustainability has expanded to encompass the three dimensions of social, environmental, and economic sustainability (Kuhlman & Farrington, 2010). The idea of these three pillars stems from John Elkington’s (1999) Triple Bottom Line (TBL), which expands business success metrics to include contributions to these dimensions of sustainability. The pillars are closely intertwined and must be seen together to implement sustainability practices (Elkington, 1999). Sustainability in a business context commonly refers to measures taken by businesses to adopt practices that support sustainable development along all three dimensions (Goyal, Rahman & Kazmi, 2013).

Corporate sustainability (CS) is one of the terms that are frequently used to describe the concept of sustainability within a business context. At the firm level, CS has been defined as “meeting the needs of a firm’s direct and indirect stakeholders without compromising its ability to meet the needs of future stakeholders as well” (Dyllick & Hockerts, 2002, p.131). Salzmann, Ionescu-Somers and Steger (2005) add to this definition, stating that CS is about a company’s activities that contribute to solving environmental and social issues in strategic and profitable ways. Several researchers argue that CS encompasses all three pillars of sustainability in business decisions and activities, while ensuring profitability (Dyllick & Hockerts, 2002; Schaltegger, Lüdeke-Freund & Hansen, 2012). The terms corporate sustainability (CS) and corporate social responsibility (CSR) are often used interchangeably, inconsistently and ambiguously by researchers (Bansal & Song, 2017; Cañizares, 2021). Thus, it is reasonable to assume that many of the concepts relating to CSR, which have been studied to a greater degree, also apply to CS. In this thesis, we use the terms “sustainability” and “corporate sustainability” interchangeably, following the definition above.

## 2.2 The current state of corporate sustainability

Corporate sustainability has received mounting attention during the last decades (Cheng, Ioannou & Serafeim, 2014). Climate change has sparked an urgency to reduce emissions and waste, and firms are beginning to be held accountable for their actions (Markard et al. 2012; Wu & Pagell, 2011). This has led companies to adopt sustainability practices at an increasing pace as they attempt to meet rising consumer and stakeholder demands, and as they respond to stricter regulations (Bansal & Roth, 2000; Bossle et al., 2016; Evans et al., 2017; Sharma, 2000). The call for transparency and action has led firms to take corporate sustainability more seriously (Kleindorfer et al., 2005). Some companies are already reaping benefits of their sustainability efforts through increased competitiveness, while others are amplifying their efforts to prepare for the future when sustainability will be a necessity (Wang & Sarkis, 2013). This rapid shift comes with a series of challenges: there is still little scientific knowledge on how sustainability can be implemented in practice by firms to increase competitiveness (Aguinis & Glavas, 2012; Gray & Shadbegian, 1998). Furthermore, many researchers argue that sustainability is inherently different from other types of innovation and strategies (Adams et al., 2016; Hermundsdottir et al., 2021; Markard et al., 2012). The nature of sustainability produces a unique set of difficulties that firms must face, making much of the established strategic understanding inappropriate.

One of the most notable differences is that sustainable firms face the double externality problem (Rennings, 2000). This can be defined as follows:

*“The “double externality problem” refers to the situation where environmental innovations produce both positive spillovers for the firm based on basic R&D, and at the same time produce positive externalities by improving environmental quality. This means that environmental innovators improve the quality of the environment, but while the firm bear the costs of the innovation it is the society that reap the benefits of less pollution”*  
Jakobsen & Clausen (2016, p. 131-132)

General innovation has a positive externality where the firm’s incentive to invest in research and development (R&D) is reduced because of knowledge spillover that benefits competing firms (Faber & Frenken, 2009; Peri, 2005). Sustainability innovation has an additional externality where parts of the value created is appropriated by society, rather than by the firm investing in the sustainability innovation (Malen & Marcus, 2017). In other words, more sustainable companies do not necessarily get financial returns from their investments. Instead, higher costs are incurred compared to the firm’s polluting competitors, creating a disincentive for firms to invest in environmental sustainability (Cecere, Corrocher, Gossard & Ozman, 2014; Jaffe, Newell & Stavins, 2005; Zhang, Malik, Khan, Ali, Malik & Bilal, 2022). The double externality problem is thus a central issue preventing firms from adopting sustainable policies. This thesis attempts to understand how firms with sustainability strategies tackle this issue.

Another difficulty is that sustainability changes are often difficult to implement (Hasmeier & Losacker, 2021). Sustainability innovations are usually factor saving rather than quality improving, leading customers to receive the same quality but at a higher cost (van den Bergh, Truffer & Kallis, 2011). Furthermore, sustainability is characterised by a higher complexity that is partly caused by the large number and variety of actors and interests that are involved in transformation processes towards sustainability (Markard et al., 2012). This leads to several additional challenges, such as an increasing demand for resources and knowledge, which needs to be met by sustainable companies. In Section 2.7, we examine how sustainable companies face these challenges.

In summary, corporate sustainability is rapidly becoming essential for firms. However, lack of research combined with a unique set of difficulties makes it critical to understand how firms with high sustainability efforts succeed and overcome these issues. This is the objective of the study.

### **2.3 Which companies are at the forefront of the sustainability transition?**

A key steppingstone to understanding sustainability strategy is understanding which companies are at the forefront of implementing it. Due to the complex nature of sustainability, there are reasons to believe that larger and more established firms are leading the way. The particular set of issues incurred by sustainability call for large and established players with the necessary financial resources and competitive resilience to handle these challenges (Laudal, 2011). In that case, the sustainability transition relies on another type of innovation than what is typically seen. In conventional innovation theory, such as radical innovation and disruptive innovation, small and newly established firms are the most important value creators (Hermundsdottir et al., 2021). Without being tied to bureaucracy, existing supply chains and customer relationships, they have been able to capture more of the opportunities for value creation (Christensen, 1997; Henderson & Clark, 1990).

If larger and older companies provide most sustainability innovations, it is reasonable to assume that sustainability innovation processes differ from the established theory, as intrapreneurship and entrepreneurship require different innovation processes (Parker, 2009). Studies suggest that firm characteristics such as size and age might indeed be a factor in their commitment to environmental strategies, practices and performance (Gil, Jiménez & Lorente, 2001; Shrivastava & Tamvada, 2019; Vijayvargy, Thakkar & Agarwal, 2017). Most research agrees that larger companies are more sustainable, and that they can easier translate sustainability to profitability (Vijayvargy et al., 2017). A comprehensive literature review conducted by Balasubramanian et al. (2020) confirmed that larger firms to a higher extent implement environmental practices than smaller firms. The same holds true for foreign firms compared to local ones. However, age was not found to be a significant factor in determining sustainability efforts (Balasubramanian et al., 2020). Hermundsdottir et al. (2021) similarly found the large players to be more sustainability-



oriented, but, in contrast to other research, they also found age to positively relate to sustainability practices.

Thus, the literature shows that larger companies tend to be more sustainable, and we expect to find the same for our study. Whether age is important is not as clear, but as Hermundsdottir & Aspelund (2021) have previously found age to correlate with sustainability in Norwegian manufacturing, we propose the same for our study. Furthermore, it is reasonable to assume that older companies have more competencies that are useful when dealing with the increased complexity of sustainability, such as larger networks and know-how through experience. This leads to:

- H1: Larger companies are more sustainability-oriented.
- H2: Older companies are more sustainability-oriented.

## **2.4 Sustainability, competitiveness and growth ambition**

To properly understand how companies can succeed with sustainability, it is important to look to those that already are. In recent years, the amount of evidence pointing towards sustainability as a competitive advantage has risen drastically. Sustainable companies are more likely to believe that sustainability is a source of competitiveness (Eide, Saether & Aspelund, 2020). Many researchers argue that sustainability can lead to better performance, in terms of both operational and financial performance (Vijayvargy et al., 2017; Balon, 2020). In addition, research has shown sustainable companies to be more innovative (Macchion, Moretto, Caniato, Caridi, Danese, Spina & Vinelli, 2017; Michelino, Cammarano, Celone & Caputo, 2019). In other words, the companies pursuing sustainability strategies are better at perceiving opportunities within the spheres of sustainability, and they utilise these opportunities for increased competitiveness and innovation. We believe these skills consequently result in higher growth ambitions among sustainability-oriented firms. If they are indeed able to translate sustainability into better performance, sustainable companies are more likely to grow as they outperform the less sustainable competition.

Much literature supports this hypothesis. However, historically, two conflicting views have emerged in the literature about the competitiveness of sustainability – the traditionalist view and the revisionist view. The traditionalist view claims that sustainability policies are cost drivers (Gray & Shadbegian, 1998; Palmer, Oates & Portney, 1995), and that environmental efforts lead to diminishing returns (Gray & Shadbegian, 1998). The benefits of implementing sustainability practices are said to go to society at large and cannot be easily captured by the firms themselves. Thus, the companies themselves absorb external costs (Gray & Shadbegian, 1998). Increased costs and diminished returns eventually have a negative effect on the firm's competitive advantage (García-Sánchez, Gallego-Álvarez & Zafra-Gómez, 2019).

The revisionist view instead argues that sustainability efforts can increase firm competitiveness while simultaneously creating value for the environment and society at large (Cai & Li, 2018; Hart & Ahuja, 1996; Porter & van der Linde, 1995). Porter and van der Linde (1995) believed the traditionalist view to be outdated, and argued that when implemented correctly, environmental regulations can lead to value-adding innovations that can increase operational efficiency. They argue that pollution is a waste of resources and represents unnecessary costs for the firm. Furthermore, they advocated for managers to see sustainability practices as an opportunity and a potential source of competitive advantage rather than solely as a cost-driving threat. Porter and Kramer (2006) also argued that many of the sustainability efforts put into motion today are not as productive as they could be, stating that sustainability strategies have the potential to be a source of innovation and competitive advantage.

The revisionist view has gained the most support in recent research, with the majority of studies agreeing that sustainability practices are related to increased competitiveness (Goyal et al., 2013; Hermunsdottir & Aspelund, 2021; Orlitzky, Schmidt & Rynes, 2003; Salzmann et al., 2005). The evidence shows that the expenses incurred to reduce pollution can be partly or completely offset by gains made elsewhere, i.e., reduced costs and differentiation (Ambec & Lanoie, 2008). One of the ways in which competitiveness is measured is through financial performance. Much evidence exists of a positive relationship between financial performance and sustainability (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Przychodzen & Przychodzen, 2015; Rezende, Bansi, Alves & Galina, 2019).

