Norwegian School of Economics
Bergen, Spring 2023

Putting Sustainability Talk into Managerial Action

A Study of Norwegian Firms' Sustainability Integration into Management Control Systems and its Relation to Financial Performance

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Master Thesis in Economics and Business Administration
Major: Business Analysis and Performance Management

NORWEGIAN SCHOOL OF ECONOMICS

Acknowledgements

We would like to thank our supervisor, Joel Berge, for challenging our thoughts and ideas and supporting us throughout the whole writing process. Besides, we want to thank Andreas Friis from the S-HUB team and Anette Myhre Momrak, who provided us with the sustainability survey data and were ready at any time to answer our questions and give clarifications. Lastly, we want to thank our Double Degree cohort from NHH, who gave us fresh creativity aside from writing this master's thesis.

Bergen, June 2023

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Abstract

The pursuit of sustainable development has become one of the most important challenges and consequently a central concern for companies. Often, that concern is addressed via an outside-oriented approach, focusing on communication and sustainability disclosure. This thesis aims to shift the focus from an external perspective to the internalization of sustainability into decision-making. Specifically, we examine the integration of sustainability into management control systems (MCS). Through a comprehensive analysis of 166 Norwegian companies that participated in a 'state of sustainability' survey of S-HUB Norway, we assessed the extent of sustainability integration and developed patterns of formal and informal controls. The patterns reflect that controls are not isolated tools but interplay in a diverse manner. Our findings suggest that sustainability is only moderately integrated into the MCS, with a focus on a long-term strategic perspective and a lack of concrete measures and actions. Moreover, we examined the relationship between integration depth and financial performance, considering the tension between sustainability and profitability in academia and practice. By supplementing the sustainability data with archival financial data in a regression analysis, we found a short-term negative relationship – especially in the case of financially bad performing companies and for the integration into formal controls. This negative relationship could be attributed to a restriction effect, in which an excessive number of formal or irrelevant sustainability controls are counterproductive to the financial optimization of management decisions. Another explanation for the negative relationship might be the short-term nature of our study, representing its major limitation. The potential for positive long-term effects, coupled with the inevitably growing importance of sustainability, underscores the need for proactive measures and for the adaption of internal processes.

Contents

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List of Abbreviations

CSR ..... Corporate Social Responsibility

CV ..... Control Variables

ESG ..... Environmental, Social, and Governance

KPI ..... Key Performance Indicator

LOC ..... Levers of Control

MC ..... Management Control

MCS ..... Management Control Systems

OLS ..... Ordinary Least Squares

QQ ..... Quantile-Quantile

ROA ..... Return on Assets

ROE ..... Return on Equity

RQ ..... Research Question

S-HUB ..... Sustainability Hub Norway

UN ..... United Nations

WCED ..... World Commission on Environment and Development

1. Introduction

1.1 Relevance and Motivation

Climate change is one of the biggest challenges of today's generation. Therefore, sustainability is in the center of everyday business and a key issue in the corporate world since companies are known to be one of the biggest polluters in our society. However, not only the ecological lever is of concern but social and governance issues as well. There is increasing attention to the fair treatment of employees across the whole value chain and the legal compliance and accountability of companies. This is why the importance and availability of regulations and guidelines regarding sustainability reporting rises rapidly, with the introduction of the European Sustainability Reporting Standards as a recent example (EFRAG, 2023). Companies do not only react to the extended legislation but go beyond mandatory regulations by creating additional reports and campaigns (Baumgartner & Ebner, 2010).

Although there is a lot of talk about sustainability, way less attention is paid to how sustainability issues are implemented in organizations. So far, the focus of companies lies on the outside perspective, in particular on the reporting to mainly external stakeholders. This involves a risk of greenwashing with sustainability being merely a tool of communication (Parguel et al., 2011). Research claims that just reporting on sustainability is not enough to create an impact and deeply change the processes within a company (Albertini, 2013). It is indispensable to integrate sustainability into decision-making to establish a real internalization of sustainability. A valid question to ask is: Why don't we look at management control systems (MCS) in order to ensure that it is not just talk? Since MCS formalize rules, values, and practices to align managerial behavior with the company objectives (Malmi & Brown, 2008), they serve as the primary way of putting words into action and hence are highly important for the evolution towards a more sustainable business community. Thus, we want to investigate how deeply sustainability is integrated into Norwegian firms' MCS and our first research question (RQ) is defined as:

> *RQ1: How can the depth of sustainability integration into MCS (a) be assessed and (b) how is it implemented in Norwegian companies?*

Implementing sustainability into MCS could be an effective way of making a real contribution as taking concrete actions is essential. However, this integration can lead to tensions with

economic goals as there are two opposing effects. On the one hand, research on sustainability indicates an enhanced financial performance over time, as MCS ensure that managers and employees strive for more sustainable practices and their considerations go beyond the short-term goal of enhancing profits (Darnall et al., 2008). On the other hand, integrating sustainability aspects into MCS can constrain managerial decision-making (Wijethilake et al., 2018). Therefore, firms might be reluctant to genuinely put sustainability into action as it can negatively influence corporate performance. These tensions lead to our second RQ:

> *RQ2: Is there a relationship between the integration depth of sustainability in MCS [1] and financial performance?*

In this thesis, we firstly investigate how intensively Norwegian companies integrate sustainability considerations into their MCS and secondly how this integration is related to their profitability. Our work contributes to the present knowledge through a quantitative study in a field with rather qualitative approaches like interviews or case studies (Norris & O'Dwyer, 2004; Durden, 2008; Battaglia et al., 2016; Corsi & Arru, 2021), leading to more generalizable findings than the analysis of single companies (Ryan et al., 2002). The few quantitative studies usually work with self-assessed instead of archival data (Darnall et al., 2008; Henri et al., 2014; Judge & Douglas, 1998; Wijethilake et al., 2018) and focus on single aspects of management control (Tucker et al., 2009). There is little research about the effectiveness and interplay of a broad combination of different formal and informal controls for sustainability within MCS (Maas et al., 2016). Besides, relating the sustainability integration depth to the financial performance is a gap in literature as similar studies usually focus on the external perspective of sustainability performance, analyzing the relationship between the reporting intensity or environmental, social, and governance (ESG) scores and the financials (Khan et al., 2016; Al-Tuwaijri et al., 2004).

1.2 Methodology and Structure

To answer our research questions, we start by providing an overview of the concepts of 'sustainability' and 'management control systems' and define them for the scope of our thesis.

[1] For a better readability, we occasionally refer to "integration depth of sustainability into MCS" as "integration depth" as well as to "sustainability integration into MCS" as "sustainability integration" within this thesis.

Subsequently, the two concepts are combined, and we present frameworks on how to integrate sustainability into MCS. We explain different types of management controls for sustainability and especially focus on the 'MCS as a package' framework by Malmi and Brown (2008), which was further transformed by Crutzen et al. (2017), to assess the integration depth of sustainability into MCS.

Our methods for addressing the two research questions differ substantially and RQ2 builds upon the results of RQ1. Therefore, we separate methodology explanation and findings by research question and cover them in two different chapters.

Chapter 3 focuses on the assessment of the sustainability integration depth into MCS as well as the implementation among our sample companies (RQ1). We present the survey data, which was provided by Sustainability-Hub Norway (S-HUB), and the method of classification. Moreover, we explain the relevant survey questions and decision rules to assess the presence of certain types of management controls. Based on that, we first follow the approach of Crutzen et al. (2017) to classify the sample companies, offering the insight that a different procedure is more suitable. Hence, we develop our own approach by classifying the companies into different integration levels of formal and informal controls to demonstrate the degree of sustainability integration in their MCS. Finally, we develop a score for measuring the integration depth of our sample companies in total, as well as for formal and informal controls individually.

In chapter 4, we examine the relationship between the depth of integration and the financial performance (RQ2). To this end, we delve into the development of our research hypotheses and analyze the relevant literature regarding the links between MCS for sustainability and the economic performance. Afterwards, we expound our data and methodology. To examine the hypotheses, we complement the sustainability score developed in chapter 3 by archival accounting data to measure the respective financial performance and perform a correlation analysis. Thereby, we distinguish between formal and informal control integration as well as financially well and poorly performing firms. We used R for the analyses in this chapter.

We interpret and discuss the implications of our findings for RQ1 and RQ2 in chapter 5. After pointing out the contributions and limitations of our work, we indicate possible areas for future research and present a concise conclusion.

2. Theoretical Framework

2.1 Sustainability

Sustainability and sustainable development have taken an increasingly important role in large parts of society in recent years. In order to examine the integration of sustainability into MCS, it is first necessary to define a concept of sustainability that applies to this thesis. Additionally, we want to analyze why and how companies aim towards sustainable development.

The concept of 'sustainability' is multifaceted and ambiguous with different fields and perspectives. It combines environmental, social, human, and business viewpoints and diverse topics as global warming, biodiversity, poverty reduction or equal opportunities (Steffen et al., 2015; Montiel, 2008). The diversity of the sustainability term is also visible in the United Nations Sustainable Development Goals, which define 17 areas and 169 sub-targets to address global challenges for a sustainable future (UN, 2023). The World Commission on Environment and Development (WCED) provides the most relevant and influential definition that claims a development to be sustainable if it "*meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p. 8). It is undisputed that businesses play a crucial role for sustainable development. Therefore, it is necessary that companies link economic goals with taking responsibility for the externalities on their eco-system and all stakeholders within it (UN, 2023). This is also in line with the Triple Bottomline concept by Elkington (1997), equally balancing the interdepending environmental, social, and economic dimensions. Due to mixed terms in existing literature and lacking specification in the 'state of sustainability' survey, we cannot be certain if and to what extent the definition of the WCED was adhered to. Thus, we are referring to any idea or notion that considers the three aspects of environmental sustainability, social accountability, and economic prosperity as sustainable development (as Lueg & Radlach, 2016).

There are different reasons why companies aim towards sustainable development. Baumgartner and Ebner (2010) defined four approaches to corporate sustainability driven by different objectives:

Introverted strategies are motivated by risk mitigation and regulatory entities, forcing companies to comply with legal requirements and rules mandating sustainability in business. However, we are not aiming to analyze legal compliance levels in this thesis but if firms do

more than they are required to do by law. *Extroverted strategies* focus on the communication of sustainability commitment to increase legitimacy and to protect a firm's license to operate. This strategy does, however, not mean that sustainability is also incorporated into internal processes and hence poses a high risk of greenwashing. In contrast, the interest of this paper does not lie in what companies report publicly but whether they internalize it. This perspective is rather considered by *conservative* and *visionary strategies*. *Conservative strategies* are focused on internal measures and the economic effectiveness associated with sustainability in terms of cost efficiency and process effectiveness. Financial performance hence plays a superior role compared to sustainability, what is expected to be accordingly embedded in decision-making. *Visionary strategies,* on the other hand, aim for a competitive advantage through sustainability and for being a market leader in sustainability issues. This requires an "*internalization and continuous improvement of sustainability issues inside the company*" (Baumgartner & Ebner, 2010, p. 85).

Companies differ regarding their approach to integrate sustainability depending on whether they go beyond legal requirements, whether they do not only communicate but internalize it, and what relevance sustainability plays within this internal perspective.

2.2 Management Control Systems

One way firms can internalize sustainability issues is through implementing them into their management control system. To gain an understanding of those systems and different concepts for their implementation, we first clarify the meaning and purpose of management control.

The term management control (MC) was initially introduced by Anthony in 1965. He defined it as "*the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives*" (p. 17), aiming attention at specific tools to formally control for resource-efficient decisions. Merchant and Van der Stede (2017) further address a behavioral perspective, referring to a similar mindset within the organization, by outlining management control as *"[including] all the devices or systems that managers use to ensure the behaviors and decisions of their employees are consistent with the organization's objectives and strategies"* (p. 8). Thus, MC focuses on the alignment of individual decision-making with the overall company goals induced by (corrective) managerial action. In contrast, internal controls are "*a program of activities established to catch and monitor a potential exposure that could result in a significant error,*

omission, misstatement, or fraud" (Hightower, 2008, p. 27). Thus, they focus on assuring legal compliance, risk prevention and the reliability and completeness of accounting information and financial reporting (Doxey, 2019). As explained in the last section, the compliance with sustainability regulations, referring to introverted strategies, is already a quite present topic among businesses. Therefore, it is important to distinguish the two concepts of internal control and management control. The latter puts sustainability internalization in the center and thus takes on an internal managerial perspective, which is the core of this thesis.

Management control systems are a broad approach to put MC into effect. A problem in the MCS literature is the lack of a consistent definition (Fisher, 1995) since there are many ways of constructing them. As the analysis of this thesis is closely tied to the framework of Malmi & Brown (2008), their definition of MCS will be applied for the subsequent part: "*Those systems, rules, practices, values and other activities management put in place in order to direct employee behaviour*" (p. 290). MCS were initially directed towards formal systems that provide accounting information for planning, monitoring, and managerial decision-making (Anthony, 1965). Over time, researchers came up with broader definitions, aiming at including the strategy level (Emmanuel et al., 1990; Dent, 1990; Langfield-Smith, 1997) as well as the cultural level (Ouchi, 1979; Flamholtz et al., 1985; Simons, 1995) into MCS. There was a shift towards an overall organizational control approach and thus, an extension of formal by informal controls (Chenhall, 2003).

The distinction into formal and informal controls is especially important for the remainder of this thesis since they might differ in their importance and effects regarding the implementation of sustainability. Consequently, a detailed explanation will follow in section 2.3.1. Formal controls refer to "*rules, standard operating procedures and budgeting systems"* (Langfield-Smith, 1997, p. 208) and are anchored in the traditional, accounting-based approach towards MC, aiming at performance measurement, monitoring, and goal-congruent practices (Crutzen & Herzig, 2013). Compared to the straightforward formal controls, it is more difficult to assess informal controls (Langfield-Smith, 1997) since they are a "*more subtle, yet important*" (Ferreira & Otley, 2009, p. 264) form of control. They can be defined as shared ideals and morals that lead to a similar mindset and conduct among the members of an organization (Merchant & Van der Stede, 2017; Simons, 1995).

To practically implement the concept of MCS, several frameworks were developed in literature. The most relevant one for our study is 'MCS as a package' of Malmi and Brown

(2008) as it reflects MCS as a holistic approach of several formal and informal controls. The authors argue that firms use multiple MC practices simultaneously and they defined different types of controls, namely: cultural controls (clans, values, symbols), planning (action and long-range), cybernetic controls (budgets; financial, non-financial and hybrid measurement systems), reward and compensation as well as administrative controls (governance structure, organization structure, policies and procedures). These controls will be explained in detail in chapter 2.3.1.

The explained framework is not the only one that gained a lot of attention in the MC literature. Simons' (1995) 'Levers of Control' (LOC) are important when considering the restricting effects of MCS: The LOC concept complements the 'diagnostic' control systems, comprising the traditional accounting perspective, by 'boundary' systems that establish the strategy and define decision rights, 'belief' systems, ensuring shared values, and 'interactive' systems, which enable learning and growth. The right approach to set these four levers is necessary in order to balance between a controlling and an enabling use of MCS (Simons, 1995; Mundy, 2010; Kruis et al., 2016). When used in conjunction, the controlling and enabling functions generate a dynamic tension, enhancing firm performance (Simons, 1995; Henri, 2006). However, a strongly controlling use of MCS, including strict rules and procedures, can set too restricting limits and behavioral constraints. This might reduce the employees' innovativeness and creativity regarding new business opportunities and could negatively affect financial performance (Willert, 2016). The LOC are substantial for the further understanding of tensions between the supporting and restricting effect of MCS, although the focus will be on the framework of Malmi and Brown.

After an introduction into the concepts of sustainability and management control, we combine them and examine the integration of sustainability into MCS in the following chapter.

2.3 Integration of Sustainability into Management Control Systems

The combination of these concepts is emphasized by two directions: the MCS literature is increasingly addressing the integration of sustainability (Berry et al., 2009; Corsi & Arru, 2021). Simultaneously, literature about sustainability strategy formulation and implementation acknowledges MC to play a key role therein due to its potentials to support strategy and decision-making (Gond et al., 2012; Arjaliès & Mundy, 2013; Henri & Journault,

2010). Integration of sustainability into MCS is described by different terms in current literature. For this thesis, we follow Crutzen et al.'s (2017) definition of sustainability management controls: it includes "*all devices and systems that managers develop and use to formally and informally ensure that the behaviors and decisions of their employees are consistent with the organization's sustainability objectives and strategies*" (p. 1293).

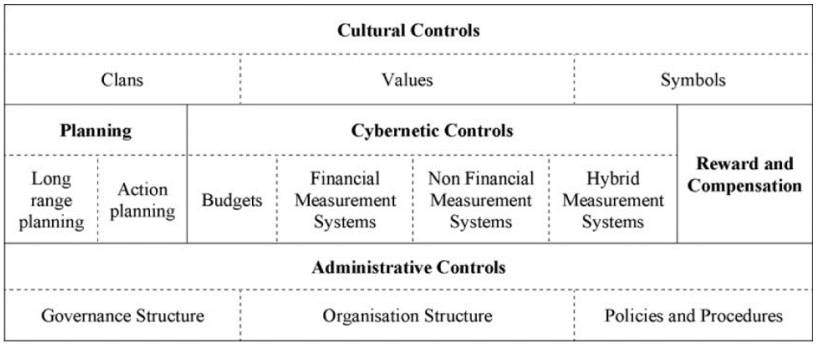
The academic literature suggests the integration of sustainability into different MC frameworks like the well-known 'Balanced Scorecard' by Kaplan and Norton (1992) or Simons' LOC (Hansen & Schaltegger, 2016; Arjaliès & Mundy, 2013; Gond et al., 2012). However, the Malmi and Brown (2008) 'MCS as a package' framework is considered particularly suitable for sustainability integration (Lueg & Radlach, 2016; Sundin & Brown, 2017; Guenther et al., 2016). Being a holistic and modular approach for MCS, it is – unlike traditional accounting-based MCS – capable of entirely addressing sustainable development aspects. It can be utilized to report and manage sustainability aspects as well as to influence employee behaviors accordingly (Lueg & Radlach, 2016; Corsi & Arru, 2021). Additionally, its modularity allows different solutions depending on the company and its context, like the market or environment (Crutzen et al., 2017). In their literature review, Lueg and Radlach (2016) observe that all controls suggested by Malmi and Brown (2008) have been combined with sustainability by empirical research, validating the framework's suitability.

Thus, we decided to use the MCS as a package framework to further explore sustainability integration into MCS and will elaborate on this integration in more detail. In the following part, we give an overview about the different forms of formal and informal controls according to Malmi and Brown (2008, see figure 1) in a sustainability context. Building on that, we will present an approach of analyzing the extent of sustainability integration, developed by Crutzen et al. (2017), in chapter 2.3.2.

2.3.1 Types of Controls

While administrative, planning, cybernetic, and reward and compensation controls are considered formal, cultural controls have an informal nature.

Figure 1: Management Control Systems Package
according to Malmi & Brown (2008)



Administrative controls relate to the organization and governance of both people and groups within the company, the supervision of employees and to whom they are held responsible for their actions (Malmi & Brown, 2008). They ensure organizational efficiency and a smooth exchange of information, by determining duties and liabilities of corporate actors (Chenhall, 2003; Ferreira & Otley, 2009). Firms make regular use of policies like codes of conducts or guidelines on best practices (Arjaliès & Mundy, 2013) to incorporate sustainability and define concrete controlling and auditing procedures (Corsi & Arru, 2021), often based on official certification standards (Crutzen et al., 2017). Defined structures as a sustainability department or officer, taking the responsibility for sustainability strategy and realization, are considered particularly important (Sundin & Brown, 2017).

Cybernetic controls refer to the formal evaluation of corporate performance. The performance is measured based on financial or non-financial key performance indicators (KPIs), which are assessed against pre-defined targets or budgets to hold managers accountable for their actions (Malmi & Brown, 2008). Cybernetic controls are directed to internal monitoring. Their application is comparable to making a 'diagnosis' (Simons, 1995) of the numeric sustainability performance by measuring externalities like greenhouse gas emissions or water and energy usage (Sundin & Brown, 2017). In practice, benchmarking is a commonly used method, comparing the own sustainability performance to industry competitors (Arjaliès & Mundy, 2013; Rodrigue et al., 2013), as well as classical budget systems for managing the environmental and social impacts (Corsi & Arru, 2021).

Planning in the long-range includes strategic planning of future objectives and positioning from an ex-ante perspective (Flamholtz et al., 1985; Malmi & Brown, 2008). The planning period refers to a time horizon of 5-10 years and is grounded on forecasts and assumptions of future developments, especially regarding the environment and related regulations (Gond et

al., 2012). Specifically, companies should create a long-term plan for sustainability activities and their anchoring in the organizational strategy (Crutzen et al., 2017).

In contrast to long-range planning, *action planning* refers to tactical decisions and the realization of the sustainability strategy via concrete actions, for instance in the form of task lists that guide employee behavior (Malmi & Brown, 2008). It involves specific responsibilities and objectives for lower corporate levels e.g., in the context of product or process redesign. This ensures their commitment by giving opportunity to exert influence on the achievement of sustainability objectives (De Villiers et al., 2016).

Reward and compensation refer to the reward of employees based on reaching pre-defined performance targets, with the intention of assuring goal congruence between managers and owners (Malmi & Brown, 2008). They can encompass extrinsic and intrinsic as well as non-financial rewards, like credit and appreciation by senior executives (Ferreira & Otley, 2009). This type of control should motivate managerial decisions that promote sustainability and thus ensure compliance with the overall sustainability strategy (Lisi, 2015). Organizational members can be rewarded based on the individual, the divisional or even the company sustainability performance, for example by a compensation link to official ESG indices (Sundin & Brown, 2017).

Cultural controls have an "*informal nature*" (Crutzen et al., 2017, p. 1295) and hence represent informal controls. Ouchi (1979) compares their appearance with the formation of clans as people adopt certain social behaviors of a group they identify with. In the MCS package, they are visually placed at the top, being comprehensive but very sophisticated controls (Malmi & Brown, 2008). They emerge and evolve slowly and therefore build a framework for the other controls, ensuring common 'beliefs' (Simons, 1995). A shared culture, which is especially reinforced by employee training and awareness building, is an effective means of highlighting a strong sustainability focus towards internal actors of the company (Pérez et al., 2007). Other widely used tools in practice are codes of ethics (Corsi & Arru, 2021) or communication platforms for informing and discussing about sustainability topics, like the intranet (Crutzen et al., 2017; Arjaliès & Mundy, 2013).

Malmi & Brown's modular approach gives room to apply and combine these different controls depending on a company's needs and strategy. Hence, we assume that the use of certain controls can provide insights into a firm's commitment and approach to sustainability,

discussed in the beginning of this chapter. Implementing only administrative controls could indicate a rather regulations and compliance focused approach (*introverted strategy*), while carrying out long-term planning alone might signal an *extroverted* view, communicating goals that are not followed by actions. On the other hand, only focusing on cybernetic controls suggests a *conservative*, quantitative-related approach. A *visionary* strategy towards sustainability is expected to combine all these controls and perspectives, internalizing sustainability not only into administrative, planning, and cybernetic controls, but also into the organization's cultures and reward systems.

2.3.2 Extent of Integration according to Crutzen et al. (2017)

A way to conceptualize and assess the usage of Malmi and Brown's (2008) controls in a sustainability context was developed by Crutzen et al. (2017). By conducting semi-structured interviews in 17 companies, the authors did not only derive concrete packages of formal and informal control mechanisms, but they theorized their findings in observed sustainability control patterns. Cultural controls were recognized as informal controls, while they categorized formal controls into five distinct types: administrative controls, cybernetic controls, long-range planning, action planning, and reward and compensation.

First, Crutzen et al. (2017) focused on formal controls and discovered certain increments among their sample companies. They classified them into four 'packages of formal management controls for sustainability' displayed in table 1. Regarding administrative controls, they focused on a company structure related to sustainability. All companies implemented such a structure and besides had cybernetic controls in place. If no further controls were included, the company belonged to the package 'reporting- & measurement oriented'. The next group of companies made use of long-range planning and hence was considered 'long-range planning oriented'. An even deeper integration of sustainability is exhibited by the third package, referred to as 'action-oriented': these companies integrated concrete short-term action planning in their company Beyond that, the 'full package'-companies applied a reward and compensation system tied to sustainability performance and hence included all the analyzed controls in their MCS. Companies that employed a particular sustainability control package adopted all controls of the former packages in the hierarchy as well. Thus, the packages build upon each other, leading to the following picture:

Table 1: Own Table based on 'Four Packages of Formal Management Controls for Sustainability' by Crutzen et al. (2017)

Sustainability formal control packages	Controls included				
	Company structure	Cybernetic Controls	Long-range planning	Action planning	Reward & Compensation
Reporting- & measurement oriented	✓	✓			
Long-range planning oriented	✓	✓	✓		
Action-oriented	✓	✓	✓	✓	
"Full package"	✓	✓	✓	✓	✓

Furthermore, Crutzen et al. (2017) developed the 'sustainability management control patterns', which represent different combinations of formal and informal controls depending on the intensity of their implementation (figure 2). The paper measured the application of cultural controls based on the number of signals that are expected to have an impact on the shared values within the organizations (Crutzen et al., 2017). Six signals were evaluated: a sustainability-oriented intranet platform, internal company events acknowledging social environmental matters, volunteer-opportunities, shared values among managers, the weight of social and environmental issues in the annual report and visual symbols. If a company fulfilled more than four signals it was considered as having strong cultural controls in place. Otherwise, the cultural controls were referred to as weak. This evaluation, paired with two different stages for the availability of formal controls, lead to the following patterns, indicating that strong cultural controls do not go along with the use of the complete package of formal controls:

Figure 2: Sustainability MC Patterns according to Crutzen et al. (2017)

Development of informal controls / Development of formal controls	**Weak cultural controls** (4 or fewer signals)	**Strong cultural controls** (more than 4 signals)
Complete package (planning + advanced cybernetic + reward + structure)	Pattern C: Advanced formal MC package (3 companies)	Pattern D: Full MC package (0 companies)
Incomplete package (planning + basic cybernetic (budget + list of indicators) + structure)	Pattern A: Basic MC (4 companies)	Pattern B: Behavior-based MC (10 companies)

To answer our first research question, we will follow the presented approach to classify our sample companies and investigate if the same logic can be found in a larger sample. An explanation of the detailed procedure and the findings can be found in chapter 3.2.

3. RQ 1: Measuring Sustainability Integration Depth into MCS

In order to answer RQ1 (*How can the depth of sustainability integration into MCS (a) be assessed and (b) how is it implemented in Norwegian companies?*), we firstly present our sustainability survey data and the selection of relevant survey questions for assessing the presence of each control. After explaining the method of classification, we assess the sustainability integration depth of our sample companies by classifying them according to the formal and informal controls they have in place. Finally, we develop a score for the measurement of sustainability integration that serves as the independent variable for the regression analysis in chapter 4.

3.1 Methods

3.1.1 Survey Data

The initial dataset was provided by S-HUB Norway, being the result of their 'state of sustainability' survey 2022. It was performed first in 2018 and is repeated on an annual basis, however, questions and respondents have changed yearly. The survey was introduced to analyze and give an overview about sustainable business practices and commitment among Norwegian companies. It includes some of the largest Norwegian companies listed at Oslo Stock Exchange, but mainly focuses on the private sector. S-HUB aims to deliver insights into the strategical and practical implementation of sustainability and its progression over time (S-HUB, 2023).

The companies of the survey are assumed to present a portion of Norwegian businesses that is more advanced regarding the commitment to sustainability than the average firm as they are either part of S-HUB or of its extended environment. This could be a sampling bias and must be kept in mind when interpreting the results. Although the concrete job description was not transmitted due to data privacy reasons, it is known that the respondents explicitly work with sustainability as part of their task area. On the one hand, their responses could be biased as they are to some extent responsible for the sustainability performance of their company. On the other hand, it makes them experts on the involved topics, having a good understanding about the questions and replying with detailed background knowledge.

In total, 209 respondents participated in the survey, being our introductory sample. Some companies answered twice through different officials or departments. As no further information about these duplicates was available, they were removed by creating averages.[2] After revising our sustainability dataset, we were left with 181 companies. Table 2 provides an overview about the characteristics of our sample companies. Since 15 companies will be removed due to a lack of financial data, explained in more detail in section 4.2.1, the table only contains 166 companies, which is the final dataset used for all our analyses.

Table 2: Characteristics Overview of Sample Companies

Element	Categories	#	%
Industry	Agriculture, Horticulture & Livestock	2	1%
	Banking, Insurance & Financial Services	23	14%
	Biotechnology and Life Sciences	3	2%
	Business Services	24	14%
	Communications	1	1%
	Computer Software	12	7%
	Construction	6	4%
	Food & Tobacco Manufacturing	7	4%
	Industrial, Electric & Electronic Machinery	4	2%
	Media & Broadcasting	1	1%
	Metals & Metal Products	3	2%
	Mining & Extraction	8	5%
	Printing & Publishing	2	1%
	Property Services	7	4%
	Public Administration, Education, Health Social Services	6	4%
	Retail	5	3%
	Textiles & Clothing Manufacturing	2	1%
	Transport Manufacturing	1	1%
	Transport, Freight & Storage	6	4%
	Travel, Personal & Leisure	6	4%
	Utilities	12	7%
	Waste Management & Treatment	3	2%
	Wholesale	20	12%
	Wood, Furniture & Paper Manufacturing	2	1%
		166	

Element	Categories	#	%
Employees	< 10	31	19%
	10-50	29	17%
	51-250	36	22%
	251-1,000	30	18%
	> 1,000	40	24%
		166	

Element	Categories	#	%
Age	0-10	33	20%
	11-25	47	28%
	26-50	63	38%
	51-100	7	4%
	> 100	16	10%
		166	

Element	Categories	#	%
Ownership	Public	39	23%
	Private	119	72%
	Other	8	5%
		166	

We extracted the companies' industry from the Orbis database, following the Bureau van Dijk sectors. The sample consists of companies from 24 different industries, with 'Banking, Insurance & Financial Services', 'Business Services' and 'Wholesale' being the most present. The number of employees is quite equally distributed among the categories, indicating that we

[2] Detailed approach to build the mean of two companies: Most of the questions were answered on a five-point Likert scale. Hence, the mean of the two answers was calculated. If building the mean caused non-integers, they were not rounded as it would skew the final answer. If one of the answers was a "6" (≙ don't know), the final answer resulted in a 6.
Besides, the survey contained dichotomous questions with the addition of an "I don't know" option ("yes" / "no" / 6). If the two answers deviated, the lowest answer was taken ("yes" > 6 > "no"), to not artificially improve the sustainability integration. As none of the multichotomous or open questions were relevant for our further analysis, they were ignored in this process.

are dealing with companies from all possible sizes. A similar picture emerges for the age of the companies: 20% are only incorporated for up to 10 years, so still in the early stage of operating, but 10% of the companies are older than 100 years, being quite established. In addition, 72% of the companies are privately owned compared to 23% that are publicly listed. Altogether, the companies differ a lot according to their business, size, age, and form of ownership. Thus, even though a sampling bias regarding the sustainability performance cannot be ruled out, they are assumed to represent a proper cross section of the Norwegian company landscape.

3.1.2 Relevant Survey Questions

In 2.3.1, we briefly described how sustainability can be implemented in the various formal and informal controls according to Malmi & Brown (2008). Based on this, we will discuss current literature to derive the selection of relevant S-HUB survey questions for assessing sustainability integration in the respective control. The selected questions are summarized in table 3.