In spite of this evidence, other sources suggest that larger companies rather adopt sustainability practices to avoid negative consequences. As mentioned above, many of the concepts related to CSR are likely transferrable to CS. Laudal (2011) states that one of the most cited drivers of CSR is corporate reputation, which is more important for larger companies. Reputation influences the perceptions of consumers, the firm's current and potential employees and investors. As the focus on sustainability is rising, larger firms are more likely to be held accountable if they are not sustainable, making sustainability a hygiene factor. Furthermore, greenwashing has become a more common phenomenon, defined as "selective disclosure of positive information about a company's environmental or social performance, without full disclosure of negative information on these dimensions, so as to create an overly positive corporate image" (Lyon & Maxwell, 2011, p. 998). In other words, not all companies claiming to be sustainable really are, and some companies view sustainability as a hygiene factor. However, the bulk of the evidence points towards a relationship between competitiveness and sustainability. The fact that many companies believe sustainability strategy to be a competitive advantage further strengthens this theory.

Seeing sustainability as a competitive advantage is not enough to increase value creation. Sustainable companies also need to act on these beliefs through innovation. Today's research suggests that these companies are able to do so. Indeed, research suggests that sustainability is

positively correlated with innovative capabilities (Macchion et al., 2017; Michelino et al., 2019). Innovation is seen as an important contribution to the increase of sustainability activities (Adams et al., 2016; Nidumolu, Prahalad & Rangaswami, 2009; Nill & Kemp, 2009). A meta-study conducted in 2020 by Kuzma, Padilha, Sehnem, Julkovski, and Roman (2020) found a positive relationship between innovation and sustainability, both in social, economic, and environmental dimensions.

Although there is an ongoing discussion on these topics, most of the research presented above shows that sustainable companies are more likely to see opportunities in the future through innovation and perceptions of competitiveness, which they likely use to outperform the competition. Therefore, we present the following hypothesis:

- H3: Sustainable companies are more likely to have higher international growth ambitions.
- H4: Sustainable companies are more likely to have higher national growth ambitions.

## **2.5 Porter's generic strategies**

Taking this one step further: if sustainability can indeed lead to increased growth ambitions, what types of strategies are used to realise this growth? One important question that so far remains unanswered is what type of strategy sustainability belongs to; cost or differentiation. In 1980, Michael Porter introduced the idea of competitive strategy, which involves the creation of competitive advantage in each of the business units in which a company competes (Salavou, 2015). Competitive advantage refers to how to beat rivals and acquire customers for a certain product offering (de Wit, 2017). Porter (1980) argued that all competitive advantages could be categorised as belonging to either cost or differentiation, and believed that these categories require fundamentally different business models (de Wit, 2017). According to Porter (1980; 1985), only strategic purity leads to superior performance. Combining these generic strategies leads businesses to be “stuck-in-the-middle”, resulting in poor performance (Salavou, 2015).

The strategy of pursuing low cost (also known as cost leadership) revolves around providing customers with value comparable to competitors at a lower cost (Porter, 1985). With this strategy, firms can match the prices of their most efficient competitors and still earn higher profits due to lower costs (Miller & Friesen, 1986). The strategy of differentiation, on the other hand, is about providing a product or service that is considered unique, thus allowing the firm to increase prices (de Wit, 2017). According to Wang, Lin and Chu (2001), the differentiation strategy creates brand loyalty and thus price-inelastic demand, which allows firms to continue gaining a competitive advantage after imitators enter the market.

Porter's theory on these generic strategies has gained widespread recognition and acceptance by practitioners and academics (Guerras-Martín, Madhok & Montoro-Sánchez, 2014; Salavlou, 2015), and his competition-focuses perspective still dominates the field of strategy to this day (Leavy, 2018; Ng, Lau & Ismail, 2014). The idea of the strategies being mutually exclusive has

also gained much support from researchers since (Campbell-Hunt, 2000). Several researchers warn against focusing on more than one type of competitive advantage. Treacy and Wiersema (1995) argued that value chains need to be built around the specific strategy in mind in order to be successful (Treacy & Wiersema, 1995). This view has received substantial support (Green, Lisboa & Yasmin, 1993; McNamee and McHugh, 1989; Prince, 1992).

## **2.6 Sustainability strategy: cost leadership or differentiation?**

In this thesis, we aim to investigate whether sustainability strategies mainly use cost or differentiation to achieve competitive advantage. The arguments supporting the revisionist view often center around two groups of arguments; those that discuss operational performance benefits, which arguably belong to a cost leadership strategy, and those that highlight differentiation as the main source of increased competitiveness. We believe that the increased calls for sustainability-oriented products and rising consumer awareness is likely to make sustainability a differentiation strategy. This is supported by authors claiming that sustainability innovations are factor saving, rather than quality-improving, leading to customers receiving the same quality of the product, but at a higher cost (van den Bergh, Truffer & Kallis, 2011). In other words, we believe that sustainability is a differentiation strategy. However, the literature remains divided on this topic.

Porter and van der Linde (1995) focused on how sustainability practices can lead to operational efficiency, and several researchers have found support for this notion since. For instance, Balon (2020) finds environmental policies to significantly improve operational performance in terms of quality, cost, flexibility and delivery. Vijayvargy et al. (2017) found sustainability practices to lead to improvements in operational performance for both large and medium-sized organisations. Eiadat, Kelly, Roche & Eyadet (2008) claim that a sustainability strategy encourages the efficient use of raw materials, thus resulting in lower costs and reduced waste. Other scholars reporting similar results include Aragón-Correa (1998). These findings provide support for a cost leadership approach to sustainability. However, other sources disagree. Younis, Sundarakani and Vel (2016), for example, did not find a significant relationship between environmental performance and operational performance. However, the authors did find a positive relationship between environmental performance, economic performance and social performance (Younis et al., 2016).

Several other sources instead emphasise the use of sustainability practices to achieve differentiation. Ambec and Lanoie (2008) argue that a sustainability strategy can allow companies to gain competitiveness through differentiation. This is supported by other authors describing a positive link between sustainability innovation and differentiation (Liao, 2016; Li, Wang, Su & Su, 2019). Triebswetter and Wackerbauer (2008) also found a positive correlation between the number of new patents and sustainability innovation. Thus, sources disagree over which type of generic strategy sustainability belongs to.

In other words, the literature is fragmented on this subject. However, in this thesis, we investigate the Norwegian manufacturing industry. Due to high labour costs (Statistisk sentralbyrå [SSB], 2005), these companies have likely relied on low operational costs to compete with international competitors in order to be viable alternatives. Thus, we believe there is no significant relationship between sustainability and cost leadership. Simultaneously, the rising focus on sustainable solutions and higher consumer focus likely leads to a higher willingness to pay a premium for more sustainable products. Norwegian manufacturers mainly sell their products nationally or export to countries with high purchasing power such as Europe, where environmental focus is high and regulations are strict. Thus, there is reason to believe that differentiation is a more viable strategy for Norwegian manufacturers. We therefore propose the following hypothesis:

- H5: Sustainability is mainly a differentiation strategy.

## **2.7 How sustainable companies can overcome the double externality problem**

Furthermore, it is important to understand how sustainable companies act to overcome the double externality problem in practice. As mentioned above, the double externality problem poses a set of unique problems for sustainable companies to overcome. We believe that sustainable companies are likely to have higher capabilities in a series of areas to overcome the double externality issue. They are likely to be better than less sustainable firms at making use of existing technology as a cost-saving measure to improve operational efficiency. This, combined with utilising more growth paths to increase sales volume, might help sustainable companies close the gap. Thus, we believe that sustainability-oriented firms make use of digitalisation and automation to a larger degree than less sustainable companies, and that the sustainable companies are more likely to use internationalisation as a way to grow.

Indeed, companies nowadays are forced to realise more complex growth paths in order to bolster their competitiveness and keep up with the evolving technologies (De Marco, Martelli & Di Mini, 2020; Falahat, Ramayah, Soto-Acosta & Lee, 2020; Jung, Hwang & Kim, 2018). Digitalisation and automation are at the centre of this evolution.

Digitalisation and sustainability becomes increasingly intertwined as digitalisation opens up for more opportunities and challenges (Ching, Ghobakhloo, Iranmanesh, Maroufkhani & Asadi, 2021; Jasiulewicz-Kaczmarek, Legutko & Kluk, 2020; Machado, Winroth & Ribeiro, 2020; Xu, Yu, Griffith & Golmie, 2018). Some researchers view digitalisation as a facilitator for sustainability-oriented innovation (Gregori & Holzmann, 2020). Digitalisation has been shown to lead to more efficient resource utilisation and thus more sustainability-oriented production and products (Ching et al., 2021; Machado et al., 2020; Xu et al., 2018). Many researchers believe that digitalisation can be used to create a competitive advantage through a more sustainability-oriented production (Ching et al., 2021; Gregori & Holzmann, 2020). However, the interplay

between sustainability and digitalisation is still debated. Some authors claim that the two strategic intents are inherently different and conflicting, competing for the same organisational resources (Ardito, Raby, Albino & Vertoldi, 2021; Moeuf et al., 2018). Employees may become overwhelmed by attempting to commit to two different strategic intents simultaneously (Ardito et al., 2021). Thus, there is no clear consensus in the literature on the relationship between sustainability and digitalisation.

A similar discussion is seen on the relationship between sustainable practices and internationalisation. Several researchers look at internationalisation as a driver for sustainability-oriented innovation, opening up more knowledge-sharing, higher environmental standards, and reduced costs (Cainelli, Mazzanti & Montresor, 2012; Christmann & Taylor, 2001; Frey, Iraldo & Testa 2013; Zhu, Sarkis & Lai, 2012). However, it is still uncertain whether these factors make up for potential stricter regulations and higher complexity companies face when attempting to pursue sustainability efforts in an international market (Chiarvesio, Marchi & Maria, 2013; Zhang & Xu, 2019). Bermúdez-Edo, Hurtado-Torres, and Ortiz-de-Mandojana (2017) described that the complexity of international activities may go beyond acceptable levels, making sustainability-oriented activities undesirable. While both positive and negative correlations are found between sustainability and internationalisation, other researchers describe mixed or neutral results (Borsatto & Amui, 2019; Borsatto, Bazani & Amui, 2020; Mattera & Ruiz-Morales, 2021; Rennings and Rammer, 2009; Román-Aso & Vallés-Giménez, 2019). Park (2018) claims that internationalisation can be both good and bad for corporate sustainability, and it can therefore be misleading to indicate a strictly positive or negative relationship between them.