Research suggests that *administrative controls* usually appear in the form of defined structures as a sustainability department or officer, who are assigned certain responsibilities like evolving the sustainability strategy or ensuring its realization in the day-to-day business (Sundin & Brown, 2017). This organizational anchoring of sustainability emphasizes its strategic integration (Corsi & Arru, 2021; Crutzen et al., 2017). In our survey data, the corporate function of the replying professional could not be submitted due to data privacy. Thus, no conclusions about any specific sustainability position could be drawn from that. However, the respondents work in the field of sustainability for their company, which is part of S-HUB or of its extended environment. Therefore, it was concluded that a basic structure being geared to sustainability is implemented in all of them, being consistent with Crutzen et al.'s (2017) findings.

Cybernetic controls are often considered to make up the foundation for the reliability of the external sustainability disclosure (Corsi & Arru, 2021). A formal assessment of sustainability performance indicators assures the relevance of sustainable issues and leads to their prioritization in the firm (Durden, 2008; Pérez et al., 2007). It encourages managers to integrate sustainability into all business decisions and ensures a focus on the sustainable strategy (Morsing & Oswald, 2009; Perego & Hartmann, 2009). Besides, reporting on the

sustainability performance helps to understand and retrace the organizational achievements and thus leads to more transparency (Maas et al., 2016). Consistent with cybernetic controls, our sample companies were asked *to what extent they measure the return on investment of sustainability efforts* (question 1a) and *to what extent the sustainable business performance is a part of the organization's quarterly or monthly reviews and business control systems* (1b).

Integrating sustainability into the *long-term-strategy* by setting plans helps to clarify the ambitions and delivers them to the employees, who are responsible for putting those plans into action (Arjaliès & Mundy, 2013; Crutzen et al., 2017). Making sustainability a part of the strategy is a "valuable intangible asset" (Pérez et al., 2007, p. 403) for the achievement of an enhanced sustainability performance (Wijethilake, 2017) and thus, it is crucial to integrate it into long-range planning processes (De Villiers et al., 2016). Therefore, we used the question *if sustainability is integrated as a part of the company's purpose and core strategy* (2a) to assess if sustainability is a component of the corporate long-term strategy. Moreover, it is important to define a sustainability strategy not only on the overall organizational level, but at the functional level of different departments, so that it becomes part of the daily activities of employees on all corporate levels (Sundin & Brown, 2017; Durden, 2008). Accordingly, we figured out *to what extent sustainability is fully integrated in the strategies of different departments (marketing, sales, operations, research & development, supply chain, human resources, IT, finance)* (2b). It is important to realize the relevance of investments in sustainability innovations (Wijethilake et al., 2018) and to support them by a proactive strategy (Epstein & Buhovac, 2014). Subsequently, it is crucial to translate the defined strategy into concrete targets (Crutzen et al., 2017) to make it more tangible. We assessed whether the sample companies satisfy this translation by the question *if they will increase investments in new sustainability opportunities, innovations or internal resources in the next 3-5 years* (2c).

Literature suggests that a real synthesis of sustainability in the planning process is only achieved by particular plans of putting the strategy into action (Durden, 2008; Lisi, 2015). The question *if there is ambition but too little action regarding sustainability in the organizations* (3c) captures this view. Further approaches of realizing this implementation are the redesign and innovation of products and processes and increased research and development expenditures to create awareness for sustainability in each operational decision (Epstein & Roy, 2001). Thus, we made use of the question about *how far the sustainability efforts involved developing new or improved goods and products, services, internal or operational processes, business practices or business models* (3a). Furthermore, the involvement of external actors,

specifically stakeholders, in sustainability considerations is an indicator of firms outperforming their competitors in terms of sustainability (Eccles et al., 2014). The reason lies in the inclusion of a new, external angle, which supports in developing novel ways of approaching sustainability in the organizational processes and ultimately leads to an alignment with the stakeholders' interests (Maas et al., 2016; Pérez et al., 2007). It was evaluated *if the companies conducted joint planning to resolve sustainability-related problems, made joint decisions about ways to improve the sustainability of their products or services and engaged in joint sustainability-oriented innovation with external actors in their task environment* (3b).

In the analysis of Crutzen et al. (2017), a *reward system* was the least present control for sustainability. This was attributed to the fear of a lower prioritization of financial goals, and to the anticipation of an intrinsic motivation, especially if sustainability is part of the organizational culture. Nevertheless, there is great evidence in literature that those compensation systems increase employee motivation and commitment to sustainability (Corsi & Arru, 2021; Epstein & Buhovac, 2014; Lisi, 2015). Tying the reward to the achievement of sustainability targets is a typical characteristic of sustainably well-performing companies (Eccles et al., 2014), especially since it emphasizes that sustainability is not only a reputational and superficial issue (Epstein & Roy, 2001). We assessed *whether the sample organizations have an incentive- or bonus system linked to sustainability impacts for the board of directors, executive management, middle management and for the entire organization* (4a).

In the context of *cultural controls* for sustainability, Gond et al. (2012) stress the importance of the "cognitive dimension" (p. 215), referring to the involvement and vision of senior executives, which is essential for a resistant implementation and efficiency of MCS for sustainability (Battaglia et al., 2016). Thus, we examined *if the entire executive management team is committed to sustainability* (5a) or *if the lack* of *executive support is a barrier to the company's sustainability performance and intended impact* (5b). A shared culture highlights a strong sustainability focus towards internal actors of the company and thus, guides employees towards a behavior which is congruent with the overall company strategy (Morsing & Oswald, 2009; Durden, 2008). To confirm the existence of a shared culture, we used the question *if the overall company culture or the lack of a sustainability mindset is a barrier to the company's sustainability performance and the intended impact* (5c). Corsi and Arru (2021) emphasize the meaningful effect of informal controls, leading to "sustainability dynamic capabilities" (p. 31) and thus, to a sensitivity for sustainability issues among the whole

company (Norris & O'Dwyer, 2004). Consequently, we considered *if the employees are more engaged because of the sustainability focus of their companies* (5d).

The goal of this chapter was to derive an appropriate selection of survey questions, which can be found in Appendix 1 (full questions). The basic descriptive statistics for the survey results are shown in Appendix 2.

3.1.3 Classification of Survey Data

Based on those survey questions we aim to analyze the implementation of formal and informal controls for sustainability among Norwegian companies' MCS. In chapter 3.2, we therefore conceptionally classify our sample companies into different groups according to patterns of formal and informal controls.

The method of classification has similarities to clustering, which is a common research method in order to examine MCS as a package (Bedford & Malmi, 2015; Chenhall & Langfield-Smith, 1998; King & Clarkson, 2015; Kruis et al., 2016). Cluster analysis "*groups observations into clusters such that each cluster is as homogeneous as possible with respect to the characteristics of interest*" (Gerdin, 2005, p. 101). However, this method results in newly invented clusters, whereas we want to reveal patterns according to the classification into predefined groups i.e. the availability of different controls.

We argue that it is relevant if certain controls are implemented, rather than how they are implemented: e.g. for question 2a (long-range planning), we consider two companies that integrated sustainability into the strategy of different but equally many departments as similar in terms of the integration depth. However, a clustering approach based on their survey answers would have suggested a large difference between the two companies. For these reasons, following a classification approach is more suitable to detect similarities between the sample companies regarding the extent of integrated controls.

The method of classification is "*the general process of grouping entities by similarity*" (Bailey, 1994, p. 4). The focus can be set on a single or on multiple dimensions, whereby the dimensions are usually correlated in the latter case (Bailey, 1994). We performed a conceptual and thus manual classification in 3.2. The robustness of the resulting groups was challenged in a second step by a quantitative technique.

3.2 Patterns of Sustainability Integration Depth

3.2.1 Decision Rules

Our starting point for assessing the integration of sustainability were the 'packages of formal management controls for sustainability' developed by Crutzen et al. (2017), making use of the previously defined controls: structure, cybernetic controls, long-range planning, action planning, and reward and compensation. As explained in 3.1.2, we assigned relevant questions from the sustainability survey to the different controls based on prevailing perspectives in literature. Based on that, we defined decision rules in the form of required answers for each question. Table 3 provides abbreviated terms for the questions selected for each control and the pertinent literature sources. A table with the full questions and answer options is presented in Appendix 1.

Table 3: Relevant Survey Questions and Decision Rules Assigned to Controls

Control		Question Short	Decision Rule	Sources
Cybernetic Controls	1a	Extent of ROI measurement of sustainability efforts	Min. 1 ≥ 4	Arjaliès & Mundy (2013); Crutzen et al. (2013); Crutzen et al. (2017); Durden (2008); Epstein & Roy (2001); Henri & Journeault (2010); Maas et al. (2016); Morsing & Oswald (2009); Perego & Hartmann (2009); Pérez et al. (2007)
	1b	Sustainable business performance is part of quarterly or monthly reviews and business control systems		
Long Range Planning	2a	Integration of sustainability in purpose and core strategy	≥ 4	Arjaliès & Mundy (2013); Crutzen et al. (2017); De Villiers et al. (2016); Pérez et al. (2007); Wijethilake (2017)
	2b	Sustainability integration into specific departments' / functions' strategies: Selection of 8 departments	Min. 3 ≥ 4	Durden (2008); Sundin & Brown (2017)
	2c	Planned Investments (within 3-5 years) in... sustainability opportunities | innovations | resources	Min. 1 ≥ 4	Crutzen et al. (2017); Epstein & Buhovac (2014); Wijethilake et al. (2018)
Action Planning	3a	Sustainability efforts (past three years) for... improved products | services | processes | business practices	Min. 2 ≥ 4	Durden (2008); Epstein & Roy (2001); Lisi (2015)
	3b	Engagement in specific activities with external task environment actors: joint planning | decisions | innovation	Min. 1 ≥ 4	Eccles et al. (2014); Maas et al. (2016); Pérez et al. (2007)
	3c	Lack of strategic transformation ('ambition but too little action') as barrier to sustainability performance	≤ 2	Durden (2008); Lisi (2015)
Reward & Compen-sation	4a	Incentive or bonus system linked to sustainability for... Board of Directors | Executive Management | Middle Management | Entire Organization	Min. 1 Yes	Corsi & Arru (2021); Crutzen et al. (2017); Eccles et al (2014); Epstein & Buhovac (2014); Epstein & Roy (2001); Lisi (2015)
Cultural Controls	5a	Sustainability commitment of executive management team	≥ 4	Battaglia et al. (2016); Gond et al. (2012);
	5b	Lack of executive support as barrier to sustainability performance	≤ 2	
	5c	Overall company culture or lack of sustainability mindset as a barrier to sustainability performance	≤ 2	Durden (2008); Morsing & Oswald (2009)
	5d	Higher employee engagement resulting from sustainability focus	≥ 4	Corsi & Arru (2021); Norris & O'Dwyer (2004)

The decision rules should be interpreted as follows: focusing on the top of the table, there are two relevant questions for the assessment of cybernetic controls (1a, 1b), with an overall decision rule that refers to both. An answer of at least 4 ("high extent" or "very high extent") was required for one of the questions to confirm the presence of cybernetic controls.

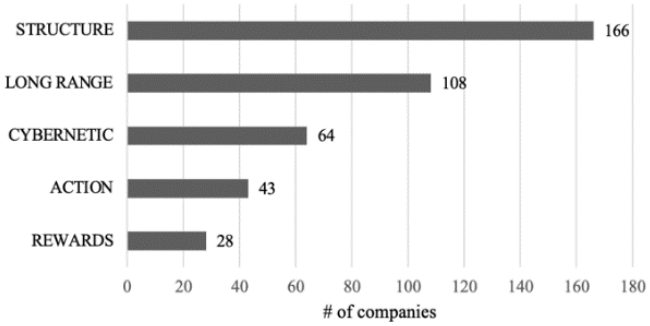
As another example, long-range planning includes three questions with different decision rules (2a, 2b, 2c). All of them must be fulfilled by the responses of the company for the validation of this specific form of control. Answers to questions with one response option must meet a single threshold. Thus, the question about the *integration of sustainability in purpose and core strategy* (2a) should be answered with at least 4 ("agree" or "strongly agree") to comply with this type of control. The other two questions further include multiple response options. For instance, the *sustainability integration into specific departments* (2b) offered a selection of eight different divisions and the companies had to give an answer of 4 or higher ("high extent" or "very high extent") for at least three of them.

Regarding reward and compensation, the survey did not include a Likert scale, but the companies had to reply with "yes" or "no" for each group of employees (4a). Therefore, the presence of such a system in at least one of the groups corresponds to stating "yes" at least once.

3.2.2 Findings

In the following, we will focus on the question which patterns of formal and informal controls are present in a diverse set of Norwegian companies. The availability of different management controls was assessed according to the questions presented in table 3, which were derived in chapter 3.1.2. Regarding the formal controls, we obtained the following distribution across the sample companies:

Figure 3: Frequency of Implemented Controls across Sample Companies



As explained before, a sustainability-enabling structure is present in all the companies. Besides, long-range planning is used by 108 companies and hence seems to be a popular form of control, indicating that companies select a quite strategic approach to address sustainability issues within MCS. Cybernetic controls are incorporated by 64 companies, which is a quite low amount although it is discussed most intensively in literature. Issues with measuring and

quantifying sustainability indicators might cause this result. Action planning is integrated in the MCS of 43 companies, which points to a large gap between the involvement of sustainability in the strategic planning process and the accomplishment of a concrete realization. In line with Crutzen et al. (2017), companies make little use of reward and compensation to control for sustainable commitment. For our sample, it makes sense amidst the limited use of cybernetic controls as it is difficult to reward managers without measuring concrete outcomes.

We first focused on classifying our sample companies into the 'four packages of formal management controls for sustainability' explained in chapter 2.3.2 (Crutzen et al., 2017). However, the investigation of our sample revealed that the creation of packages in a larger sample is substantially more complex than Crutzen et al. (2017) suggested in their in-depth analysis of 17 companies. Following their approach, only 49 sample companies would fit into the respective packages. Additional 40 companies solely realized a structure, which would not be enough to be assigned to the basic package 'reporting- and measurement oriented'. We found that the controls do not necessarily build upon each other. For instance, 11 companies implemented all controls, including reward and compensation, but do not make use of action planning and 35 companies only implemented long-range planning. The issue is visualized in the following table:

Table 4: Combination Frequency of Formal Controls across Sample Companies

	Cybernetic Controls	Long-range Planning	Action Planning	Reward & Compensation	Counts
Full package	✓	✓	✓	✓	6
Action-oriented	✓	✓	✓		16
Long range planning oriented	✓	✓			19
Reporting- & measurement-oriented	✓				8
		✓	✓	✓	1
Combinations of 3 controls	✓		✓	✓	0
	✓	✓		✓	11
	✓		✓		3
	✓			✓	1
Combinations of 2 controls		✓	✓		13
		✓		✓	7
			✓	✓	0
		✓			35
Combinations of 1 control			✓		4
				✓	2
0 controls = structure only					40

The vast majority of our sample companies cannot be classified according to the formal control packages developed by Crutzen et al. (2017) as they do not certainly build upon each other.[3] Consequently, to reach an appropriate amount of data for our status quo analysis, we deviated from their control packages and classified our data according to the number of formal controls adopted by the companies, independently of the integration of other controls. For each control, we determined if it is in place or not, not the degree of integration. Thus, the depth of sustainability integration in formal MCS was established by the total number of controls implemented, resulting in a scale of 0 to 4, which is called the "formal controls integration level". An integration level of 0 implies that only structure is in place, which is evident for the whole sample. Each next level on the scale indicates that one more formal control is in place, meaning that for level 4, all formal controls are part of the MCS of the respective company.

In a second step, we additionally considered the informal controls. The goal was to create a matrix with different combinations of the level of formal and informal controls integrated in accordance with Crutzen et al.'s 'sustainability management control patterns' (2017). The rows contain the integration level of formal controls (0 = low until 4 = high) and the columns indicate if informal and thus cultural controls are in place (yes / no).

Table 5: Frequency of Formal and Informal Control Integration Levels across the Sample Companies

# of companies		Informal Controls		
		Yes	No	
Formal Controls Integration Level	0	5	35	40
	1	11	38	49
	2	14	29	43
	3	15	13	28
	4	4	2	6
		49	117	166

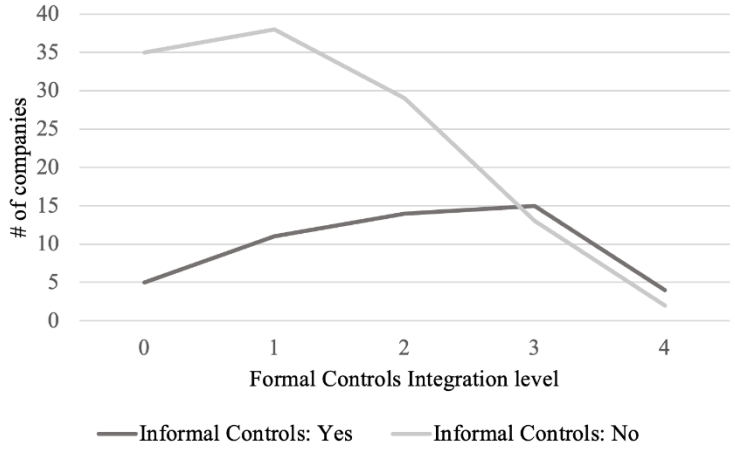
Considering formal controls in isolation, most companies have few of them in place and employing more than two controls is rare. Although the sample consists of companies that can assumed to be quite sustainable or at least make sustainability a prioritized topic of their business, we find a distribution across all levels with the highest number of companies in

[3] We implemented a k-means clustering of the sample companies that confirmed our results in a quantitative way. The results are depicted in Appendix 4, also showing that certain clusters include e.g. a high degree of integration into long-range planning and a low degree of cybernetic control.

integration level 1 and 2. Possible explanations could be that either even sustainable firms have not fully internalized sustainability yet or they are part of the environment of S-HUB and participate in the survey for external or reputational purposes but actually do not present a more sustainable section of the spectrum of companies. Considering informal controls in isolation, it is noticeable that their use is rather low. Only 30% of the companies make cultural controls part of their MCS.

The interplay of formal and informal controls results in ten different patterns. For instance, a company belonging to pattern No-2 did not adopt cultural controls but has 2 formal controls besides a sustainability-enabling structure in place. We see a switch in majorities of informal integration for an increasing level of formal integration: among formal integration level 0 to 2, the majority of companies does not have informal controls in place but the percentage of companies using them increases with the level. In contrast, the majority belonging to level 3 or 4 makes use of informal controls. The graphical representation of the formed patterns suggests a relationship between the presence of informal controls and the integration depth of formal controls:

Figure 4: Informal and Formal Control Patterns



Companies that did not implement informal controls make little use of formal controls. For example, of the 40 companies that do not adopt any formal controls apart from the structure, 35 do not apply informal controls either. However, from the 28 companies having 3 formal controls in place, 15 use informal controls, facing only 13 companies without informal controls. This indicates a correlation between the integration of formal and informal controls. In order to statistically confirm the assumed relationship, we have considered the occurrence

of formal and informal controls again during our linear regression analysis. The results can be found in the subsequent section.

3.3 Score for Sustainability Integration Depth

The patterns developed above are useful for making general statements about the sustainability integration depth into MCS in Norwegian companies. However, for a regression analysis they are not suitable as they are too aggregated with only five respectively two possible values. Thus, we developed a score to measure the level of sustainability integration into MCS in preparation for the regression analysis: next to a total sustainability integration score, also referred to as total score (S_T), we created a formal score (S_F) and an informal score (S_{IF}).

The survey questions described in 3.1.2 are the basis for both, sustainability integration patterns and score. For the classification, the presence of a certain control in a company was only confirmed if all the defined questions were answered according to the thresholds described in table 3. For the scores, in contrast, the answer points of every question assigned to a certain control were summed ($\sum AP_i$) and divided by the maximum possible answer points for that control ($\sum AP_{Max}$).[4]

$$S_{F_i} = \left(0{,}25 * \frac{\sum AP_{Cybernetic\ i}}{\sum AP_{Cybernetic_{Max}}} + 0{,}25 * \frac{\sum AP_{LT\ Planning\ i}}{\sum AP_{LT\ Planning_{Max}}} + 0{,}25 * \frac{\sum AP_{Act.\ Planning\ i}}{\sum AP_{Act.\ Planning_{Max}}} + 0{,}25 * \frac{\sum AP_{Reward\ \&\ Comp.\ i}}{\sum AP_{Reward\ \&\ Comp._{Max}}}\right) * 100$$

$$S_{IF_i} = \frac{\sum AP_{Culture\ i}}{\sum AP_{Culture_{Max}}}$$

$$S_{T_i} = 0{,}8 * S_F + 0{,}2 * S_{IF}$$

S_{F_i}	*Formal Score of company i*
S_{IF_i}	*Informal Score of company i*
S_{T_i}	*Total Score of company i*
AP	*Answer points*
$\sum AP_{Control\ i}$	*Sum of company i's answer points for questions assigned to a specific control*
$\sum AP_{Control\ Max}$	*Maximum possible answer points for questions assigned to a specific control*

[4] Answer 6 ("I don't know") was counted as 0. For questions 3c, 5b and 5c a lower answer is associated with a better integration, so the answer points (AP) used in the score were calculated by (5 - answer).

As we defined four types of formal controls, each of them contributed to S_F by 25%. Accordingly, S_{IF} was set up by adding the answers to the questions defined for cultural controls since this is the only type we analyzed for the informal dimension. Finally, S_T was formed by the average of the four formal controls and the one informal control, so that S_F accounted for 80% and S_{IF} for 20%. As cultural controls are one out of five types of controls in the 'MCS package', standing on one level with cybernetic or administrative controls (see figure 1), we only give it a weight of 20% in our total score.[5]

Our procedure resulted in a score between 0 and 100 for $S_{F,}$ S_{IF} as well as $S_{T.}$ This leaves us with a total score that equally represents the five different controls and therefore indicates the overall integration depth. Besides, the separate formal (S_F) and informal score (S_{IF}) allow us to analyze possible differences in the link between the integration depth and the financial performance, depending on the form of control. The analysis of this link refers to RQ2 and hence is the core of the following chapter.

The regression analysis, however, also provides insights about the sustainability integration depth itself and related company characteristics. Due to the thematic fit, we anticipate these insights already at this point as they do not include the firms' financial perspective. More detailed results can be found in the correlation matrix in Appendix 3. It shows that total, formal, and informal scores are all normally distributed in our sample. Overall, companies intensively using formal controls appear to be larger, with higher employee numbers (0.16) and more total assets (0.17). This is accompanied by the fact that these tend to be older companies (0.16). On the other hand, smaller companies (in terms of revenues) seem to have a deeper sustainability integration into informal controls. Additionally, the matrix shows a significant correlation between the integration level of formal and informal controls, which was indicated in our analysis in chapter 3.2.2. The results are significant on a 0.1% level and show a correlation coefficient between the two variables of 0.54. It can therefore be concluded that companies that have strongly integrated sustainability into formal controls also tend to integrate it more deeply into informal controls.

[5] Building the total score in different ways, e.g. by assigning formal and informal controls a 50% weight each, would result in the same direction of relationship in our regression analysis.

We made these initial deductions based on significant correlation coefficients in the correlation matrix. Because the interrelationships are not the focus of our work, we did not consolidate these insights by creating separate models including control variables, as we will do for the link between the scores and the finanical performance. However, the matrix shows first indications that could be strengthened by future research.

4. RQ 2: Relationship between Integration Depth and Financial Performance

4.1 Hypotheses Development

In the following, we will review the literature regarding the possible link between sustainability integration into MCS and corporate financial performance. Based on that, we will define our research hypotheses to answer RQ2 (*Is there a relationship between a deep integration of sustainability in MCS and financial performance?).*

4.1.1 Research Hypothesis 1

Research question 2 has already been approached in literature, however, only in a narrow way. Albertini (2013) discovered a positive association between environmental objectives, structures and processes and financial performance, as they result in cost savings and differentiation. This positive relation is confirmed by Melnyk et al. (2003) for a sustainability management system and by Judge and Douglas (1998) regarding the integration of environmental concerns into long-term planning. Darnall et al. (2008) selected a more comprehensive approach and analyzed proactive environmental management practices, which involved several types of formal and informal controls. They detected a superior financial performance for firms with a deeper integration of those practices, with a weaker connection if caused by institutional pressures. It is then motivated by legitimization and does not lead to a competitive advantage in the form of improved efficiencies and employee commitment.

Henri and Journeault (2010) analyzed the relation of performance measures, budgeting, and incentives with economic performance and did not find a direct significant association but an indirect positive relation via an improved environmental performance. Henri et al. (2014) confirm this result for the use of environmental cost management, which helps to identify cost drivers and advances communication that manifests the relevance of environmental concerns in the firm. Burnett and Hansen (2008) suggest that proactive environmental management in the form of controls for quantifying costs and benefits will lead to less resource-usage causing cost reductions. Unlike most of the presented studies, Lisi (2015) worked with archival instead of self-assessed financial data and evaluated the application of measures like performance evaluation, reward systems and strategic objectives related to sustainability. In line with other

studies, she could not confirm that the use of the measures is directly linked to financial performance but observed full mediation by environmental performance.

Several meta-analyses suggest that sustainable companies are financially more successful (Dixon-Fowler et al., 2013; Hang et al., 2019; Orlitzky et al., 2003). Whereas many researchers indicate a short-term relation (Khan et al., 2016; Jiao, 2010; Al-Tuwaijri et al., 2004; Surroca et al., 2010), several studies highlight that positive effects occur especially in the long run (Horváthová, 2010). Eccles et al. (2014) compared a matched sample of 'high' and 'low' sustainability firms, evaluated based on a strategical focus on sustainable practices. They found that high sustainability firms exhibit a better financial performance and are more valuable in the long-run due to lower risk and a deeper stakeholder engagement. Moreover, Servaes and Tamayo (2013) stress the positive influence of corporate social responsibility (CSR) commitment on the long-term company value. Hang et al. (2019) conclude that while there is no short-run effect of an improved sustainability performance on the financials, there is a significant one in the long-run, especially for proactive rather than reactive activities.

In contrast to the presented studies, there are papers supporting the trade-off hypothesis, indicating a negative link between sustainability and financial performance since sustainable practices come at cost. Those studies take up on Friedman's (1970) economic theory argument that businesses should only focus on shareholder value creation as CSR activities waste resources. Jensen (2002) as well as Brown et al. (2006) confirmed that corporate social behavior leads to agency costs as managers feel the personal duty to behave socially responsible, although it is a loss to shareholders. Hahn et al. (2010) criticize that most research focuses on a "*win-win paradigm*" (p. 218), referring to the presumption that environmental and financial goals can be reached at the same time without conflicts or compromises. Makni et al. (2009) discovered a negative causal relationship between environmental ratings and the financial performance. They justify this result by environmental investments being costly for usually small-sized Canadian companies and attribute it to the study's short-term perspective. Moreover, Brammer et al. (2006) and Baird et al. (2012) find negative relationships between a firm's CSR and stock market performance. Ittner et al. (2003) highlight that MCS for sustainability entail administrative costs and can lead to reduced motivation due to a lack of understandability, cancelling out potential benefits. Other researchers confirm potential negative effects due to costs of implementation, supervision, and advancement, as well as issues with expressing sustainability measures in quantified terms (Durden, 2008; Lisi, 2015).

As our sustainability data has not been collected over a longer time span, we can only develop a hypothesis for the short-term relationship with profitability. The literature review has disclosed conflicting results: most of the studies support a positive relationship, e.g. due to cost savings, differentiation, and employee commitment as well as the indirect link via an improved sustainability performance. However, those indirect effects can be assumed to occur rather in the long-term. Some other studies suggest a negative relationship, which arises in particular from the restriction of managers and costs associated with the implementation and operation of the systems, especially influencing short-term relationships. Due to those contradicting results in literature, we do not assume a direction of the short-term relationship:

> *H1: There is a significant relationship between a firm's sustainability integration level into its MCS and its profitability in the short term.*

Since many influencing factors lead to opposite statements in literature, we further broke down H1 to provide more detailed insight through H2 and H3.

4.1.2 Research Hypothesis 2

Our second research hypothesis focuses on potential differences regarding the link to financial performance between the use of formal and informal controls.

Several researchers claim that the collection and examination of sustainability data helps to control for sustainability targets and thus, is a prerequisite for the thorough implementation of a sustainability strategy (Bebbington & Thomson, 2013; Maas et al., 2016). Henri and Journeault (2010) attribute this to formal controls drawing managerial attention to critical sustainability concerns. According to Pérez et al. (2007), accounting systems focusing on sustainability boost environmental performance and lead to higher employee awareness and management commitment.

In contrast, some researchers worry about sustainability losing its relevance if it is deeply integrated with common managerial accounting, being designed for the achievement of economic goals (Gond et al., 2012; Figge & Hahn, 2013). Virtanen et al. (2013) found that a too formal approach of controlling for environmental activities can impair the intrinsic motivation of organizational actors, leading to a negative effect on the sustainability performance. Besides, performance evaluation as part of MCS cannot direct managers towards

more sustainable decision-making if the controllability and understandability is low (Franco-Santos et al., 2012), which is quite typical for sustainability indicators.

Consequentially, some research suggests that informal controls occur more frequently in the context of sustainability than formal ones (Perego & Hartmann, 2009; Gond et al., 2012) and that they enable the success of formal controls (Ferreira & Otley, 2009). According to Corsi and Arru (2021), informal controls are more efficient to motivate and shape employee behavior towards the business' sustainability targets. Crutzen et al. (2017) propose that a dominance of cultural controls could be beneficial to control for sustainable involvement. Norris and O'Dwyer (2004) confirmed this dominance, determining conflicts between formal and informal controls if there is no manifestation of cultural controls in the formal system. However, they noticed that consciousness for sustainability was deeply rooted in the whole firm, assigning this to the controls being social and clan based. Durden (2008) discovered inefficiencies in his case organization's MCS, attributable to a lack of informal controls.

Referring to the use of different LOC by Simons (1995), Wijethilake et al. (2018) focused on the relation between environmental innovation strategy and organizational performance. They distinguished between an enabling use of MCS, with a focus on belief and interactive systems, and a controlling use, stressing boundary and diagnostic systems that engage in a closer monitoring of managers. The application of an environmental innovation strategy does not influence the performance but if MCS are introduced as a moderator, the relationship turns positive for enabling systems and negative for controlling systems. This supports the assumption that excessively constraining managers deteriorates corporate performance.

Some literature suggests that informal controls are used more often in a sustainability context and are more efficient in improving the sustainability performance. Thus, an informal control approach might as well be more effective to enhance the financial performance. Considering the restricting effect of formal controls, as well as the high costs associated with them, one can assume that the correlation differs between formal and informal controls. Thus, we have considered them differentially:

> *H2A: There is a significant **negative** relationship between a firm's sustainability integration level into **formal controls** and its profitability in the short term.*
>
> *H2B: There is a significant **positive** relationship between a firm's sustainability integration level into **informal controls** and its profitability in the short term.*

4.1.3 Research Hypothesis 3

The third research hypothesis considers contrasting directions of effect regarding the link between sustainability and financial performance.