The main discussion on the relationship between sustainability and strategic growth paths concerns the complexity that comes with combining sustainability with these paths. Companies are not necessarily ready for such complex challenges. While some researchers look at complexity as a hindrance, we believe that the complexity of the interplay will help sustainability-oriented innovations overcome the double externality problem. We propose that sustainable firms are highly skilled at taking advantage of other strategic tools to succeed in spite of additional challenges, and thus the following hypotheses were formulated:

- H6: Sustainable companies have a higher degree of overall digitalisation efforts.
- H7: Sustainable companies have a higher degree of international activities.

### **3 Methodology**

This chapter presents the methodology of the thesis. First, an overall description of the research design and method is presented. Then, descriptions of the sample and data collection process are provided, including descriptions of the survey questionnaire and the data selection process. This is followed by a presentation of key factors and variables that are used for the analysis of this thesis. Thereafter, the data screening process is presented along with assumptions tests for the multivariate analysis. The statistical techniques used are then described, including factor analysis, Spearman's rho, and ANOVA. Thereafter, the research quality of the process is discussed in terms of replicability, validity, and the methods applied to prevent biases. Lastly, a summary of the dataset is provided.

#### **3.1 Research design and methods**

The term "data collection" describes the process in which data is gathered from a sample so that a research question can be answered (Bell, Bryman & Harley, 2019). The two most common approaches are the quantitative and qualitative research methods (Ringdal, 2018). This thesis utilises a deductive and quantitative approach to collect data. This choice was made based on the arguments presented in the following four paragraphs.

This study examines the characterisation of Norwegian manufacturers focusing on sustainability strategies. The objective is to investigate how sustainability is implemented and to generalise these findings beyond the confines of the sample. According to Bell et al. (2019), generalisation of findings is possible as long as data references a representative sample. Investigating as many cases as possible is thus beneficial, as this increases the chance of obtaining a representative sample. A quantitative research strategy allows for the generalisation of the data and projects the findings into a larger population, allowing a comparison of this thesis' results to similar research (Yilmaz, 2013). This is particularly valuable in an accelerating line of research, such as corporate sustainability. Moreover, the cross-sectional design allows for the collection of data on more than one case at a single point in time and makes it possible to examine the relationships between variables (Bell et al., 2019). All this considered, a quantitative approach was deemed a good fit for the purpose of this thesis.

This thesis utilised a self-completion questionnaire distributed via email to collect data. A questionnaire is a common data collection tool in economics and business studies (Kothari, 1990). This collection tool is advantageous when the goal is to investigate the prevalence of the phenomenon in question (Yin, 2014). This paper looks at relationships between sustainability and strategic concepts such as internationalisation, digitalisation and growth, making the questionnaire an appropriate data collection tool.

The data retrieved from the questionnaire was supplemented with company-specific data obtained from official registers. Utilising multiple sources of evidence makes the database more extensive, which increases the data's robustness in terms of reliability. Both methods allow for the collection of large amounts of data in a short span of time.

In addition to being robust, the quantitative research method limits bias and interaction with participants, mitigating risks of the researcher's own views and opinions affecting the outcome, thus making the data sample more objective (Borrego, Douglas & Amelink, 2009). This, and all the aforementioned arguments, explains why a quantitative research method was chosen.

The data analysis techniques employed in this study include testing the variables' factor structure with Confirmatory Factor Analysis (CFA). The main data analysis consisted of correlation analysis with Spearman's rho and regression analysis with analysis of variance (ANOVA). Spearman's rho is used to test the association between two variables, while ANOVA tests for variation across different groups (Pallant, 2016).

In the following subchapters, a further description of the methodology and procedures is described.

### **3.2 Sample and data collection**

The data used in the analysis stems from two different sources and was collected through two different data collection methods, namely a self-completion questionnaire and through official registers provided by the service *Proff Forvalt*. The following section describes the data collection process and the types of data obtained.

#### ***Survey questionnaire***

The questionnaire is a cross-sectional self-report data collection method, where the data represents a single source at a single time. According to Bell et al. (2019), a questionnaire is often superior when there is a wide geographical dispersion, as lots of resources would be required to conduct all the interviews. Combined with a limited budget and resources, this made the questionnaire a superior choice. One of the downsides of using a questionnaire is the lack of guidance for the participant during the data collection process. However, with only a few open questions, this was not considered a considerable issue.

The questionnaire "*NTNU's industry survey*" was developed and distributed by the Department of Industrial Economics and Technology Management at the Norwegian University of Science and Technology (NTNU) in 2022. It was designed to map the characteristics of Norwegian manufacturers. The data collection process took roughly two months, reaching from February 2022 to April 2022.



The questionnaire consisted of 87 questions divided into 15 main parts. The questions were related to the following topics: internationalisation, growth strategy and ambition, sustainability, digitalisation, competitive advantage, competence, causation, effectuation, technology and products. The questionnaire was pretested on three companies before it was distributed to the sample. The development and collection of the questionnaire was performed in the survey tool “Nettskjema”. The questionnaire was distributed in bulk in Outlook’s e-mail merger.

The data contains both natural, ordinal and nominal scales. The general factual questions are open-ended. Subjective questions regarding the opinion of the company, such as “Sustainability is an integral part of our business strategy” are for the most part given as Likert-type scales ranging from 1: “strongly disagree” to 7: “strongly agree”. Some of these questions are also given as yes/no-answers, such as “Does the company have sales activities abroad?”. The survey thus captures the top management’s perceived reality of the company in 2022. All the questions given in the survey are included in Appendix 1.

The sample included companies with the NACE codes in group “C - Manufacturing”, which includes companies producing an array of products, such as furniture, machinery and chemicals. Firms with less than 5 employees and more than 500 employees were excluded. In total, 4 839 firms’ information was retrieved from *Proff Forvalt* using these criteria. Thereafter, further exclusion criteria were applied: The companies had to (1) have organisational costs over 1 547 000, (2) have a registered email address, and (3) not be holding companies. In addition, companies that were obviously not in the target group, such as local cafés, were removed. These criteria led to a reduction in the number of participants to a sample of 2 325 Norwegian manufacturers.

In order to increase the response rate, follow-up emails to non-respondents were sent once. At the end of the data collection period, data from 459 companies was collected. This corresponds to a response rate of 19,7 %.

A total of 86 % of the respondents were CEOs or equivalent, and practically all the respondents were part of the top management team in the company.

### ***Data Retrieved from Proff Forvalt***

Data from official registers was retrieved from *Proff Forvalt* (forvalt.no). The collection of financial data from *Proff Forvalt* was performed by professor Arild Aspelund. *Proff Forvalt* holds reliable information on all of the companies in the population. The company-specific information obtained included each firm’s number of employees in 2021 and establishment year.

### ***Data selection***

The following selection criteria were applied to the final sample preceding the data analysis: (1) companies that had answered the questionnaire twice; here the first answer was removed, (2) companies whose names were not in the original sample list, (3) companies that were a part of a group, (4) companies that did not wish to be a part of the thesis, and (5) companies that did not fit the questionnaire. A total of 47 companies were removed in this process.

After the data selection process, the data retrieved from both the survey and *Proff Forvalt* were gathered in a joint SPSS file.

### **3.3 Key variables**

There are two types of variables in ANOVA analysis; independent and dependent variables. Furthermore, we make a distinction between factors and variables. Each question in the questionnaire is represented by a variable in SPSS. Factors denote underlying concepts that are measured by several variables.

The dependent variable – or factor – is sustainability strategy. “Sustainability strategy” is a factor that consists of the variables “perceived degree of sustainability” in innovation, development of new products, business strategy, values and profiling. In addition, it measures the strategic use of sustainability on the management level. Thus, it measures the degree of sustainability used in strategic decisions. This factor is inspired by Bob Willard’s book “The new sustainability advantage: seven business case benefits of a triple bottom line” (2012).

In this thesis, we measure sustainability strategy against the other parameters in question. Sustainability strategy measures how ingrained sustainability-oriented practices and thinking is in the overall strategy of the firm. The degree of sustainability strategy of the firm directly influences the firm’s sustainability-oriented innovation efforts. For instance, sustainability strategies have been linked to sustainability-oriented innovation and green creativity in past research (Chen, 2008; Saether, Eide & Bjørgum, 2021; Song & Yu, 2017). Green creativity is a measure of the company’s ability to develop new ideas related to green products, green services and green practices (Chen, 2011). A sustainability strategy can also stimulate creative thinking and facilitate resource efficiency, which further promotes green creativity (Song & Yu, 2018).

The degree of sustainability strategy also impacts the firm’s sustainability performance (Hart, 1997; Sharma & Vredenburg, 1998). An ingrained sustainability strategy has been found to enhance a firm’s level of sustainability awareness and stimulate the company’s ability to create green and novel ideas for green products and processes (Song & Yu, 2018). Thus, current literature suggests that a high score on sustainability strategy measures reflects the actual implementation of sustainability-oriented practices in the field (Sharma and Vredenburg, 1998; Song & Yu, 2018).

The independent factors and variables in this ANOVA are described by growth ambition, growth strategy, internationalisation, digitalisation, size and age.

Growth ambition denotes two factors that together describe the company's overall ambition to grow. These factors are called "national growth ambition" and "international growth ambition". International growth ambition measures the managements' and owners' international growth ambition and whether internationalisation is deemed a necessity for the company's survival. National growth ambition measures managements' and owners' national growth ambition.

The term growth strategy describes the variables that measure the type of strategy and strategic tools a company uses to seek growth. More specifically, variables measure to what degree a company seeks growth through pricing, differentiation and customisation. Furthermore, three variables seek to pinpoint how integral the following strategic tools are in the growth strategy of a company: innovation, internationalisation and digitalisation.

The term internationalisation measures the company's internationalisation strategy and other parameters related to internationalisation. It is used to refer to a number of independent variables, including the factor "export activities", the number of countries the firm exports to, international sales activities, the proportion of foreign sales, international production activities, and the proportion of production conducted abroad. Export activities is a factor consisting of the company's subjective opinion regarding export activities with respect to market share, sales growth, sales growth compared to competitors, profitability, knowledge retrieval and overall export activities. The rest of the internationalisation variables are individual questions.

"Digitalisation" is a factor that measures whether and how the company is focusing on digitalisation and automation. It measures to what degree digital tools, solutions and technology have been used in marketing and sales, business model and values, innovation, product improvements and exploration of new customer groups and markets.

"Size" was measured by the number of employees in 2021. "Age" was given by the establishment year. The firm size variable was recorded into logarithmic variables. Such a conversion was performed to avoid skewness.

All the variables used in the model are presented in Appendix 1.