Some researchers point out a reciprocal relationship, implying that sustainability has no effect on the financial performance, but the financial performance affects sustainability. Wagner and Blom (2011) found that sustainable practices improve the return of firms performing above the industry median due to increased customer goodwill, whereas for firms performing below the median the investment would be higher than the outcome. However, the use of environmental management practices and the financial performance are both consequences of solid management (Al-Tuwaijri et al., 2004) and thus reciprocally influence each other in the form of a "*virtuous circle*" (Orlitzky et al., 2003, p. 424): economically well-performing firms have the ability to invest into sustainable projects, making them again more profitable. In this context, the slack-resources hypothesis (Waddock & Graves, 1997), assuming that companies with a surplus of financial resources can afford sustainability investments, can lead to reverse causality issues (Orlitzky, 2008). In contrast, Soytas et al. (2019) suggest that incentives to implement sustainability initiatives are lower for productive firms due to higher marginal costs as higher efficiency and lower flexibility make it harder to change well-established processes.

An analysis regarding relationships between sustainability and financial performance can be affected by different directions of actions. Therefore, it is crucial to identify indications for the slack-resources hypothesis and reverse causality issues. These assume that financially successful companies may have more resources to allocate towards MCS for sustainability or for investing in other activities that enhance sustainability performance. That could lead to a higher integration depth among financially well performing companies. To investigate this phenomenon, we subdivided the sample into companies that perform financially well or poorly, while assuming different effects for these two groups:

> *H3A: There is a significant **positive** relationship between a firm's sustainability integration level and its profitability in the short term among **financially good performing** companies.*
>
> *H3B: There is a significant **negative** relationship between a firm's sustainability integration level and its profitability in the short term among **financially bad performing** companies.*

4.2 Methods: Regression Analysis

To assess the defined hypotheses, we conducted a correlation analysis and developed several regression models with the program R. For this purpose, we combined the sustainability survey data with archival financial data of the respective companies. As there was no sustainability survey of S-HUB from years before 2022 that included the selected questions, it was not feasible to work with panel data in our regression analysis.

4.2.1 Financial Data

The corresponding financial data for our sample companies was accessed via Bureau van Dijk's database Orbis and matched via the sample companies' Norwegian ID number. It is the leading database for the comparison of private company information and therefore highly suitable for our sample, containing a great number of private companies (Bureau van Dijk, 2023). Orbis was used for our models' dependent and control variables. For the regression analysis, the performance indicators of the year 2021 were used. Although there were still Covid-19 restrictions in the beginning of the year, it can be assumed that the companies could cope with it better than they did in the first year of the pandemic. Besides, we will evaluate the financial KPIs in relation to the respective industry and hence will account for how far the companies were affected by the lockdown differently. While it can be expected that the 2021 numbers were impacted by Covid, we do not anticipate this to bias the results in our setting in any particular direction. As this thesis was written, the results of 2022 were not yet published for most of the sample companies. Consequently, no cause-effect conclusions can be drawn from the regression, but the relationship between the survey data and the financial data can be analyzed.

After extracting the financial data, additional cleaning was required. Of the 181 companies, 6 companies were founded in 2021. Accordingly, reliable and meaningful data about the financial performance was not available. Moreover, one company was not registered in Orbis, and another company had a negative operating revenue, indicating some extraordinary incidents. Finally, seven companies were removed from the dataset due to a lack of the required financial data in Orbis. Consequently, the final dataset for the correlation analysis consists of 166 companies.

We did not exclude the financial institutions since removing them would have reduced the sample size heavily: 23 companies of the final dataset belong to the sector 'Banking, Insurance & Financial Services'. Even though their economic performance logic differs from other industries due to structural differences, comparability is ensured by assessing the financial ratios in relation to the respective industry median.

In order to answer H3a (*positive relationship for financially good performers*) and H3b (*negative relationship for financially bad performers*), a further division of our dataset into financially good and financially bad performing firms was necessary. We defined all companies whose Return on Assets (ROA) was above the industry median as good performers and those whose ROA was below the median as bad performers. Thus, we used three different datasets for our regression analysis: the full dataset (166 companies), a good performers dataset (86 companies) and a bad performers dataset (80 companies). The full dataset is used to answer H1, H2a and H2b, while the good performers dataset was used for H3a and the bad performers dataset for H3b.

4.2.2 Variables

To investigate H1 to H3, we used correlation models, including different independent, dependent and control variables. Those will be explained in the following section.

Independent variables – Sustainability Integration Depth

The independent variables in our correlation analysis reflect the level of sustainability integration into MCS. We make use of the measures we developed within the scope of this thesis: the total, the formal and the informal score explained in section 3.3.

Dependent variables – Financial Performance

To measure the sample companies' financial performance, we focused on an accounting-based perspective by using profitability indicators extracted from the Orbis database (see 4.2.1). The choice of an accounting perspective results partly from our sample that includes many private companies. Additionally, decision-making abilities and managerial performance, for instance influenced by how managers choose to allocate funds across various projects, are reflected in accounting-based metrics rather than external market responses (Albertini, 2013; Cochran & Wood, 1984). In order to cover different profitability perspectives and to add more robustness to our findings, we use Return on Assets (ROA) as well as Return on Equity (ROE) as

measures for financial performance. Hence, for all hypotheses (H1 – H3) both dependent variables were analyzed.

$$ROA = \frac{P\ /\ L\ (before\ taxes)}{Total\ Assets}$$

The ROA reflects a company's profitability since it measures its capability to generate profits "*for each euro of assets invested*" (Palepu et al., 2019, p. 179). It refers to its efficiency of asset usage and hence its operational efficiency. ROA is commonly used in sustainability and MCS literature to measure profitability (Clarkson et al., 2004; Trumpp & Guenther, 2017; Ittner et al., 2003; Eccles et al., 2014). It is an indicator for the operating result and thereby the managerial performance of a company, although it is influenced by asset intensity. We account for this influence by control variables that are introduced in the following section. For the return we used profit / loss before taxes to adjust for tax effects.

$$ROE = \frac{P\ /\ L\ (before\ taxes)}{Total\ Equity}$$

To check the robustness of our results regarding the ROA, we repeat the regression with the ROE, which "provides an indication of how well managers are employing the funds invested […] to generate returns" (Palepu et al., 2019, p. 178). Like ROA, it is an indicator for the overall profitability of a company and a high ROE can partly reflect good managerial performance. In contrast to ROA, however, ROE refers only to the capital of owners or shareholders and is an indicator of value creation for investors. It is therefore one of the key indicators of financial performance. In addition, ROE reflects the return earned on the cumulative profits that have contributed to the equity over time. The main added value of including a second variable is to counteract special effects. Moreover, ROE is extensively used in other studies, analyzing similar contexts (Makni et al., 2009; Bush & Hoffmann, 2011; Eccles et al., 2014), often in combination with ROA (Albertini, 2013).

In summary, ROA is of higher relevance for our research question as it better reflects the operational performance. However, analyzing ROA and ROE together increases the robustness of our results and provides a holistic view of a company's financial performance, profitability, and efficiency.

Profitability measures differ across industries e.g. due to different asset intensities, margins and in recent years due to Covid implications. This is why we did not use absolute values for

ROA and ROE, but the deviation from every company's respective industry median. This is in line with other studies, like Wagner and Blom (2011), Lisi (2015), Hart and Ahuja (1996) or Agle et al. (1999). Besides, using the median instead of the mean weakens the possible impact of outliers. We used the Orbis database for the industry assignment as well as the extraction of industry medians. Through that approach, we control the dependent variables for industry effects. Other control variables are explained in the following section.

Control Variables (CV)

We included control variables to account for possible confounding effects on the relationship between the sustainability integration depth and the profitability measures. In our analysis, we will add them step-by-step to increase the robustness of our results. Aligned with current literature, we examined the effects of the variables shown in table 6.

Table 6: Explanation and Literature Accordance for CV Inclusion

Model	CV	Literature	Explanation
2	# employees	Henri & Journeault (2010); Darnall at al. (2008); Henri et al. (2014); Judge & Douglas (1998); Lisi (2015); Wijethilake et al. (2018); Perego & Hartmann (2009); Wijethilake (2017)	According to Chenhall (2003), the number of employees is the most used variable to control for size in the MCS literature. There are two main points that could lead to a higher integration depth: 1) Larger companies are more visible, resulting in a higher responsiveness to sustainability issues. 2) Larger companies might have more slack resources to invest in sustainability implementation. Besides, larger companies are expected to have a higher ROA.
	Total assets	Soytas et al. (2019); Eccles et al. (2014)	
	Revenues (ln)	Hawn & Ioannou (2016)	
3	+ Equity ratio	Barnett & Salomon (2012); Khan et al. (2016); Makni et al. (2009); Surroca et al. (2010)	A company's capital structure directly influences its ROE: especially for very low equity ratios, there is a pronounced impact of debt on ROE. By controlling for it, it can be assessed how effectively companies are generating returns on their equity, regardless of their varying capital structures. Since ROA focuses on the overall efficiency of asset utilization, controlling is less relevant in this regards. However, there are also indirect influences on both, e.g. that the amount of debt is an indicator for the default risk. Debt influences managerial behaviour and thus, could lead to a preference of creditors at expense of other stakeholders, focusing on the achievement of financial goals.
4	+ Years since foundation	Burnett & Hansen (2008); Sandino (2007); Soytas et al. (2019)	More established companies could be more profitable than young companies as they usually have a broader customer and asset base. Younger companies might be more agile in reacting to new developments and thus, can quickly integrate sustainability into internal processes.
	+ S-HUB member-ship (dummy)	Individual for our sample.	As S-HUB is a sustainability network, members could be more sustainability-oriented than non-members.

All the data, except for the S-HUB membership, was taken out of Orbis. For companies whose data regarding the number of employees or age was not available, research on their websites

and annual reports was conducted. Aligned with researchers as Henri and Journeault (2010), Eccles et al. (2014), Jermias and Setiawan (2008), Trumpp and Guenther (2017) or Perego and Hartmann (2009), we used the natural logarithm for the large-range control variables employees, total assets, revenues, and age to transform them into a more normalized dataset. Furthermore, control variables should not be highly correlated with the independent variable or other control variables as this can result in multicollinearity. This issue is analyzed in chapter 4.2.5.

4.2.3 Descriptive Statistics

Table 7 shows the descriptive statistics for the dependent, independent, and control variables included in this regression analysis. As described above, our sample consists of 166 companies. The total, formal and informal scores comprise a possible range from 0 to 100 and are assigned as described in 3.3. The table shows that the average informal score (63,16 with a 95% confidence interval of [60,99; 65,33]) exceeds the average formal score (48,54 with a 95% confidence interval of [46,78; 50,30]. However, this finding is not meaningful since there were substantially more questions regarding the integration of formal controls compared to informal controls.

Table 7: Descriptive Statistics

Statistic	N	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Total Score	166	51.47	11.05	26.67	85.00	0.38	0.13
Formal Score	166	48.54	11.56	23.85	83.75	0.47	0.19
Informal Score	166	63.16	14.27	20.00	95.00	-0.42	-0.09
ROA deviation	166	1.79	17.90	-59.93	90.03	0.75	5.97
ROE deviation	166	9.08	68.53	-325.56	276.23	-0.32	6.40
Employee number (ln)	166	5.16	2.27	0.69	10.35	0.03	-0.80
Revenues (ln)	166	13.27	3.43	0.00	20.50	-1.08	1.70
Total assets (ln)	166	13.94	3.39	5.19	21.79	-0.31	-0.18
Equity Ratio	166	0.36	0.23	0.01	0.99	0.72	-0.24
Age (ln)	166	3.16	0.85	1.39	5.35	0.35	0.54
S-HUB Membership	166	0.20	0.40	0.00	1.00	1.45	0.10

A variable's skewness indicates the lack of its distribution's symmetry (George & Mallery, 2018). While the informal score is slightly left-skewed (towards values lower than the mean), formal and total score are slightly right-skewed. A variable's kurtosis describes the amount of mass in the tails of its distribution and describes how much of the variance comes from extreme values (George & Mallery, 2018; Hair et al., 2010). All scores have a negative excess kurtosis

(= kurtosis - 3) value. This means their distributions have a thinner tail than a normal distribution, indicating outliers are rather infrequent. In literature, there are differing statements about the deviation values up to which a compliance with the normal distribution requirement can be assumed. However, many researchers accept a deviation range of -2/2 for the skewness and -7/7 for the excess kurtosis (Hair et al., 2010). Hence, kurtosis and skewness all lie clearly within the range in which a normal distribution can be assumed for S_T, S_F and S_{IF}.

Regarding the dependent variables, it is visible that the companies included in the analysis' sample perform in average slightly better than their respective industry median from a profitability perspective (mean > 0). Especially the ROE's minimum and maximum values are rather far apart. Additionally, the corresponding excess kurtosis points out that more of the independent variables' variances come from extreme values compared to a perfect normal distribution. Nevertheless, the kurtoses for both dependent variables are still in a range considered compliant with a normal distribution. Therefore, we did not adjust the values by a natural logarithm.

This master thesis focuses on the relationship between the depth of sustainability integration in MCS and financial performance. However, the correlation matrix depicted in Appendix 3 also provides information about the relationship between the control variables and the sustainability integration depth that has already been explained in 3.3. As a too high interrelationship can be critical, we control for multicollinearity in section 4.2.5.

4.2.4 Model Development

In order to test H1 – H3 and building on the considerations explained above, we developed several regression models. They all differ according to the dataset (total sample, good performers, bad performers), the independent variable (total, formal and informal score for control implementation) and the dependent variable (ROA, ROE). Additionally, we gradually added control variables (CV) in three steps as follows:

- Model 1: no CV
- Model 2: number of employees, revenues, total assets
- Model 3: equity margin
- Model 4: S-HUB membership, age

The following table explains what combinations of variables and dataset options were used to answer our research hypotheses:

Table 8: Composition of the different Regression Models for H1-H3

	Chapter	Dataset	Independent Variable (Sustainability Score)	Dependent Variables	Control Variables
H1	4.3.1	Whole sample	Total Score	ROA, ROE	Model 1-4
H2a	4.3.2	Whole sample	Formal Score	ROA, ROE	Model 1-4
H2b		Whole sample	Informal Score	ROA, ROE	Model 1-4
H3a	4.3.3	Good performers	Total Score	ROA, ROE	Model 1-4
H3b		Bad performers	Total Score	ROA, ROE	Model 1-4

We selected this approach to strengthen the results' robustness – on the one hand by considering two different profitability ratios as dependent variables, on the other hand by slowly adding control variables to identify which models have the highest quality for each dependent variable.

We accept a significant correlation and reject the null hypothesis if the correlation coefficient between the respective independent and dependent variable is significant at least on a 10% level. This must be the case in the two most informative models for both, ROA and ROE. The most informative models are the ones with the highest explanatory power (level of adjusted R^2), while each model itself must be significant at least on a 10% level. This is in line with many papers in the field of management accounting that accept p-values up to 10% to consider findings as significant (Bedford et al., 2016; Pondeville et al., 2013; Chenhall, 2005; Ittner et al., 2003).

4.2.5 Diagnostic Tests

Before conducting the linear regression, we examined if our data is suitable for this type of analysis. The ordinary least squares (OLS) method attempts to minimize the squared residuals, i.e. the squared differences between actual values and estimated values of the dependent variable. This section is organized according to the Gauss-Markov assumptions. If they are satisfied, OLS estimators are the best possible estimator in a linear regression model. In this sense, the assumptions can be considered a prerequisite for linear regression (Graybill, 1961; Poole & O'Farrell, 1971). The numerical test results for the following analyses are summarized in Appendix 5 for all regression models. The graphical analyses described in the following chapter were conducted for all the models, however, due to this thesis' capacity, we only inserted the graphical illustrations exemplarily for the H1 models (see Appendix 6).

Non-Collinearity

Multicollinearity describes a high correlation of two or more independent variables with each other. In this case, regression coefficients are biasedly estimated (Poole & O'Farrell, 1971; Stock & Watson, 2020). Multicollinearity can be tested by creating a correlation matrix. According to Studenmund (2014), correlation values above 0.8 are an indication of multicollinearity. As this was the case for total assets and revenues (see Appendix 3), we additionally performed 'variance inflation factor' tests. Literature suggests that values above 10 are an indication of multicollinearity (Chatterjee & Hadi, 2012), which is not the case in any of our models (see Appendix 5).

Normal Distribution of Residuals

The residuals of a linear regression must be approximately normally distributed since violation can lead to false standard errors, which in turn cause false test statistics, p-values, and hypotheses test results (Poole & O'Farrell, 1971; Stock & Watson, 2020). Interpretation of histograms as well as quantile-quantile (QQ) plots of the standardized residuals are gaited and reliable methods for testing and indicated that the requirements for a normal distribution are met (see Appendix 6). Additionally, skewness and kurtosis of the residual distribution were considered (Razali & Wah, 2011), confirming the assumption for most of the models. As thresholds are not met for H3a ROA models 1 and 2 (see Appendix 5), we will focus on models 3 and 4 to analyze the ROA of the good performers.

Homoscedasticity of Residuals

Heteroskedasticity is an increasing or decreasing dispersion of the residuals (Stock & Watson, 2020), causing that t-values and p-values are not reliably estimated and biased (Poole & O'Farrell, 1971). To test for homoscedasticity, scatter plots were analyzed (see Appendix 6), indicating heteroskedasticity for some of our models. This assumption was additionally confirmed by a Breusch-Pagan test (see Appendix 5).[6] However, heteroskedasticity can be remedied by using heteroskedasticity-robust estimators. This does not change the estimates themselves but has the effect that the standard errors are adjusted and thus neither the t-values nor the p-values are biased (Long & Ervin, 2000; Hayes, 2007).[7]

[6] A low p-value rejects H_0 of homoscedasticity and accepts the alternative hypothesis of heteroskedasticity (Wooldridge, 2009).
[7] In line with relevant literature (Cribari-Neto & Ferrari, 2005; Hayes, 2007), the estimation option HC3 was chosen.

Control for Influential Cases

Extreme outliers can be problematic since they influence the position of the regression lines and thus the coefficients (Chatterjee & Hadi, 2012). Based on the residuals, Cook's distance tests whether a case is an outlier with respect to the independent and dependent variable (Cook & Weisberg, 1982). The models' graphical representations of Cook's distances do neither show a case that differs extremely from the others nor one that has a Cook's distance of more than 1, what Cook and Weisberg (1982) consider as influential cases (see Appendix 6). In addition, we used a composite outlier score in R[8], which is a joint application of different outliers' detection algorithms (R documentation, 2023; Lüdecke et al., 2021). It would consider a case an outlier if it was classified as such by at least half of the algorithms used. However, this was not the case for any of our models (see Appendix 5).

Random Sample of Population

In this study, the explored population are Norwegian companies. Random sampling selects participants from a population so that each member (all Norwegian company) has an equal chance of being chosen. The researcher then collects data from as many members as possible to ensure a representative sample (Stock & Watson, 2020). Our sample was not selected by us but by S-HUB, who contacted companies of their extended environment for their survey. Being within or in the immediate vicinity of such a knowledge network can be seen as an indication that a company places significant importance on sustainability. It might suggest that the firm has already incorporated sustainability topics more extensively into its MCS. This would assert that the sample selection is biased to a certain extent. However, we find a quite high spectrum and standard deviation (between 11 and 14) for the integration scores (see table 7). In addition, we calculated the average Reuters/Refinitiv ESG rating of the 25 publicly listed companies in our sample. The average of 59.56 (range of 0 - 100) is below the European average of the STOXX 600 companies (= 66) (Refinitiv, 2021). Even though the sample selection could not be completely random, these findings indicate a low associated bias.

Exogeneity

The last assumption of linear regression is the non-existence of exogeneity, meaning that there is no correlation of an independent variable with the error term. This is especially relevant

[8] Including z-scores, interquartile range, Mahalanobis distance, robust Mahalanobis distance, minimum covariance determinant, invariant coordinate selection, OPTICS, isolation forest, and local outlier factor (R documentation, 2023).

when drawing causal inferences as it would lead to a biased treatment effect caused by omitted variables, simultaneity, or measurement error (Stock & Watson, 2020). When investigating the relationship between sustainability and financial performance, however, causality can hardly be addressed and there is common doubt about its direction (Soytas et al., 2019; Ittner et al., 2003; Trumpp & Guenther, 2017).

The underlying diagnostic tests showed that most of the requirements for linear regression are met. We found evidence of heteroskedasticity but were able to mitigate it by applying heteroskedasticity-robust estimators. However, our model quality might be influenced by a small selection bias as well as endogeneity effects. To investigate the latter in more detail, we distinguish between financially good and bad performers in H3a and H3b.

4.3 Findings

The following section explains the results of the regression analysis, which was conducted to answer RQ2. The findings are organized according to hypotheses 1 to 3.

4.3.1 Overall Integration Level (H1)

Table 9 displays the regression results for the ROA and ROE models. It includes the non-z-leveled (first line) and the z-leveled (second line) correlation coefficients for the total sustainability integration score as well as the z-values for all relevant control variables.

Among the models that include ROA as dependent variable, model 1 does not include any control variables and is thus a linear regression between the two constructs. The regression coefficient is significant, and the estimate indicates a weak negative connection. R^2 reveals that 5.12% of the ROA variance can be explained by the model. The coefficient of determination increases when control variables regarding the company size are included in model 2 and the overall significance stays on a 1% level. Adding more control variables does not add explanatory power (R^2) and the significance of models 3 and 4 decreases. Even if the model is still significant on a 10%-level when adding equity ratio, we conclude that model 2 is the best fitting one for ROA. Additionally, all models show a significant relationship between the total score and ROA. This confirms the robustness of the initial result and accordingly, a slightly negative link between the level of sustainability integration and the profitability for our sample. Looking at the non-z-leveled coefficient (first row), we can

interpret the strength of the relationship. Holding our control variables constant, a one-unit shift in the total score would lead to a ROA decrease by 0.3666 percentage points.

Table 9: H1 Regression Results

n = 166	Dependent Variable: ROA				Dependent Variable: ROE			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Total Sus. Score (β)	-0.3666**	-0.3305**	-0.2097 .	-0.2135 .	-0.7937 .	-0.8370 .	-0.9614 .	-0.9611 .
Z Values								
Total Score	-0.2262**	-0.2039**	-0.1294 .	-0.1318 .	-0.1280 .	-0.1349 .	-0.1550 .	-0.1550 .
Employee no. (ln)		0.0073	0.0105	0.0018		0.1499	0.1550	0.1595
Revenues (ln)		0.3376	0.4158 .	0.3253 .		0.1720	0.1433	0.1440
Total assets (ln)		-0.2458	-0.2682 .	-0.2965		-0.1219	-0.1184	-0.1057
Equity Ratio			0.0722	0.0732			-0.0826	-0.0823
Age (ln)				0.0446				-0.0387
S-HUB Membership				0.0018				0.0405
R^2	0.0512	0.0897	0.0646	0.0661	0.0164	0.0609	0.0704	0.0728
Adj. R^2	0.0454	0.0671	0.0342	0.0231	0.0104	0.0376	0.0403	0.0301
F statistic	8.847**	3.968**	2.128 .	1.537	2.730	2.612*	2.334*	1.704
Note:					. < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001			

When repeating this procedure with ROE as dependent variable, only models 2 and 3 are significant. Model 2, only including size control variables, shows a negative relationship on a 10% significance level. Adding the equity ratio enhances the explanatory power slightly. Hence, in contrast to the ROA models, adding the equity ratio has a strengthening effect and model 3 is the best fitting one. This is reasonable since the effects of equity ratio on ROE are expected to be more direct and stronger than for ROA, even if they are not significant (see table 6). Age and S-HUB membership (added in model 4), on the other hand, seem to be irrelevant control variables as for ROA. Including them has the consequence that the model quality and significance decreases. The analyzed relationship is significant and negative for all significant models but only on a 10% level. The non-z-leveled coefficient is much stronger than for ROA, which can be attributed to the larger span and standard deviation of ROE (see table 7). The z-leveled value hence shows a slightly weaker relationship compared to ROA. Arriving at a similar result for a different measure of profitability increases the robustness of the detected correlation.

Models 1 and 2 for the ROA as well as models 2 and 3 for the ROE show a significant negative relationship, while being significant themselves and presenting the highest explanatory power. Considering the requirements for accepting hypotheses defined in 4.2.4, this allows us to accept hypothesis 1: there is a significant correlation between a firm's sustainability integration level into its MCS and its financial performance, which is moderately negative.

This is in line with parts of the reviewed literature that argue in favor of a trade-off, agency-cost or managerial-constrain perspective. However, we only analyze a direct and short-term relation and there could be an indirect effect, for instance via the environmental performance, or differing results in the long-term. Drivers of this relationship and potential underlying reasons for its negativity are discussed more comprehensively in section 5.1.2.

4.3.2 Formal and Informal Integration Level (H2a, H2b)

To analyze whether the relationship changes when considering the integration depth of formal and informal controls in isolation, we repeated the foregoing regression after replacing the total score by the formal and informal score, respectively.

Table 10: H2a Regression Results

n = 166	Dependent Variable: ROA				Dependent Variable: ROE			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Formal Sus. Score (β)	-0.3416**	-0.3193**	-0.1984*	-0.2024*	-0.6773 .	-0.7761 .	-0.8952	-0.8894*
Z Values								
Formal Score	-0.2207**	-0.3217**	-0.1281*	-0.1307*	-0.1143 .	-0.1310 .	-0.1511*	-0.1501 .
Employee no. (ln)		0.0105	0.0114	0.0027		0.1511	0.1556	0.1601
Revenues (ln)		0.3460 .	0.3238 .	0.3330 .		0.1792	0.1534	0.1539
Total assets (ln)		-0.2474	-0.2708 .	-0.2991		-0.1245	-0.1222	-0.1095
Equity Ratio			0.0739	0.0749			-0.0806	-0.0803
Age (ln)				0.0455				-0.0379
S-HUB Membership				-0.0004				0.0379
R^2	0.0487	0.0904	0.0641	0.0656	0.0131	0.0598	0.0692	0.0713
Adj. R^2	0.0429	0.0678	0.0337	0.2260	0.0070	0.0365	0.0390	0.0286
F statistic	8.395**	4.001**	2.110 .	1.525	2.170	2.562*	2.289*	1.668
Note:					. < 0.1; ∗ p < 0.05; ∗∗ p < 0.01; ∗∗∗ p < 0.001			

Table 10 provides an overview of the key results for the formal score and the overall picture is similar to the total score. The formal score is significant in ROA model 1, again indicating a slightly negative relation. The model quality (R^2 and overall significance) increases by controlling for size (model 2) and decreases when adding equity ratio, age, and S-HUB membership. While model 2 is the most informative, the negative relationship between formal score and ROA is also significant on a 10% level in model 3 including equity ratio. Regarding the strength of the relationship, the correlation coefficients are in general slightly weaker compared to the total score results. In model 2, a one-unit shift in the formal score would lead to a ROA decrease by 0.3193 percentage points.

The ROE confirms a significant negative correlation if controlled for size only, as well as for size and equity ratio. Again, the strengths of the correlations are slightly lower than for the

total score. Overall, however, the results are very similar, which is among others because the score consists largely of the formal score. Again, we applied the requirements to accept hypotheses defined in 4.2.4: given the significant results for the ROA models 1 and 2 and the ROE models 2 and 3, there is a significant negative relationship between a firm's sustainability integration level into formal controls and its profitability and we can accept hypothesis 2a.

Table 11: H2b Regression Results

n = 166	Dependent Variable: ROA				Dependent Variable: ROE			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Informal Sus. Score (β)	-0.2015 .	-0.1543	-0.1081	-0.1091	-0.6000	-0.4748	-0.5321	-0.5450
Z Values								
Informal Score	-0.1605 .	-0.1230	-0.861	-0.869	-0.1249	-0.0988	-0.1108	-0.1134
Employee no. (ln)		-0.0181	-0.0029	-0.0104		0.1341	0.1394	0.1457
Revenues (ln)		0.3611 .	0.3223 .	0.3307 .		0.1815	0.1481	0.1464
Total assets (ln)		-0.2781 .	-0.2866 .	-0.3110 .		-0.1395	-0.1386	-0.1202
Equity Ratio			0.0699	0.0708			-0.0858	-0.0857
Age (ln)				0.0369				-0.0475
S-HUB Membership				0.0030				0.0428
R^2	0.0257	0.0647	0.0549	0.0560	0.0156	0.0530	0.0606	0.0636
Adj. R^2	0.0198	0.0415	0.0242	0.0125	0.0096	0.0295	0.0301	0.0205
F statistic	4.337*	2.786*	1.790	1.287	2.598	2.254 .	1.988 .	1.475
Note:					. < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001			

Table 11 summarizes the equal figures for the informal score. For ROA, models 1 and 2 are significant. The regression coefficient is only significant on a 10% level in model 1, which besides has a low explanatory power of 2%. For ROE, the coefficient of regression is not significant in any of the models. This prohibits further interpretations and reveals that our models are not robust. Accordingly, we cannot reject H0 and therefore assume that there is no significant short-term relationship between the firms' sustainability integration level into informal controls and their profitability.

The analysis thus shows that sustainability integration into formal controls is associated with poorer financial performance in the short term, while there is no detectable relationship between integration into informal controls and financial performance. This might stem from the composition of the informal score since we could include less elements to measure informal controls as the relevant survey questions were limited. However, our results could also indicate that negative trade-off, agency-cost or managerial-constrain effects found in H1 are stronger connected to the sustainability integration into formal than into informal controls. Further interpretation and discussion are provided in chapter 5.1.

4.3.3 Differentiation according to Financial Performance (H3a, H3b)

H3a and H3b are examined to find out whether financial performance itself is an influencing variable on the relationship under investigation. This is especially important as our literature review (4.1) showed that endogeneity and reciprocal relationships are relevant in the given field of research. As explained earlier, we divided our sample into above and below industry median performers in relation to ROA. Now we assess if the correlation coefficients differ among them.

The results for good performers (H3a) are shown in table 12 and for bad performers (H3b) in table 13. They indicate that for the ROA as well as the ROE the direction of coefficients does not differ between financially good and bad performers. The findings are negative as they are for the entire sample (H1).

Table 12: H3a Regression Results

Good Performers	Dependent Variable: ROA				Dependent Variable: ROE			
n = 86	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Total Sus. Score (β)	-0.4966*	-0.3775*	-0.2445 .	-0.2373 .	-0.7048	-0.4957	-0.8463 .	-0.8082
Z Values								
Total Score	-0.3064*	-0.2329*	-0.1509 .	-0.1465 .	-0.1136	-0.0799	-0.1364 .	-0.1303
Employee no. (ln)		-0.1132	-0.0500	-0.0298		0.0449	-0.0101	-0.0242
Revenues (ln)		0.3372	0.2667	0.2232		0.2649	-0.0408	-0.0624
Total assets (ln)		-0.4313 .	-0.4465 .	-0.4103		-0.3603 .	-0.1131	-0.1196
Equity Ratio			0.0765	0.0690			-0.5011***	-0.5169***
Age (ln)				-0.0046				0.0829
S-HUB Membership				-0.0665				-0.0687
R^2	0.1024	0.1847	0.1959	0.2045	0.0148	0.0604	0.2937	0.3042
Adj. R^2	0.0917	0.1444	0.1443	0.1312	0.0031	0.0140	0.2484	0.2401
F statistic	9.58**	4.586**	3.800**	2.791*	1.264	1.302	6.486***	4.747***
Note:					. < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001			

We cannot accept H3a (positive relationship) for the good performers due to the negative coefficients. Nevertheless, we still analyze the results in detail. In contrast to the H1 analysis, models 2 and 3 are the most informative for ROA (instead of models 1 and 2 for H1). As models 1 and 2 were found to not meet the requirements of normally distributed residuals, we will focus on models 3 and 4. The explanatory powers of these models are above 13% and hence higher than for the entire sample in H1. Furthermore, they show a significant negative relationship. However, for ROE we only find one model that describes a significant relationship on a 10% level (model 3). It should also be emphasized that the correlation coefficient for the control variable equity ratio becomes very strong and highly significant for

model 3 and 4, which was not the case for all other hypotheses' models. The difference is that only companies with positive ROA, and thus positive ROE, are considered, as they are all above the consistently positive industry medians. This could strengthen the clarity of the equity ratio effect. In contrast, all other regressions include a mix of companies with positive and negative returns, on which a change in equity ratio might have multilayered effects. Our models continue to indicate a negative relationship, also for the sub-sample of good performers. Nevertheless, it appears to be not perfectly robust, causing ambiguity about the actual presence of a significant relationship. In any case, H3a, which suggests a positive relationship, cannot be accepted.