### **3.4 Screening the data**

The dataset comprises the results from the survey and *Proff Forvalt*, consisting of 412 entries. However, the data included outliers and missing data, which had to be dealt with. In addition, statistical techniques have underlying assumptions of the dataset. Thus, in this subchapter, the

assessment of assumptions for factor analysis, correlation, and ANOVA are described. This includes the level of measurement, independence of observations, sample size, missing values, normal distribution, related pair, homoscedasticity, and homogeneity of variance.

### ***Dealing with outliers***

A case in this dataset corresponds to a single respondent. Outliers in a single case may disrupt the whole dataset when performing analysis such as correlation (Pallant, 2016). Thus, scatterplots were created to detect any possible outliers. One company was removed in this process as it posed as a large outlier which obscured the dataset. This was a company with 1899 as the establishment year. Another case was removed as it had the exact same Likert-type score on each question. This signals strong disengagement and the company was thus removed from the sample. Disengagement was detected during a manual screening process. In total, two companies were removed in these processes.

### ***Dealing with sample size and missing values***

It is important to have a sufficiently large sample size to ensure the reliability of the correlation coefficients (Tabachnick & Fidell, 2007). The data has a sample size of approximately 460 answers. According to MacCallum, Widaman, Zhang, and Hong (1999), this amount is adequate even for cases with low commonalities and few factors.

Some of the variables had missing data, which may challenge the analysis procedure. However, when assessing the missing data, it appeared to be random and far apart. Thus, the missing data was not replaced, but rather ignored. Replacement of such missing data may lead to more harm, as estimation procedures are likely to overfit the data and cause correlations to be too high (Tabachnick & Fidell, 2007).

### ***Assessing multivariate analysis assumptions***

All the three statistical techniques utilised in this thesis, factor analysis, correlation and one-way ANOVA, assume independence of observation. This means that each observation must not be influenced by any other observation (Pallant, 2016). According to Pituch and Stevens (2016), a violation of this assumption is *very* serious. The format of the questionnaire assured that no participant could see other participants' results, and that all participants answered the questionnaire independently. By doing so, the questionnaire satisfies the independence of observation.

Another assumption is the "level of measurement". It assumes that the dependent variable is measured as an interval or ratio. However, this is not an assumption for Spearman's rho, as it can handle ordinal values (Pallant, 2016). In ANOVA, the dependent variable "sustainability strategy" is an interval, thus complying with the rule.

For multivariate statistical techniques, one generally assumes a normal distribution. To measure this, the dataset was screened for skewedness and kurtosis. Skewness indicates the symmetry of the distribution, while kurtosis measures the peakedness of the distribution (Pallant, 2016). When a distribution is normal, the values of both of these measures are equal to zero (Tabachnick & Fidell, 2007). Tabachnick and Fidell (2007) claim that with a sample size of over 200, the underestimates of variance disappear. However, other authors, such as Garson (2012), Cramer and Howitt (2004) and George and Mallery (2010) argue that a common rule-of-thumb is that both the skewedness and kurtosis should be within the +2 to -2 range. This was the most conservative rule and was therefore chosen in order to reduce the chances of getting any errors. The initial skewedness and kurtosis test showed that one of the measures was both highly skewed and leptokurtic. This was the *proportion of production abroad*. The measure was consequently removed from the dataset.

When exploring relationships among variables through techniques such as correlation and factor analysis, one assumes that each subject provide a score in both variable X and variable Y, also known as having related pairs (Pallant, 2016). This assumption is satisfied by ensuring that if at least one variable is missing, this data point is disregarded when this variable is needed.

Ideally, the data should also be linear and have homoscedasticity when exploring relationships among variables. This may be difficult to satisfy when working with real-life cases (Pallant, 2016). However, when applying Spearman's rho, these assumptions are not essential for producing viable results.

One last assumption for ANOVA is homogeneity of variance. This measures whether the variability of scores of each of the groups are similar (Pallant, 2016). Homogeneity of variance is tested by running Levene's test for homogeneity of variance in IBM SPSS. When violated, the alternative for ANOVA, Robust Test of Equality of Means using Welch, was run on the data in question. Welch is a method that is insensitive to the homogeneity of variance, and can therefore be used as an alternative to ANOVA when homogeneity of variance is not satisfied (Tomarken & Serlin, 1986). Tomarken and Serlin (1986) recommend Welch over other alternatives, such as Brown-Forsythe, arguing that Welch is more robust.

The final sample size used for analysis in this thesis consisted of 410 cases.

### **3.5 Establishing the measurement model**

#### ***Factor analysis***

A confirmatory factor analysis (CFA) model was used to specify the posited relations of the observed variables to underlying constructs, with constructs allowed to intercorrelate freely (Long, 1983).

Factor analysis is a statistical technique applied to discover which variables in the set form a coherent subset that is relatively independent of one another (Tabachnick & Fidell, 2007). Thus reducing numerous variables into a smaller number of factors.

As the questions used in the questionnaire were retrieved from earlier research, an exploratory factor analysis (EFA) was not deemed relevant (Byrne, 2000). However, confirmatory factor analysis (CFA) was performed as it is associated with theory testing. The CFA was performed using IBM SPSS AMOS and yielded satisfactory results, with a score above 0,9 on the model fit estimates TLI and CFI.

### **Measurement assessment**

The measurement Cronbach's alpha was calculated to measure the internal reliability of the factors (Lance, Butts & Michels, 2006). While some authors claim that a Cronbach's alpha over 0,7 is satisfactory, other researchers argue that 0,8 is preferred (Lance et al., 2006; Nunnally & Bernstein, 1994). Thus, this paper operates with a limit of 0,8. The results of Cronbach's alpha can be found in Appendix 3. All factors returned Cronbach's alpha values above 0,8, suggesting that all factors have a good internal validity.

## **3.6 Spearman's rho and ANOVA**

### ***Spearman's rho***

Correlation is used to describe the strength and the direction of a relationship between two variables (Ringdal, 2018). In this research project, Spearman's rank order correlation (rho) is used, as it handles ordinal or ranked data.

Before running Spearman's rho, a preliminary analysis of the scatterplot was performed. This included checking for outliers, inspecting the distribution of data points, and determining the direction of the relationship between the variables (Pallant, 2016). Thereafter, the correlation analysis with Spearman's rho was run by using IBM SPSS.

### ***ANOVA***

Analysis of variance (ANOVA) is a regression technique used for comparing the mean score of more than two groups (Pallant, 2016). In this thesis, a one-way analysis of variance was used. It involves one independent variable, also called a factor, which is a number with different levels, also called groups (Ringdal, 2018). ANOVA enables comparison of variance (variability in scores) *between* the different groups with the variability *within* each of the groups (Pallant, 2016). ANOVA was performed using IBM SPSS.

In addition to looking at the table of descriptives and table of the ANOVA, the table showing the Levene's homogeneity of variance and the table of Robust Test of Equality of Means were also inspected. When Levene's homogeneity of variance was not satisfied, the results from the

Robust Test of Equality of Means using Welch was used instead. See Subchapter 3.4 for a more thorough description.

The ANOVA table was used to recognise the significant results of the analysis. However, this table only shows that there are one or more statistically significant differences. To pinpoint the exact groups that are different from other groups, a post hoc test was needed. In this thesis, the Bonferroni post hoc test was performed.

### **3.7 Research quality**

The methodology describes how research is conducted in a way that aims to ensure generalisability and replicability, and to limit bias.

Reliability is concerned with the consistency and repeatability of measures (Wilson, 2014). Data was retrieved from multiple sources in order to ensure reliability. In doing so, the quality of research is strengthened by addressing a broader range of historical, attitudinal and behavioural issues (Yin, 2014). To ensure inter-judgemental reliability, the procedures and methods were discussed with professor Arild Aspelund.

Validity is also a way of testing the quality of research. It refers to the relationship between a construct and its indicators, meaning it indicates whether a concept actually measures that phenomenon that it is intended to capture (Bell et al., 2019). To ensure face validity, the questions in the questionnaire were reviewed by professor Arild Aspelund, Ann Elida Eide, Dag-Håkon Haneberg and Øystein Moen. Sampling validity was ensured by asking multiple questions to measure the same factor, as well as using secondary data to supplement the subjective data from the questionnaire.

The thesis does however have a limitation in terms of validity. The data strongly relies on self-reported generic data from a single respondent from each organisation. The respondent's own opinions and interpretation of the questions could therefore impact the results. One example is the term "sustainability" which was never defined in the questionnaire. As mentioned in the theory, the term sustainability can be interpreted as social, environmental, and economic efforts, or only one of them. Thus, it may be that the interpretation of sustainability varied amongst the respondents.

Construct validity is particularly important for quantitative research and was ensured by pretesting a pilot study. To ensure the content validity of the measurement items in the questionnaire, a pretest was performed on three manufacturing enterprises. The purpose of this pretest was to determine whether the questionnaire could be fully understood and whether the answers were exhaustive. Each pretest lasted about 30 minutes. Only minor changes needed to be made after the pretests. These changes helped make the answer alternatives more exhaustive. In

addition to this test, the questionnaire was based on existing questions from the literature. This strengthens the research's generalisability (Bell et al., 2019).

To further test for generalisability, a simple comparison between the sample and the population on the *number of employees* and *year of establishment* were performed. The comparison showed that there was a significant difference in the size of the companies between the sample and the population. More specifically, the results show that the population had a significantly higher mean of employees as compared to the sample. This is due to non-response. Results show that a particularly high non-response rate among the smaller firms caused the sampling error. Follow-up emails were used to keep the sampling error at a minimum. Thus, all companies had a fair chance to answer, but it is likely that the smaller companies had less resources available to answer a questionnaire with over 80 questions. This sampling error is a limitation in the thesis.

Another limitation is that the questionnaire had some degree of participation fatigue, which causes non-response. A handful of participants reported that the survey was too long to answer. In addition, surveys distributed through mail have been criticised for being prone to nonresponse bias, meaning that the companies that respond differ substantially from those that do not (Armstrong & Overton, 1977).

While self-reported questionnaires are a popular method, they are also prone to common method bias, meaning that the relationship between two constructs may be inflated. In order to limit this bias, the recommendations by Podsakoff, MacKenzie, Lee, and Podsakoff (2003, p. 898-899) were followed. These include separating some variables by pages in the questionnaire, thus separating them psychologically. In addition, CFA was run for statistical control.

Social-desirability bias is one of the most common methods of bias affecting the validity of surveys, it describes the tendency of respondents to answer questions in a manner that may be viewed more favourably by others (Krumpal, 2013; Nederhof, 1985). When possible, information was gathered from multiple sources in order to prevent social-desirability bias (Podsakoff & Organ, 1986). Moreover, using self report questionnaires and anonymising the answers, the social-desirability bias was further reduced (Nederhof, 1985).

### **3.8 Summary statistics**

The final sample consisted of 410 Norwegian manufacturers. All companies in the study are industrial companies registered with the European standard NACE code 10-33 based on the EU industry standard Nace Rev. 2 (NACE, 2008).

The number of employees ranges from 5 to 471, with the majority belonging to the lower part of the scale. This reflects the industrial sector in Norway, where most of the companies are either small or medium-sized (SSB, 2022). The companies were established between 1946 and 2019.



Most of the companies are newer, with the median being the year 1996, which can be seen in Table 3.1.

*Table 3.1 - Sample characteristics (n=410)*

	<b>Range</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Median</b>	<b>S.D.</b>
<b>Number of employees</b>	466	5	471	51,7	25,00	69,5
<b>Year of establishment</b>	73	1946	2019	1994,3	1996	13,8

The 410 companies belong to 22 different industries, as shown in the table below (NACE, 2008). The categories that are most represented are “manufacture of fabricated metal products, except machinery, and equipment” and “manufacturing of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials”. About 25 % of the companies were high-tech companies, while 75 % of the companies were grouped as low-tech according to Eurostat’s (2016) definition. Table 3.2 below presents a full overview of the represented industries in this research paper.

*Table 3.2 - Industries represented in the sample*

<b>Industry</b>	<b>Frequency</b>	<b>Percentage</b>
Manufacturing of food products	38	9,1 %
Manufacturing of beverages	6	1,5 %
Manufacturing of textiles	15	3,7 %
Manufacturing of wearing apparel	4	1,0 %
Manufacture of leather and related product	1	0,2 %
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	45	11,0 %
Manufacture of paper and paper products	3	0,7 %
Printing and reproduction of recorded media	10	2,4 %
Manufacture of chemicals and chemical products	8	2,0 %
Manufacture of basic pharmaceutical products and pharmaceutical preparations	1	0,2 %
Manufacture of rubber and plastic products	20	4,9 %
Manufacture of other non-metallic mineral products	24	5,9 %

Manufacture of basic metals	6	1,5 %
Manufacture of fabricated metal products, except machinery and equipment	75	18,3 %
Manufacture of computer, electronic and optical products	20	4,9 %
Manufacture of electrical equipment	19	4,6 %
Manufacture of machinery and equipment n.e.c.	34	8,3 %
Manufacture of motor vehicles, trailers and semi-trailers	10	2,4 %
Manufacture of other transport equipment	11	2,7 %
Manufacture of furniture	20	4,9 %
Other manufacturing	15	3,7 %
Repair and installation of machinery and equipment	25	6,1 %
High-tech	103	25,1 %
Low-tech	307	74,9 %

## 4 Results

### 4.1 Group Analysis of Sustainability Strategy

The sample was organised into three different groups based on the score of a company's overall sustainability strategy. The companies with a sustainability score among the top 25 % were placed in a group called "High" and were regarded as the highly sustainable companies. The lowest 25 % were placed in the group named "Low" and were regarded as the least sustainable companies. The rest of the companies were placed in a third group named "Medium" group. These are regarded as the normal companies, having an average sustainability-oriented focus. Table 4.1 shows a description of the three groups.

*Table 4.1: Description of the groups*

	Group	Minimum	Maximum	Mean	Median	S.D.
Size	<u>Low</u>	5	197	29,120	15,000	34,352
	<u>Medium</u>	5	427	52,620	27,000	67,622
	<u>High</u>	5	471	72,890	35,000	90,222
Age	<u>Low</u>	1956	2019	1995	1996	12,642
	<u>Medium</u>	1947	2019	1994	1996	13,312
	<u>High</u>	1946	2017	1993	1997	15,593

### Correlations

The table below shows a Spearman's rho correlation analysis between sustainability strategy and size and age. The results show that there is a significant positive correlation between sustainability strategy and size. It suggests that larger companies tend to be more sustainability-oriented. No significant correlation is found between sustainability strategy and age.

*Table 4.2: Correlation of sustainability strategy and size, and sustainability strategy and age*

		Size	Age
Sustainability Strategy	Correlation	0,271**	-0,007
	Sig (2-tailed)	<0,001	0,892
	N	407	407

\*\* = Significant at the 0,01 level (2-tailed)

### Comparative Analysis of Groups

#### *General characteristics:*

Table 4.3 provides a description of the three different groups. The table shows that there are some differences in terms of firm characteristics.

On average, the companies with a high sustainability strategy are significantly larger compared to the mean in the least sustainable group. The same is observed between the average companies and the least sustainable companies. There is no significant difference in the mean when it comes to the age of the companies.

*Table 4.3: Characteristics of the groups*

	<b>Group</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>St.dev</b>	<b>F-value</b>
Size	<u>Low</u> <sup>2,3</sup>	0,7	2,290	1,258	0,406	14,851**
	<u>Medium</u> <sup>1</sup>	0,7	2,630	1,472	0,456	
	<u>High</u> <sup>1</sup>	0,7	2,370	1,600	0,474	
Age	<u>Low</u>	1956	2019	1995,290	12,642	0,481
	<u>Medium</u>	1947	2019	1994,500	13,312	
	<u>High</u>	1946	2017	1993,440	15,593	

\*p<0,05, \*\*p<0,001

1,2,3: denote significant group differences, Bonferroni test

*Growth ambition:*

Table 4.4 shows that the highly sustainability-oriented group have higher growth ambitions in general. More specifically, highly sustainable companies have a significantly higher mean in national growth ambition than the least sustainability-oriented group. The positive relationship between sustainability and growth ambition is even more prominent in terms of international growth ambition, where there is a significant different mean across all three groups.

*Table 4.4: Comparison of Growth Ambition*

	<b>Group</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>St.dev</b>	<b>F-value</b>
Norwegian growth ambition	<u>Low</u> <sup>2,3</sup>	1	7	4,957	1,909	6,709**
	<u>Medium</u> <sup>1</sup>	1	7	5,536	1,504	
	<u>High</u> <sup>1</sup>	1	7	5,808	1,437	
International growth ambition	<u>Low</u> <sup>2,3</sup>	1	7	2,406	1,893	15,855**
	<u>Medium</u> <sup>1,3</sup>	1	7	3,046	1,966	
	<u>High</u> <sup>1,2</sup>	1	7	3,960	2,118	

\*p<0,05, \*\*p<0,001

1,2,3: denote significant group differences, Bonferroni test

*Growth strategy:*

Table 4.5 and Table 4.6 show that there are significant differences between the groups in regard to growth strategies. The highly sustainability-oriented group has a significantly higher mean than the other groups in terms of seeking growth through differentiation. There was no

significant difference between the groups when it came to seeking growth through customisation, however, all three of the groups scored high on this measure. Growth through pricing was low among all three groups, but higher for the medium group than the low group.

*Table 4.5: Comparison of Growth Strategy*

	<b>Group</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>St.dev</b>	<b>F-value</b>
Growth strategy through pricing	<u>Low</u> <sup>2</sup>	1	7	2,42	1,420	3,578*
	<u>Medium</u> <sup>1</sup>	1	7	2,90	1,468	
	<u>High</u>	1	6	2,75	1,542	
Growth strategy through differentiation	<u>Low</u> <sup>3</sup>	1	7	4,33	1,769	11,563**
	<u>Medium</u> <sup>3</sup>	1	7	4,76	1,398	
	<u>High</u> <sup>1,2</sup>	1	7	5,39	1,534	
Growth strategy through customisation	<u>Low</u>	1	7	4,96	1,607	3,133
	<u>Medium</u>	1	7	5,10	1,570	
	<u>High</u>	1	7	5,47	1,410	

\*p<0,05, \*\*p<0,001

1,2,3: denote significant group differences, Bonferroni test

The group with a high sustainability strategy has a significantly higher mean compared to the medium- and low-scoring group on all of the growth tools measured in this thesis. These tools were innovation, internationalisation and digitalisation. There is, however, a notable difference in the mean across the different measures. The average scores on growth through innovation and digitalisation are higher than growth through internationalisation.

*Table 4.6: Comparison of Growth Strategy through tools*

	<b>Group</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>St.dev</b>	<b>F-value</b>
Growth strategy through innovation	<u>Low</u> <sup>2,3</sup>	1	7	3,63	1,836	33,178**
	<u>Medium</u> <sup>1,3</sup>	1	7	4,53	1,695	
	<u>High</u> <sup>1,2</sup>	1	7	5,43	1,402	
Growth strategy through internationalisation	<u>Low</u> <sup>2,3</sup>	1	7	2,23	1,866	15,348**
	<u>Medium</u> <sup>1,3</sup>	1	7	2,90	2,055	
	<u>High</u> <sup>1,2</sup>	1	7	3,75	2,102	
Growth strategy	<u>Low</u> <sup>2,3</sup>	1	7	3,00	1,840	21,925**

through digitalisation	<u>Medium</u> <sup>1,3</sup>	1	7	3,93	1,759	
	<u>High</u> <sup>1,2</sup>	1	7	4,64	1,855	

\*p<0,05, \*\*p<0,001

1,2,3: denote significant group differences, Bonferroni test

*Digitalisation:*

Table 4.7 shows that there are significantly different means in all the digitalisation-measures in this survey. There is a significant difference in the mean between the group with a high sustainability score and a low sustainability score in all the measures. The same can also be seen between the group with a medium sustainability score and a low sustainability score. However, there is only one significant difference between the high scoring group and the medium scoring group. This is the measure “digitalisation in exploration of new customer groups and markets (9.5)”.

It is worth noting that the two measures of *digitalisation in the business model* and *digitalisation in innovation* are consistently low. This suggests that the major differences are rather found in the measures of digitalisation in marketing and sales, digitalisation in production improvements, digitalisation in exploration of new customer groups and markets, and overall digitalisation efforts.