As for the good performers, ROA models 2 and 3 are the most informative for the sample of bad performers in H3b (R^2 of 10% respectively 6%). They show a significant negative relationship on a 1% respectively 5% level. This is confirmed by the ROE models 2 – 4 that are all significant and additionally show a significant negative correlation coefficient. Based on ROA models 2 and 3 as well as ROE models 3 and 4, we can deduce a significantly negative short-term relationship between sustainability integration depth and financial performance for firms that perform below the industry median.

Table 13: H3b Regression Results

Bad Performers	Dependent Variable: ROA				Dependent Variable: ROE			
n = 80	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Total Sus. Score (β)	-0.2283*	-0.2540**	-0.2359*	-0.2518*	-0.7174	-0.9497 .	-1.2400*	-1.2385*
Z Values								
Total Score	-0.1409*	-0.1567**	-0.1456*	-0.1554*	-0.1157	-0.1531 .	-0.1999*	-0.1997*
Employee no. (ln)		0.0109	0.0166	0.0081		0.1213	0.1204	0.1298
Revenues (ln)		0.0659	0.0275	0.0421		-0.1353	-0.1367	-0.1366
Total assets (ln)		0.1391	0.1451	0.0794		0.2766	0.3630	0.3551
Equity Ratio			-0.0574	-0.0514			0.0647	0.0650
Age (ln)				0.1073				-0.0139
S-HUB Membership				-0.0210				0.0603
R^2	0.0488	0.1450	0.1237	0.1433	0.0195	0.1202	0.1652	0.1699
Adj. R^2	0.0366	0.0994	0.0611	0.0551	0.0069	0.0733	0.1056	0.0845
F statistic	4.004*	3.179*	1.976 .	1.624	1.549	2.561*	2.771*	1.989 .
Note:								. < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001

In conclusion and without the possibility of including long-term data, we can deduct from our regression analysis that there seems to be an overall negative correlation between a firm's depth of sustainability integration into MCS, particularly into formal controls and for financially poorly performing companies.

5. Implications

5.1 Interpretation and Discussion

5.1.1 Research Question 1

In the first part of our thesis, we have compiled how sustainability integration into MCS can be assessed and how it is implemented in Norwegian companies (RQ1). In the following, we discuss and interpret the four main outcomes of our analysis and underline this thesis' contribution to research. These outcomes include insights about which controls for sustainability are in place in our sample (1) and how the use of formal and informal controls interplay (2). Additionally, we contribute to current literature by developing patterns on how controls can be combined to assess sustainability integration (3) and by developing a score on how the depth of integration can be measured for quantitative analyses (4).

First, we gained insights into which of the controls according to Malmi & Brown (2008) are in place within our sample for implementing sustainability. Long-range planning is the most frequently used control, so the analyzed companies particularly focus on setting long-term goals. However, it is striking that in many companies these are not translated into short-term plans and goals (action planning) or measured in concrete terms (cybernetics). Integration into the reward and compensation system, which actively influences managers' decisions, has hardly taken place in our sample. First, this supports our impression that companies implement sustainability especially non-quantified and in relation to external perception, as described at the beginning of this thesis. Furthermore, the result is remarkable since the focus in literature is especially on cybernetic controls, which is still implemented to a rather low degree in our sample (64 out of 166 companies). Another insight is that sustainability has been integrated into informal controls by only 30% of the companies. Especially older and larger companies rather make use of formal controls as shown in the correlation matrix. Altogether, the use of a large variety of controls is quite limited and especially cultural controls are not well established.

Secondly, we found variations in the interplay between the use of formal and informal controls. While Crutzen et al. (2017) suggest that companies focus on either formal or informal approaches, our results indicate that the use of these approaches is mutually reinforcing. However, this enhancement of informal and formal controls is also actuated by other literature

(Durden, 2008; Ferreira & Otley, 2009). We deduce that it makes sense to combine these controls and that their interplay is meaningful. On the one hand, the corporate culture cannot replace formal control systems. On the other hand, cultural controls are important for reducing the resistance of managers and for motivating them. At this point, a referral to Simons' LOC is again appropriate, which underlines that a suitable balance of an enabling and restricting use of MCS is necessary for financial success.

The third contribution of our analysis regarding RQ1 is the development of new patterns describing how sustainability is integrated into companies' formal and informal controls. The study by Crutzen et al. (2017) suggests that controls build on each other in a certain way, using a small sample and qualitative research approaches. We found that with a larger sample of 166 companies and data collection through a survey, this can no longer be confirmed. Controls are linked in different ways and MCS follow the modular and dynamic character that is foreseen in Malmi & Brown's 'MCS as a package' concept. Not every company that has integrated sustainability into rewards and compensation, for example, does the same for cybernetic controls, long-range and action planning. As our results from a larger sample suggest a more flexible construct, we have formed sustainability integration patterns depending on the number of controls implemented. Our analysis results in the fact that the most common patterns do not include high levels of informal or formal controls. Consequently, there is still room for a deeper sustainability integration, also among quite sustainable companies.

One of our main contributions is the creation of a sustainability integration measure, based on the survey questions defined for the pattern development. We developed a formal, an informal and a total score (0-100) that assess the sustainability integration depth in MCS. They contribute to the current state of research since they can be used as a measurement tool for further quantitative analyses. The scores enable researchers to conduct comparative analyses, e.g. between organizations or time periods, and are thus especially helpful in the long-run. They can serve as variables in regression analyses, as in our thesis, however, not only in conjunction with financial performance but with sustainability performance or corporate innovativeness as well.

Lastly, the findings from research question 1 also suggest key insights for practitioners: we discovered that there is still room for a deeper integration of sustainability practices into MCS. Especially the utilization of cultural controls remains limited, although being considered particularly effective.

5.1.2 Research Question 2

In this second part, we examined if there is a relationship between the integration depth of sustainability in MCS and the financial performance (RQ2). There are contradictory results in literature about whether a (direct) relationship exists and how it manifests. Research indicates increased costs due to the integration versus cost savings due to a higher efficiency, different financial links in the short- and long-run as well as tensions between the enhancement of managerial decision-making and the restriction of managers. An indirect influence via an improved sustainability performance was detected regularly. Due to these different perceptions, we did not formulate a positive or negative direction. However, our regression analysis points out a significant negative relation between the constructs of integration depth and the profitability of our sample companies. To further investigate a potentially differing effectiveness of formal and informal controls, we broke down our independent variable into a formal and an informal score. Again, we found a negative relation for the formal score, as hypothesized, but no significantly positive or negative one for the informal score. Besides, we subdivided our sample into financially good and bad performers to address different directions of effect in reference to potential reverse causality issues and the slack-resources hypothesis. The results confirm a negative relationship for the bad performers but there is a lack of significance for the good performers. There are several possible explanations for the observed results, leading to different insights and implications.

Firstly, management controls are supposed to guide managerial decision-making. Formalizing them in MCS can therefore lead to an alignment with the overall company goals but also to a restriction of managers, which amplifies if they are extended by controls for sustainability. Consequently, managers must incorporate economical as well as sustainability considerations into their decisions, which are often contradictory. If sustainability is internalized and becomes a priority, this can lead to decisions that are not favoring the economic goals of the organization and thus are not connected to the optimum financial performance. Moreover, it could be more efficient to not integrate all different types of controls but to focus on the most relevant ones for the specific organization. Referring to cybernetic controls, it is complex to measure and quantify sustainability indicators. If managers are rewarded based on the sustainability performance, there can be issues with the controllability and the understandability of the measures. Therefore, a too formal approach can take away the intrinsic motivation of managers to act in a socially responsible manner and might rather lead to

managerial constraints, explaining the significant negative results for the formal score. It is besides an indication that informal controls could be slightly more effective in a sustainability setting, although they are used less in our sample.

In terms of statistical influences, we can refer to reverse causality and the law of small numbers. As the overall correlation is negative and we could not accept hypothesis 3a, there is no indication for reverse causality issues in our sample. There does not seem to be a difference in the direction of the relationship between the sustainability integration depth of financially well and bad performing companies. The assumption that well performing companies can thus afford investing into sustainability integration, and do so, does not hold here. However, we cannot draw any conclusion referring to causality, so the relation could still be reciprocal. An indirect relationship can also be discussed. Research suggests that the integration of sustainability into MCS leads to an improvement of environmental performance. Nevertheless, there are tradeoffs between environmental and financial performance and an improvement of the environmental performance does not have to translate into an enhanced financial performance. This refers to the non-existence of a 'win-win paradigm'. Another reason for the negative results could be that only a few of our sample companies have a high score regarding the control implementation. The group with the deepest integration is hence quite small and not entirely representative. Due to the law of small numbers, this could lead to a low financial performance for this integration level, which does not indicate that this holds generally.

Most importantly, our study deals with a short-term nature. The transformation of MCS towards sustainability is costly and it takes time until they develop their effects. Thus, short-term relationships could be especially influenced by costs of implementation and control. Especially informal controls, which imply a cultural change, take time to become part of the corporate actors' mindsets. We cannot make profound statements about the correlation in the long-term. However, many studies that suggest a positive link between sustainability and financial performance found that it especially occurs in the long run, leading to the assumption that the results could differ for a panel data analysis. The integration of sustainability into MCS can lead to lower risk and a deeper stakeholder engagement in the long run. Moreover, MCS are a proactive tool, which compared to reactive actions rather lead to a positive long-term relation (Hang et al., 2019).

By elaborating on research question 2, we fill a gap by assessing the relationship between a firm's sustainability integration into MCS and its financial performance. Since the research focus often lies on the external perspective of sustainability performance (e.g. ESG reporting) and financial performance, the relationship assessed in this thesis has only been addressed little by now. Relevant quantitative studies often made use of self-assessed instead of archival financial data, focusing on single controls or just including the ecological perspective of sustainability. Our analysis, however, includes archival financial data and is based on MCS as a package, being a holistic approach. The result of our analysis, namely a negative short-term relationship between integration depth and financial performance, represents a new insight in the context of the chosen research design.

Additionally, the findings from RQ2 suggest several key insights for practitioners: our analyses showed that an overly formal approach to sustainability integration into MCS can diminish intrinsic motivations and lead to managerial constraints, which might have negative financial effects. This not only makes the use of informal controls particularly important, but also the controllability and understandability of formal control measures. To achieve financial success, practitioners should strive for a balanced approach to MCS by combining enabling and restricting controls. By considering these insights, practitioners can enhance their understanding of sustainability in MCS and develop more effective management practices within their organizations.

5.2 Limitations and Further Areas of Research

This thesis is subject to several limitations, which are presented in the following.

At first, we only consider the status quo of sustainability integration and the financial performance of one fiscal year. Therefore, it is only a snapshot of the overall relationship, and we can solely determine short-term effects. This is due to data availability issues: the surveys of S-HUB of former years have different sample sizes, include different companies, and covered different questions. Thus, a comparison of the development of sustainability internalization over time was not possible. In addition, accounting ratios reflect the historical performance of companies (Peloza, 2009) but market measures were not available due to the high number of private companies, and the pandemic heavily influenced the 2020 KPIs. Consequently, from a sustainability integration as well as from a financial perspective, the use of panel data would have been little meaningful. Future research could address this issue by

analyzing how the integration of sustainability into MCS changes among the sample companies over time and by again relating this to the financial performance, over a longer time horizon. In this regard, we would recommend S-HUB to stick to the same survey questions and the same companies in the upcoming years in order to generate meaningful comparisons over time.

In addition, we matched sustainability data from 2022 with financial data from 2021 since the numbers of 2022 were not yet available for most of the companies. As the implementation of sustainability in MCS is expected to fully establish after some time, the general link between these two constructs can be investigated but no statements about a cause-effect relationship or the direction of effect can be made. Thus, further research on the causality and on the reciprocal effects would be insightful.

Moreover, the analyzed sample consists of 166 companies, which are all located in Norway. They represent a cross-section of industries, but no randomization was performed, so a sampling bias cannot be ruled out. Norway is expected to be a quite advanced country regarding sustainability issues. Additionally, companies being connected to S-HUB and answering their survey might be more sustainable than the average firm. It would be interesting to repeat the analysis with a larger and more diversified sample or a sample that contains companies from an entirely different region, like Asian countries, as the studied literature in general focuses on Europe and North America.

Finally, sustainability is a “vague concept” (Wijethilake et al., 2018, p. 1156) and the measurement of this variable varies extremely among researchers (Peloza, 2009), reducing the comparability of our study. The sample companies self-assessed their state of sustainability and internal actors might be biased. Besides, the survey questions were not explicitly designed according to our research approach. The goal was to present the state of sustainability in Norwegian companies referring to sustainability practices and strategies, but the questions not explicitly targeted the integration into MCS. Future researchers could design a survey that specifically addresses the depth of the usage of particular controls and match it with externally evaluated data to confirm the assessment. Besides, further insights into the effectiveness of different controls regarding the sustainability performance of organizations would be valuable.

5.3 Conclusion

There is no question that sustainable development is one of the greatest challenges facing today's societies and thus one of the central issues for every business. There are various approaches to integrate this into operations, with some companies focusing on simply meeting basic legal requirements (introverted strategies) or limiting sustainability to external communications, making green-washing a common practice (extroverted strategies). The motivation of this work is to overcome the focus on this external perspective. We aimed to analyze whether firms' words are put into action and if they align decision making with sustainability goals. Since decision making is anchored in management control, we wanted to investigate the sustainability integration in MCS.

On the one hand, we looked at how this integration can be assessed and how it is implemented (RQ1) in our sample of 166 Norwegian companies that took part in a 'state of sustainability' survey by S-HUB Norway. Based on their answers and on Malmi & Brown's 'MCS as a package', we formed patterns for sustainability integration assessment and created a score for sustainability integration measurement. Both consider the complex and diverse interplay of controls and are thus more flexible than concepts available in current literature. The analyses have shown that sustainability has been only moderately integrated into MCS in our sample companies, which focus especially on a long-range planning perspective.

On the other hand, and due to the ongoing tension between sustainability and profitability in science and practice, we analyzed whether there is a relationship between the depth of integration and economic success (RQ2). Therefore, we combined sustainability data with archival financial data. The regression analysis suggests a negative relationship in the short-term, in particular for formal controls as well as for the subgroup of financially bad performers. The observed phenomenon may be attributed to a potential restriction effect on managers. This effect occurs when there is an excessive number of sustainability controls, particularly those that are formal or not aligned with the specific needs of the organization. The short-term nature of our study is considered another main explanation for a negative relationship and represents the main limitation of this thesis. On the other hand, positive effects of a MCS transformation towards sustainability are expected to rather occur in the long-term, while the short-term relationship is influenced by costs of implementation and control.

All in all, despite finding negative relationships in the short run, we do not conclude that an integration of sustainability into MCS cannot be recommended to companies. Even if there is a slightly negative link to financial performance, this might change in the long run. Furthermore, it is inevitable to become more sustainable in the future since sustainability will gain even more importance: the younger generation is sensitized to sustainability, inducing an increased stakeholder pressure, and especially the extension of legislation will oblige companies to implement activities and comply with certain requirements. Therefore, companies that did not internalize and hence prepared their internal processes for sustainability yet might have competitive disadvantages in the future. An implication for policy makers would be to recognize and address the trade-off between sustainability and financial performance by giving more economical incentives to internalize sustainability.