*Table 4.7: Comparison of Digitalisation*

	<b>Group</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>St.dev</b>	<b>F-value</b>
Digitalisation in marketing and sales	<u>Low</u> <sup>2,3</sup>	1	7	3,52	1,999	6,160*
	<u>Medium</u> <sup>1</sup>	1	7	4,17	1,707	
	<u>High</u> <sup>1</sup>	1	7	4,41	1,689	
Digitalisation in the business model	<u>Low</u> <sup>2,3</sup>	1	7	2,52	1,628	8,899**
	<u>Medium</u> <sup>1</sup>	1	6	3,26	1,570	
	<u>High</u> <sup>1</sup>	1	7	3,38	1,670	
Digitalisation in production improvements	<u>Low</u> <sup>2,3</sup>	1	7	3,31	1,799	8,775**
	<u>Medium</u> <sup>1</sup>	1	7	4,11	1,657	
	<u>High</u> <sup>1</sup>	1	7	4,14	1,636	
Digitalisation in innovation	<u>Low</u> <sup>2,3</sup>	1	7	2,54	1,694	12,391**
	<u>Medium</u> <sup>1</sup>	1	7	3,47	1,850	
	<u>High</u> <sup>1</sup>	1	7	3,65	1,937	
Digitalisation in exploration of new customer groups and markets	<u>Low</u> <sup>2,3</sup>	1	7	2,95	1,813	20,003**
	<u>Medium</u> <sup>1,3</sup>	1	7	4,00	1,637	
	<u>High</u> <sup>1,2</sup>	1	7	4,53	1,883	

Digitalisation efforts	<u>Low</u> <sup>2,3</sup>	1	7	2,978	1,373	18,389**
	<u>Medium</u> <sup>1</sup>	1	6,6	3,801	1,253	
	<u>High</u> <sup>1</sup>	1	7	4,021	1,417	

\*p<0,05, \*\*p<0,001

1,2,3: denote significant group differences, Bonferroni test

*Internationalisation:*

As seen in the descriptives table, there are large variations in international exposure between the three groups of companies. A statistically significant higher percentage of the sustainability-oriented group has international sales, compared to the least sustainability-oriented group, with 61 % compared to 35 %. Companies with a high sustainability strategy also have a significantly higher share of sales abroad, compared to both the medium- and low-scoring groups. The high-scoring group on average has 23 % of their sales abroad, compared to 14 % in the medium-scoring group and 13 % in the low-scoring group. In addition, the high-scoring group also has a significantly higher share of its production abroad compared to the medium-scoring group.

The difference between the high-scoring group and the medium-scoring group can also be seen in terms of the export activities. It shows that the high-scoring group has a significantly higher score than the medium-scoring group with 4,6 compared to 4,1.

*Table 4.8: Comparison of Internationalisation*

	<b>Group</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>St.dev</b>	<b>F-value</b>
International sales activities	<u>Low</u> <sup>3</sup>	0	1	0,35	0,480	7,055**
	<u>Medium</u> <sup>3</sup>	0	1	0,46	0,499	
	<u>High</u> <sup>1,2</sup>	0	1	0,61	0,491	
Proportion of sales abroad	<u>Low</u> <sup>3</sup>	0	100	13,405	28,268	3,385*
	<u>Medium</u> <sup>3</sup>	0	100	14,233	25,580	
	<u>High</u> <sup>1,2</sup>	0	100	22,748	31,201	
International production activities	<u>Low</u>	0	1	0,130	0,332	3,602*
	<u>Medium</u> <sup>3</sup>	0	1	0,120	0,323	
	<u>High</u> <sup>2</sup>	0	1	0,240	0,431	
Export activities	<u>Low</u>	2	6,6	4,131	0,930	5,221*
	<u>Medium</u> <sup>3</sup>	2	6,3	4,129	0,819	
	<u>High</u> <sup>2</sup>	1,1	6,3	4,571	0,924	

\*p<0,05, \*\*p<0,001

1,2,3: denote significant group differences, Bonferroni test

## 4.2 Hypotheses evaluation

Results from Subchapter 4.1 indicate that H1, H3, H4, H5, H6, and H7 were supported, while H2 was rejected. The positive correlation between the sustainability strategy and size, along with the significant difference in the mean between the most and least sustainable companies, support hypothesis 1, namely that larger companies are more sustainability-oriented. Neither correlation nor ANOVA indicate any significant relationship between sustainability strategy and age, thus rejecting hypothesis 2 that older and thus more established companies are more sustainability-oriented.

All the hypotheses concerning growth are supported. The growth ambition results in Table 4.4 support hypothesis 3 that more sustainable companies are more likely to seek growth through internationalisation. Highly sustainable companies also have higher national growth ambition, than the least sustainable groups, which support hypothesis 4. Highly sustainable companies have a significantly higher mean in seeking growth through differentiation and no significant results when it comes to seeking growth through pricing. This supports hypothesis 5 that sustainability is mainly a differentiation strategy. In terms of strategic tools, the results indicate that sustainable companies pursue growth through internationalisation and digitalisation significantly more than less sustainable companies. This is further confirmed in Table 4.7 and Table 4.8. Thus, both hypothesis 6 and hypothesis 7 are supported, namely that sustainable companies have a higher degree of overall digitalisation efforts and internationalisation activities.

*Table 4.9: Evaluation of hypotheses*

Hypothesis	Model parameters	Difference in mean for sustainable companies	Hypothesis evaluation
H1	Size	Significant	Supported
H2	Age	Not significant	Rejected
H3	sustainable companies are more likely to have higher international growth ambitions	Significant	Supported
H4	sustainable companies are more likely to have higher national growth ambitions	Significant	Supported
H5	Growth strategy through pricing Growth strategy through differentiation	Not significant Significant	Supported
H6	Growth strategy through digitalisation Digitalisation efforts	Significant Significant	Supported
H7	Growth strategy through internationalisation	Significant	Supported



	International sales activities	Significant	
	Proportion of sales abroad	Significant	
	International production activities	Significant	
	Perceived export results	Significant	

## **5 Discussion**

This study sought to explore how sustainability strategy can be successfully implemented to fuel growth and competitiveness. We aimed to explore which firms are at the forefront of the sustainable shift, and how they are able to overcome the particular difficulties associated with sustainability innovations and implementation. This was achieved by investigating the relationships between sustainability strategy and firm characteristics, growth ambitions, growth strategies, and concrete strategic tools.

The results show that sustainable companies are significantly larger, while age did not have any impact on the level of sustainability strategy. Furthermore, a significant positive relationship was found between sustainability strategy and growth ambition in terms of international growth ambition and national growth ambition. The results suggest that the higher growth ambition is mainly materialised through a differentiation strategy, and that the sustainability-oriented firms are better at making use of digitalisation, automation and internationalisation to achieve their goals. These findings shed light on how sustainability is pursued in practice, helping increase the understanding of one of the most fundamental shifts of our time.

This chapter addresses the findings presented in the former chapter, and discusses the similarities and differences with previous research. The chapter is structured as follows: first, the relationship between sustainability and firm characteristics is discussed. Thereafter, we discuss what type of strategy sustainability is and how sustainable companies are able to overcome the double externality problem through the use of different growth paths. In addition, we discuss how sustainability efforts and growth ambition can truly be compatible. Lastly, theoretical and practical implications are presented, before a section on limitations and further work.

### **5.1 Which companies are driving the sustainability transition?**

The analysis shows that size is positively correlated with sustainability efforts, indicating that larger companies play a more important role in the ongoing shift towards sustainability. This contrasts with much of the established innovation theory, where small players usually outperform larger ones, for instance through radical and disruptive innovation (Christensen, 1997; Henderson & Clark, 1990). This is due to the flexibility that comes with not being tied to bureaucracy, existing supply chains and customer relationships (Christensen, 1997; Henderson & Clark, 1990). The findings support the notion that the increased complexity associated with sustainability strategy calls for different innovation processes. Here, size is shown to be advantageous, as the sustainability-oriented transitions require a complex set of resources and knowledge that larger companies are more equipped to handle (Markard et al., 2012). This means that the mechanisms for traditional innovation are likely markedly different for sustainable innovations than for the bulk of innovation seen to this day. Thus, our findings help

strengthen the theory that the nature of sustainability is unique and requires new thinking and research into the strategic aspects of this process.

Age did not have a significant impact, contrary to our proposed hypothesis. We believed that the relational resources, networks and superior know-how of more established (i.e older) companies would be beneficial for conducting sustainability strategy (Hermundsdottir et al., 2021). Our findings suggest that size is a better variable to measure these effects. Larger companies seem to harness many of the proposed benefits resulting from age. This might suggest that newer but large firms are able to gain some of these benefits due to their size, while also being able to ingrain new technology and best practices into their strategies.

Anyhow, these results have important implications: support schemes and nations should pour their efforts into larger firms with established customers, supply chains etc., instead of supporting individual entrepreneurs with new ideas.

## **5.2 Sustainability is associated with higher growth ambition**

The results also shed light on how sustainability-oriented firms focus their strategies and how they are able to reap the benefits of sustainability in practice. A strong, positive relationship was found between sustainability strategy and growth ambition. This indicates that highly sustainable companies are able to translate their sustainability into competitiveness, sparking growth as they outperform the less sustainable competition.

Findings in the literature support this interpretation. As mentioned in Subchapter 2.3, the revisionist view has become dominant in later years, arguing that sustainability can be a source of competitiveness (Cai & Li, 2018; Hart & Ahuja, 1996; Porter & van der Linde, 1995). Several sources provide evidence that sustainability-oriented practices are related to better firm performance (Goyal et al., 2013; Hermundsdottir & Aspelund, 2020; Orlitzky et al., 2003; Salzmann et al., 2005). Thus, there is substantial evidence showing sustainability to be a competitive advantage. Our results build on these findings - we suggest that this competitiveness translates to higher growth ambitions. Because growth is a key driver for shareholder value creation and successful financial performance, higher growth ambitions imply that highly sustainable companies are better positioned for the future. Furthermore, research has shown that more sustainable companies believe sustainability to be a competitive advantage (Eide et al., 2020), suggesting they would also be more likely to seek growth to exploit this upper hand.

Alternatively, sustainability policies may be hygiene factors, causing dissatisfaction if not provided. In other words, lack of a sustainability strategy as an ingrained and outspoken part of the overall strategy might have an impact on performance and lead to dissatisfied stakeholders and customers, thus hampering growth opportunities. As discussed by Laudal (2011), this is often the case for larger and multinational companies pursuing CSR-policies. He claims that

larger multinationals are more vulnerable to unfavourable publicity and a bad reputation. As discussed in the theory, many of the concepts related to CSR are likely to be transferable to corporate sustainability

More research is needed to understand the direction of the relationship between growth and sustainability. Whether sustainability is mainly a competitive advantage or a hygiene factor is impossible to determine from our data. It could also be the case that these interpretations are not mutually exclusive - they might both impact different companies in different ways and this interplay could impact sustainability strategies. Regardless, the findings show that sustainability is already becoming increasingly important for companies. The correlation between sustainability and growth suggests that markets are maturing and confirms previous findings that stakeholders and consumers are placing increasing demands on companies to be sustainability-oriented (Carter & Easton, 2011; Gonzales-Perez, 2013). The correlation seen between sustainability and growth ambition clearly shows that sustainability is already having an impact on performance.

An interesting dimension of this discussion is that international growth ambitions to a higher degree relate to sustainability strategy than national growth ambitions. The literature has been highly fragmented over how sustainability and internationalisation correlate, and these findings suggest that the relationship is partly concerned with growth. The results could mean that international markets place a higher value on more sustainable solutions, making sustainability a more essential competitive advantage abroad. This in turn creates opportunities for sustainability-oriented Norwegian manufacturers to capture more value through internationalisation. Thus, sustainable companies may be able to reap more benefits than non-sustainable companies, making up for some of the barriers to this strategy that are mentioned in the theory (Chiarvesio et al., 2013; Zhang & Xu, 2019). Another possible explanation could be the unique competitive advantage Norwegian manufacturing industry has as a result of being mostly powered by renewable energy. This leads Norwegian firms to gain a comparative advantage over international competition with regards to emissions. Assuming highly sustainable firms compete against each other and Norwegian firms can offer even lower carbon footprints than the competition, this would lead Norwegian sustainable manufacturers to benefit even more abroad, making internationalisation a logical growth path. Alternatively, the association between international growth and sustainability may be due to the small size of Norway. Perhaps the investments associated with sustainability innovation are so large that they require larger markets to be profitable. In this case, internationalisation is a key part of sustainability strategy, vital to succeed and reach profitability. More research is needed to understand this.

### **5.3 What type of strategy is sustainability and how is it implemented?**

As discussed in the theory, the literature has so far disagreed over which of Porter's generic strategies sustainability belongs to (e.g see Ambec & Lanoie, 2008; Porter & van der Linde, 1995). The results in this thesis show that most sustainable companies do not seek growth through lower prices, scoring a mean of 2,8 of 7 on this measurement. However, they do seek growth through differentiation, with a mean of 5,4, which is significantly higher than the firms with medium and low sustainability efforts. Thus, sustainability is shown to mainly be a differentiation strategy, indicating that customers are willing to pay a premium for the value added by higher sustainability. However, the results also show that sustainable companies make use of cost reducing measures such as digitalisation and automation to succeed. We believe this is one of the ways sustainable companies solve the double externality problem.

By showing that sustainable firms are more likely to score high on digitalisation, these results partake in the ongoing discussion on the relationship between digitisation and sustainability. The literature suggests that it may be difficult to pursue both sustainability and digitalisation simultaneously, as the two strategic intents are inherently different and conflicting, competing for the same organisational resources (Ardito et al., 2021; Moeuf et al., 2018). Our findings rather support the literature of those suggesting that it is indeed possible to target both strategies at once (Ching et al., 2021; Machado et al., 2020; Malgozata et al., 2020; Xu et al., 2018). One possible interpretation is that digitalisation is being used deliberately to help solve some of the difficulties that arise with sustainability. As discussed in Subchapter 2.2, the double externality problem creates difficulties for sustainable companies by lowering the share of value the companies are able to capture and turn to profits (Rennings, 2000). However, digitalisation is a versatile strategy that has often been used as a way for companies to increase efficiency, productivity, and thus decrease costs. Thus, we believe that combining sustainability with digitalisation and automation might help companies overcome the double externality problem. A good example from this can be found in the case literature, where increased use of artificial intelligence and machine learning are used to monitor production processes and identify areas for improved operational efficiency (Melander & Pazirandeh, 2019). This empirical evidence demonstrates that digitalisation and automation can be used to lower emissions.

Regarding innovation efforts, the results also reveal that sustainable companies view innovation as a more integral part of their growth strategy. This aligns with recent research claiming that sustainability is innovation's new frontier (Macchion et al., 2017; Michelino et al., 2019). Many sources discussing eco-innovation and green innovation also place significant emphasis on innovative capabilities for successful sustainable companies (Adams et al., 2016; Nidumolu et al., 2009; Nill & Kemp, 2009). This is not surprising since much of the technology needed to reach emission goals is not yet invented, and depends on rethinking existing solutions.

Another interesting dimension of our findings relate to the ongoing discussion of the role played by internationalisation in sustainable companies. The results show that sustainable companies have a significantly higher score on internationalisation than less sustainability-oriented alternatives, suggesting they are more skilled at utilising several growth paths. However, the score is still relatively low. The mean amongst the most sustainable companies is only marginally higher than the Likert-type scale answer “to some degree”. This could suggest that Norwegian manufacturing companies in general do not view internationalisation as the most valuable tool for strategic growth. Several sources claim that the stricter regulations and higher complexities that companies face when exporting exceeds the benefits that may be a result of international activities (Bermúdez-Edo et al., 2017; Zhang & Xu, 2019). Another explanation is that companies only view internationalisation as a way to grow when it is implemented in moderation. We believe that the latter is more likely, as our results show that sustainable companies are relatively content with their export activities.

In summary, these results help uncover how sustainability-oriented firms are able to solve the double externality problem. In addition to pursuing a differentiation strategy, sustainable firms are shown to be highly skilled at taking advantage of other strategic tools to succeed. Sustainable companies to a higher degree employ digitalisation and automation, which are believed to be cost saving measures. In addition, highly sustainable companies have higher degrees of internationalisation, suggesting they are better at utilising more channels to acquire a wider customer base. Thus, they are able to reduce costs while increasing sales volume. In addition, they are better at using innovation to grow. These measures differentiate them from less sustainable firms, and are believed to be means to tackle the increased complexity and higher costs associated with sustainability. Thus, firms with highly sustainable strategies appear more skilled at making use of opportunities in the market. In other words, sustainability strategies are profitable when they have the ability to both reduce operational costs while providing the product or service with sustainability-oriented qualities that customers are willing to pay more for. More research is needed to confirm this hypothesis.

#### **5.4 Are growth and sustainability efforts really compatible?**

The results also raise a fundamental question about sustainable companies: are growth ambitions really compatible with sustainability? The nature of growth itself implies an increase in consumption– as more resources, material and energy are required to increase production. The companies studied in this thesis are manufacturing companies in the Norwegian industry. A total of 77 % of them describe their product as mainly physical. As mentioned in Subchapter 2.1, sustainability entails not restricting the future’s ability to meet their needs (United Nations, 1987). With a global resource having surpassed 100 billion tonnes that far exceeds this premise, an even higher consumption will be problematic (Circle Economy, 2022). Thus, it could be contradictory when sustainability strategies rely on growth and increased production to succeed. While the results indicate that no such contradiction exists between growth ambitions and

sustainability-oriented practices, the question still remains as to whether emissions increase as a result of this proposed growth. As long as the product that is sold in greater quantities is a more sustainability-oriented alternative, net emissions are still reduced. However, it is important to be on the lookout for greenwashing-strategies, in which companies attempt to profile themselves as green or promote sustainability efforts outwards to gain some of the competitiveness associated with this, without making a tangible difference (Lyon & Maxwell, 2011). Thus, more research is needed to understand how one can make this growth as sustainable as possible.

## **5.5 Implications**

This study contributes to research by uncovering which companies are driving the sustainability transition, and which strategies and tools they use to achieve growth. This understanding is crucial if we are to tackle the climate crisis. Without properly understanding the mechanisms used by highly sustainable companies to obtain a competitive advantage and thrive, the shift towards sustainability will be characterised by uncertainty and more failed and costly endeavours. We contribute theoretically to a highly fragmented field. In addition, we contribute to theory by partaking in several unresolved discussions, such as which type of strategy sustainability is, and how sustainable companies act to overcome the double externality problem in practice.

By researching the fundamental characteristics of companies, this study provides information that can offer insights for managers wanting to gain and uphold a competitive advantage. First and foremost, the thesis finds a significant relationship between sustainability and growth ambition, demonstrating that sustainability indeed has an impact on performance and value creation. This is valuable as it provides evidence of the fact that sustainability is worth striving for. For companies that want to succeed and grow, sustainability must be taken into account. Earlier research by Eide et al. (2020) found that managers' personal motivation for sustainability can contribute to deeper anchoring of sustainability efforts. Combined with our findings on the positive relationship between sustainability and growth, this may motivate managers to educate themselves on sustainability and implement sustainability strategy to a higher degree.

The study also shows how sustainability strategy is often accomplished in practice. Sustainable companies utilise sustainability mainly as a differentiation strategy, and the evidence points towards the fact that sustainability can and should be combined with other strategic paths to complement this. Thus, managers seeking sustainability strategy should use digitalisation, automation and internationalisation to cope with the double externality problem and be competitive.

Regulators and lawmakers can also use this information to help companies make the sustainable shift successfully and to improve their support schemes. For instance, they should focus on large

companies when allocating funds for sustainable innovation, as these companies are more likely to succeed.

## **5.6 Limitations and further research**

As seen in the discussion, this paper tries to make inferences with bidirectional relationships, which is a limitation in our study. With analysis of variance, it is impossible to strictly determine these directions. More research is thus needed to properly understand these relationships. For instance, it is still unclear whether higher sustainability efforts in growing companies are due to a competitive advantage or whether it is mainly a hygiene factor, although we argue more support exists for the former alternative. It would also be beneficial to conduct qualitative research on why sustainable companies use digitalisation and internationalisation, to confirm whether these strategies really are related to sustainability. An alternative interpretation is that the more successful companies are more competent at using a variety of different growth paths, including sustainability, and that sustainability is a particularly good measure of identifying these strategically successful companies. Thus, more research is needed to properly understand these mechanisms. More qualitative research is also needed to understand exactly how internationalisation is used more by sustainable companies.

As mentioned earlier, the choice of method inevitably involves a trade-off between the depth and breadth of data collection. This is further exacerbated by the fact that the survey was not specifically created to answer this paper's research objective. This could make the construct variable too general. For instance, adding questions to measure sustainability performance could have been helpful to generate a more detailed image of the relationship between sustainability and growth.

Another limitation is external validity and generalisation. The paper only investigated Norwegian manufacturers. These companies are exposed to strict environmental and social regulations that are practically unique to Norway. This may reduce the external validity of the findings, as other countries may have other governmental regulations. However, the findings can be generalised to companies interacting with Norway and its strict environmental and social regulations.

The study is also based on cross-sectional data. Such data only provides a snapshot of information in time. The lack of longitudinal data makes it difficult to include changes and development over time. This is a common deficiency in this field of research, and further research should therefore attempt to investigate the same sample after a given time.

Furthermore, the paper covers several industries, both high-technology and low-technology. However, there has been limited focus on the underlying factors that may affect the way sustainability affects a certain industry. These factors may be relevant for the impact of sustainability in their growth strategies. Different industries could have different regulatory and



societal expectations, which may impact their sustainability strategy. Further research should therefore expand the database to include and investigate these mechanisms.

Future research should also attempt to uncover the impact of sustainability strategy on sustainability performance. It would be beneficial to confirm our findings by looking at the degree of sustainability actually achieved by companies claiming to have a highly sustainable strategy. Some companies might be sustainable without really formulating it in their strategies, while greenwashing might lead other companies to falsely present themselves as sustainable. Our research demonstrates that sustainable companies are ambitious and seek growth at a faster pace than less sustainable competitors. However, to tackle climate change it is vital that the companies that are growing actually make a real world difference.

## 6 Conclusion

The world is facing an unprecedented challenge in terms of climate change, requiring businesses to take massive action as emissions and resource use must be drastically cut. Firms are already facing a rising pressure to adopt corporate sustainability. However, lack of research combined with a unique set of difficulties associated with sustainability has made it critical to increase understanding of how to succeed with sustainability efforts. This study aimed to contribute by answering fundamental questions regarding the sustainable transition: which companies are at the forefront, and how do they implement sustainable strategy in practice?

These questions were explored in the study through the use of correlation analysis with Spearman's rho and ANOVA. The study shows that larger companies tend to be more sustainable, indicating that sustainability innovation is markedly different from traditional innovation. Age was not a significant determinant for sustainability. The results also showed a positive relationship between sustainability and growth ambition, suggesting that sustainability is already an integral part of successful companies. This higher growth ambition indicates that sustainability is already a source of competitiveness, leading highly sustainable companies to grow while outperforming the less sustainable competition. Alternatively, lack of sustainability may lead to dissatisfied stakeholders and hamper growth. Either way, the results show that sustainability practices are associated with growth, indicating they have a positive effect for firms.

Furthermore, the study reveals that Norwegian manufacturers mainly view sustainability as a differentiation strategy, as opposed to a cost leadership strategy. This suggests that customers are willing to pay a premium price for sustainability-oriented products. Furthermore, the findings reveal that sustainable companies are more likely to utilise innovation, internationalisation and digitalisation to achieve growth. This supports the notion that the complexity associated with sustainability leads companies to adopt other tools and strategies to succeed. Our findings show that sustainable companies are usually more competent strategically, making use of technology and innovation to seize opportunities and create competitiveness. In summary, differentiation strategies, digitalisation, innovation and internationalisation were found to be used by sustainable companies to succeed with their sustainability strategies. These growth paths are likely used by sustainable firms to overcome the double externality problem.

Further work is needed to properly understand the direction of these relationships, and to understand how sustainability strategy is related to actual sustainability performance. Researchers should also combine these findings with longitudinal studies to measure achieved growth against growth ambitions and confirm the relationship between sustainability and growth.

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## Appendix 1 - Questionnaire items

No.	Item
1	Sustainability is strategically anchored at management and board level
2	Sustainability is a driver for the development of new products and services
3	Sustainability is an inspiration for continuous improvement of our production (either products or services)
4	Sustainability is an integral part of our business strategy
5	Sustainability is a fundamental value for our company
6	We clearly profile the company as sustainable
7	Growth through increased sales in Norway is a strong desire for the company's management
8	Growth through increased sales in Norway is a strong desire for the company's owners
9	International growth is a strong desire for the company's management
10	International growth is a strong desire for business owners
11	International growth is necessary for the company's survival
12	The company seeks growth by offering the customer a low price
13	The company seeks growth by offering products and services that are clearly different from the competition
14	The company seeks growth by offering products and services that are adapted to specially selected customer groups
15	The company seeks growth through innovation and development of new products and services
16	The company seeks growth through internationalisation
17	The company seeks growth through digitisation and / or automation
18	The company's sales and marketing activities are largely controlled by digital tools
19	The company's value creation and business model are mainly based on digital solutions
20	We have used digital technology to adapt or improve existing products or services
21	We have developed new products or services where digital technology is central

22	We have used digital solutions to reach new customer groups or markets
23	Does the company have sales activities abroad?
24	Does the company have production abroad?
25	Approximately what proportion of the company's total sale in 2021 was export (%)?
26	Approximately what proportion of the company's total production in 2021 was abroad (%)?
27	How satisfied are you with the export results in terms of achieved market share
28	How satisfied are you with the export results in terms of sales growth
29	How satisfied are you with the export results in terms of sales growth compared to competitors
30	How satisfied are you with the export results in terms of profitability
31	How satisfied are you with the export results in terms of to gain new knowledge through contact with customers and partners
32	How satisfied are you with the export results in terms of to gain new knowledge about alternative business models
33	All things considered, how satisfied are you with the overall results of the export activities in recent years?

- The items from 1 to 22 were answered on a 1-7 Likert-type scale from 1 “to a small degree” to 7 “to a very large extent”.
- Item 23 was answered with either “yes” or “no”.
- Item 24 was answered with “yes, both internationally and in Norway”, “yes, only abroad”, or “no”.
- Items 25 and 26 were answered in a percentage from 0 to 100.
- The items from 27 to 33 were answered on a 1-7 Likert-type scale from 1 “very dissatisfied” to 7 “very satisfied”.

## Appendix 2 - Tests of normality

No	Item	Mean	Skewness	S.E.	Kurtosis	S.E.
1	Sustainability is strategically anchored at management and board level	5,14	-0,712	0,121	-0,040	0,241
2	Sustainability is a driver for the development of new products and services	4,67	-0,495	0,121	-0,521	0,242
3	Sustainability is an inspiration for continuous improvement of our production (either products or services)	4,83	-0,668	0,121	-0,289	0,242
4	Sustainability is an integral part of our business strategy	4,69	-0,489	0,121	-0,551	0,242
5	Sustainability is a fundamental value for our company	4,59	-0,468	0,121	-0,699	0,241
6	We clearly profile the company as sustainable	4,06	-0,101	0,121	-0,961	0,241
7	Growth through increased sales in Norway is a strong desire for the company's management	5,50	-1,096	0,121	0,508	0,241
8	Growth through increased sales in Norway is a strong desire for the company's owners	5,42	-1,032	0,121	0,251	0,241
9	International growth is a strong desire for the company's management	3,47	0,298	0,121	-1,504	0,241
10	International growth is a strong desire for business owners	3,44	0,331	0,121	-1,489	0,241
11	International growth is necessary for the company's	2,42	1,118	0,121	-0,033	0,241

	survival					
12	The company seeks growth by offering the customer a low price	2,74	0,458	0,121	-0,678	0,241
13	The company seeks growth by offering products and services that are clearly different from the competition	4,80	-0,592	0,121	-0,062	0,242
14	The company seeks growth by offering products and services that are adapted to specially selected customer groups	5,17	-0,890	0,121	0,396	0,241
15	The company seeks growth through innovation and development of new products and services	4,53	-0,430	0,121	-0,597	0,241
16	The company seeks growth through internationalisation	2,94	0,625	0,121	-1,031	0,241
17	The company seeks growth through digitisation and / or automation	3,87	-0,047	0,121	-1,174	0,241
18	The company's sales and marketing activities are largely controlled by digital tools	4,06	-0,258	0,122	-0,915	0,243
19	The company's value creation and business model are mainly based on digital solutions	3,10	0,263	0,122	-0,996	0,243
20	We have used digital technology to adapt or improve existing products or services	3,91	-0,290	0,122	-0,859	0,243
21	We have developed new products or services where digital technology is central	3,29	0,255	0,122	-1,134	0,243

22	We have used digital solutions to reach new customer groups or markets	3,88	-0,110	0,122	-1,067	0,243
23	Does the company have sales activities abroad?	0,47	0,130	0,122	-1,993	0,243
24	Does the company have production abroad?	0,15	1,950	0,121	1,812	0,241
25	Approximately what proportion of the company's total sale in 2021 was export (%)?	16,310	1,780	0,121	1,918	0,240
26	Approximately what proportion of the company's total production in 2021 was abroad (%)?	4,851	3,815	0,121	14,564	0,241
27	How satisfied are you with the export results in terms of achieved market share	4,14	0,033	0,179	0,209	0,355
28	How satisfied are you with the export results in terms of sales growth	4,33	-0,241	0,178	0,226	0,355
29	How satisfied are you with the export results in terms of sales growth compared to competitors	4,44	0,188	0,178	0,768	0,355
30	How satisfied are you with the export results in terms of profitability	4,24	-0,217	0,178	-0,355	0,355
31	How satisfied are you with the export results in terms of to gain new knowledge through contact with customers and partners	4,43	-0,178	0,178	0,157	0,355
32	How satisfied are you with the export results in terms of to gain new knowledge about alternative business models	3,91	-0,226	0,178	0,535	0,355

33	All things considered, how satisfied are you with the overall results of the export activities in recent years?	4,47	-0,317	0,179	-0,021	0,356
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## Appendix 3 - Factor analysis results

CFI: 0,942

TLI: 0,927

No.	Items	Loadings	Cronbach's alpha
	<b>Sustainability Strategy</b>		0,943
1	Sustainability is strategically anchored at management and board level	0,824	
2	Sustainability is a driver for the development of new products and services	0,856	
3	Sustainability is an inspiration for continuous improvement of our production (of goods or services)	0,836	
4	Translation results Sustainability is an integral part of our business strategy	0,914	
5	Sustainability is a fundamental value for our company	0,901	
6	We clearly profile the company as sustainable	0,820	
	<b>National growth ambition</b>		0,979
7	Growth through increased sales in Norway is a strong desire for the company's management	1,007	
8	Growth through increased sales in Norway is a strong desire for the company's owners	0,953	
	<b>International growth ambition</b>		0,938
9	International growth is a strong desire for the company's management	0,991	
10	International growth is a strong desire for business owners	0,980	
11	International growth is necessary for the company's survival	0,780	

	<b>Digitalisering</b>		0,839
18	The company's sales and marketing activities are largely controlled by digital tools	0,540	
19	The company's value creation and business model are mainly based on digital solutions	0,746	
20	We have used digital technology to adapt or improve existing products or services	0,838	
21	We have developed new products or services where digital technology is central	0,767	
22	We have used digital solutions to reach new customer groups or markets	0,677	
	<b>Export activities</b>		0,870
27	Satisfaction with export activities in terms of achieved market share	0,812	
28	Satisfaction with export activities in terms of sales growth	0,858	
29	Satisfaction with export activities in terms of sales growth compared to competitors	0,771	
30	Satisfaction with export activities in terms of profitability	0,626	
31	Satisfaction with export activities in terms of gaining new knowledge through contact with customers and partners	0,575	
32	Satisfaction with export activities in terms of gaining new knowledge about alternative business models	0,353	
33	All things considered, how satisfied are you with the overall results of the export activities in recent years?	0,870	