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Appendix

Appendix 1: Relevant Survey Questions

No.	Label	Question	Response	Control
4a		Does your company have an incentive- or bonus system linked to sustainability impacts for the following groups?		
	BONUS_Board	Board of Directors	***	Reward & Comp,
	BONUS_CXO	Executive Management (CXOs)	***	Reward & Comp,
	BONUS_MidMan	Middle Management	***	Reward & Comp,
	BONUS_EntOrg	Entire Organization	***	Reward & Comp,
2b		To what extent is sustainability fully integrated in the strategies of the following functions / departments?		
	INT_MarkComm	Marketing/Branding/Communications	*	LR planning
	INT_Sales	Sales	*	LR planning
	INT_Op	Operations	*	LR planning
	INT_Innov	Innovation, Research and Development	*	LR planning
	INT_SuppCh	Purchasing and Supply Chain	*	LR planning
	INT_HR	HR, Employee Development and Recruitment	*	LR planning
	INT_Tech	IT, Technology, Digitalization, Data	*	LR planning
	INT_AccFin	Accounting and Finance	*	LR planning
5c		Are the following internal factors barriers to your company's sustainability performance and intended impact?		
	Intern_Culture	Overall company culture and/or lack of sustainability mindset	**	Culture
5b	Intern_ExecSup	Lack of Executive Support (Board/C-Suite)	**	Culture
3c	Intern_Trans	Lack of real strategic transformation (ambition, but too little action)	**	Action planning
2c	INV_Opp	My company will increase our investments in new opportunities within sustainability/ESG in the upcoming 3-5 years.	**	LR planning
	INV_RDI	My company will increase our investments in sustainability innovations / R&D in the upcoming 3-5 years.	**	LR planning
	INV_Res	My company will increase our investments in internal resources dedicated to sustainability in the upcoming 3-5 years.	**	LR planning
5a	MAN_COMMIT	To what extent is the entire executive management team committed to sustainability?	*	Culture
5d	SHENG_Empl	The following stakeholders are more engaged as a result of our sustainability focus. Employees	**	Culture
2a	SO_Strat	Sustainability is integrated as a part of the company's purpose and core strategy	**	LR planning
1a	SROI	To what extent does the company measure the Return on Investment (ROI) of sustainability efforts?	*	Cybernetic
1b	SUS_Control	To what extent is sustainable business performance a part of the organization's quarterly / monthly reviews and business control systems?	*	Cybernetic
3b		During the past three years, to what extent has your company engaged in the following activities with external actors in your task environment? (Task environment refers to the environment your company operates in, and such actors include customers, suppliers, competitors and other companies in your industry)		
	SusCOLL_Task3	Conducting joint planning to anticipate and resolve sustainability-related problems	*	Action planning
	SusCOLL_Task5	Making joint decisions about ways to improve the sustainability of our products/services	*	Action planning
	SusCOLL_Task6	Joint sustainability-oriented innovation	*	Action planning
3a		During the past three years, to what extent have your company's sustainability efforts involved developing the following?		
	SUSINN_Prod1	New or improved goods and products	*	Action planning
	SUSINN_Prod2	New or improved services	*	Action planning
	SUSINN_Proc1	New or improved internal / operational processes	*	Action planning
	SUSINN_Proc2	New or improved business practices / business model	*	Action planning
	*	Scale: 1 = Very low extent, 2 = Low extent, 3 = Neither, 4 = High extent, 5 = Very high extent, 6 = I don't know		
	**	Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neither, 4 = Agree, 5 = Strongly agree, 6 = I don't know		
	***	Yes / No / I don't know		

Appendix 2: Descriptive Statistics for the Survey Results

No.	Statistic	N	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
2b	INT_AccFin	166.00	3.46	1.15	1.00	6.00	0.25	0.16
	INT_HR	166.00	3.86	1.08	1.00	6.00	-0.08	0.39
	INT_Innov	166.00	4.25	1.10	1.00	6.00	-0.29	-0.19
	INT_MarkComm	166.00	3.97	1.04	1.00	6.00	-0.34	0.14
	INT_Op	166.00	3.79	1.05	1.00	6.00	0.08	0.10
	INT_Sales	166.00	3.87	1.24	1.00	6.00	-0.04	-0.35
	INT_SuppCh	166.00	3.92	1.11	1.00	6.00	-0.12	0.07
	INT_Tech	166.00	3.61	1.21	1.00	6.00	0.26	-0.15
5c	Intern_Culture	166.00	2.80	1.08	1.00	6.00	0.38	-0.49
5b	Intern_ExecSup	166.00	2.60	1.14	1.00	6.00	0.97	0.82
3c	Intern_Trans	166.00	3.19	1.17	1.00	6.00	-0.06	-0.83
2c	INV_Opp	166.00	4.47	0.79	1.00	6.00	-0.46	1.65
	INV_RDI	166.00	4.27	0.99	1.00	6.00	-0.69	1.3
	INV_Res	166.00	4.26	1.06	1.00	6.00	-0.51	0.83
5a	MAN_COMMIT	166.00	3.93	0.91	1.00	6.00	-0.68	0.76
5d	SHENG_Empl	166.00	4.09	0.73	2.00	6.00	-0.44	0.32
2a	SO_Strat	166.00	4.28	0.87	1.00	5.00	-1.51	2.64
1a	SROI	166.00	2.33	1.04	1.00	5.00	0.33	-0.77
1b	SUS_Control	166.00	2.85	1.23	1.00	5.00	-0.05	-1.18
3b	SusCOLL_Task3	166.00	3.44	0.92	1.00	5.00	-0.67	-0.16
	SusCOLL_Task5	166.00	3.29	0.92	1.00	5.00	-0.44	-0.19
	SusCOLL_Task6	166.00	3.39	0.99	1.00	5.00	-0.58	-0.31
3a	SUSINN_Proc1	166.00	3.81	0.97	1.00	6.00	-0.27	0.12
	SUSINN_Proc2	166.00	3.75	1.05	1.00	6.00	-0.29	0.21
	SUSINN_Prod1	166.00	4.39	1.08	1.00	6.00	-0.40	0.30
	SUSINN_Prod2	166.00	4.13	1.06	2.00	6.00	-0.08	-0.57

Appendix 3:
Correlation Matrix

	Total Score	Formal Score	Informal Score	ROA deviation	ROE deviation	Employee number (ln)	Revenues (ln)	Total assets (ln)	Equity Ratio	Age (ln)	S-HUB Membership
N	166	166	166	166	166	166	166	166	166	166	166
Mean	51.47	48.54	63.16	1.79	9.08	5.16	13.27	13.94	0.36	3.16	0.20
Std. Dev.	11.05	11.56	14.27	17.90	68.53	2.27	3.43	3.39	0.23	0.85	0.40
Min	26.67	23.85	20.00	-59.93	-325.56	0.69	0.00	5.19	0.01	1.39	0.00
Max	85.00	83.75	95.00	90.03	276.23	10.35	20.50	21.79	0.99	5.35	1.00
Skewness	0.38	0.47	-0.42	0.75	-0.32	0.03	-1.08	-0.31	0.72	0.35	1.45
Kurtosis	0.13	0.19	-0.09	5.97	6.40	-0.80	1.70	-0.18	-0.24	0.54	0.10
Total Score											
Formal Score	0.98***										
Informal Score	0.71***	0.54***									
ROA deviation	-0.23**	-0.22**	-0.16*								
ROE deviation	-0.13	-0.11	-0.12	0.67***							
Employee number (ln)	0.12	0.16*	-0.05	0.06	0.17*						
Revenues (ln)	0.03	0.08	-0.13 .	0.13 .	0.18*	0.75***					
Total assets (ln)	0.13 .	0.17*	-0.03	0.01	0.11	0.72***	0.82***				
Equity Ratio	-0.02	-0.02	0.01	0.03	-0.13 .	-0.22**	-0.35***	-0.24***			
Age (ln)	0.13 .	0.16*	0.01	0.02	0.04	0.50***	0.46***	0.60***	-0.14 .		
S-HUB Membership	0.06	0.06	0.06	-0.01	0.04	0.12	0.08	0.17*	-0.04	0.14 .	

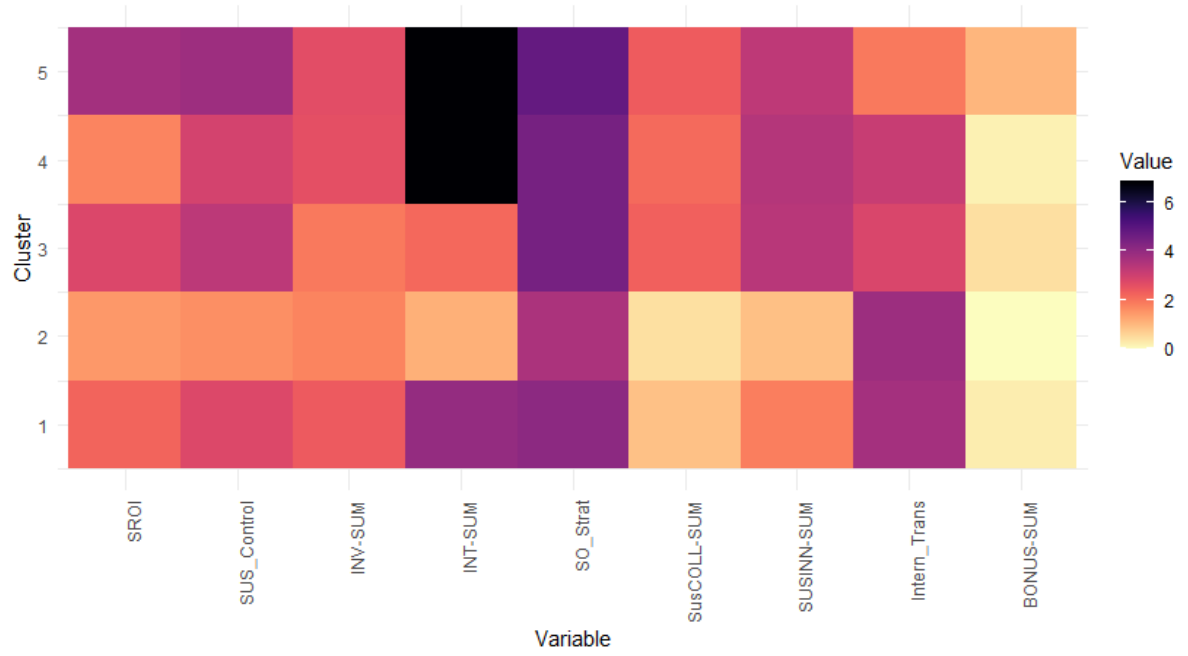
Note: . < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001

Appendix 4: K-means Clustering

We conducted a k-means clustering to validate our finding, that in our sample formal controls do not build on each other as described by Crutzen et al. (2017). Therefore, we included the relevant survey questions described in 3.1.2 and Appendix 1. In addition, however, some questions were grouped together because clustering with yes / no answers (BONUS questions) or a large selection (INT questions) was too granular (see table on the right). In most cases, a higher value means a deeper integration of sustainability in the respective control. The only exception is the SO_Strat responses, where a lower value indicates a deeper integration.

From the eight summarized answer groups, the machine learning algorithm was designed to create five clusters that are shown on the heatmap below.

Survey Questions	Group for Cluster Analysis	Control
SROI	SROI	Cybernetic
SUS_Control	SUS_Control	
INV_Opp INV_RDI INV_Res	INV-SUM	Long range planning
INT_MarkComm INT_Sales INT_Op INT_Innov INT_SuppCh INT_HR INT_Tech INT_AccFin	INT-SUM (Count how many answers were answered with > 3)	
SO_Strat	SO_Strat	
SusCOLL_Task3 SusCOLL_Task5 SusCOLL_Task6	SusCOLL-SUM (Count how many answers were answered with > 3)	Action planning
SUSINN_Prod1 SUSINN_Prod2 SUSINN_Proc1 SUSINN_Proc2	SUSINN-SUM (Count how many answers were answered with > 3)	
Intern_Trans	Intern_Trans	
BONUS_Board BONUS_CXO BONUS_MidMan BONUS_EntOrg	BONUS-SUM (Count how many answers were answered with yes)	Rewards & Compensation



At first glance, cluster 5 represents the companies that have integrated sustainability the deepest. For all question groups the values are highest (darkest) and for SO_Strat lowest (lightest). In contrast, cluster 2 represents the companies that have integrated sustainability least strongly and contains the lightest areas (except for SO_Strat). This underscores our classification analysis: by no means have all companies implemented sustainability in cybernetic controls to deep degrees (esp. clusters 2 and 4). This deviates from Crutzen et al.'s framework (2017). Instead, clusters are formed in such a way that companies with sustainability integration in cybernetic controls have also integrated sustainability more frequently in reward and compensation.

Additionally, the following examples show a departure from Crutzen et al (2017):

- Cluster 4 displays deep sustainability integration in long-range and action planning, with weak integration in cybernetic controls.
- Cluster 3 includes a weak integration in long-range planning with a rather strong integration in action planning.

Appendix 5: Numerical Diagnostic Test Results

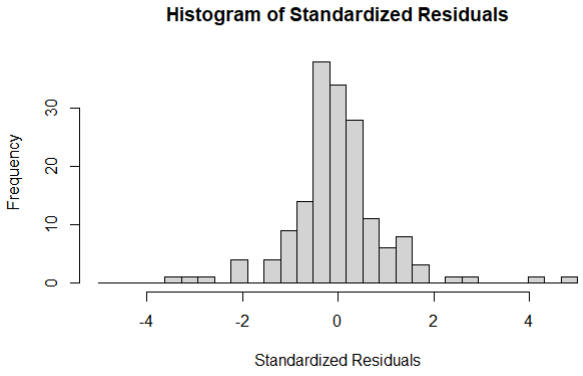
VIF factors (Multicollinearity)

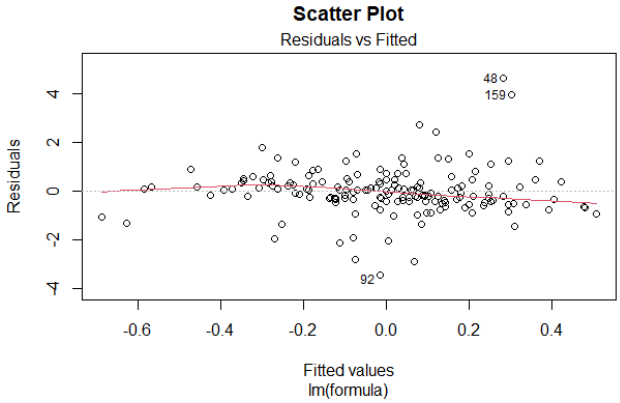
Hypo-thesis	Model	Total Score	Formal Score	Informal Score	Employee number (ln)	Revenues (ln)	Total assets (ln)	Equity Ratio	Age (ln)	S-HUB Membershi
H1	M1									
	M2	1.0511			2.4951	3.7592	3.4469			
	M3	1.0597			2.4048	3.9239	3.3458	1.1558		
	M4	1.0659			2.4677	4.0326	4.0164	1.1573	1.6119	1.0470
H2a	M1									
	M2		1.0569		2.5000	3.7311	3.4409			
	M3		1.0667		2.4078	3.8888	3.3354	1.1554		
	M4		1.0725		2.4703	4.0015	4.0078	1.1571	1.6132	1.0458
H2b	M1									
	M2			1.0376	2.4721	3.7744	3.4079			
	M3			1.0421	2.3853	3.9768	3.3081	1.1585		
	M4			1.0492	2.4523	4.0847	3.9963	1.1598	1.6065	1.0517
H3a	M1									
	M2	1.0830			3.2147	4.4819	3.4288			
	M3	1.0717			3.249	5.2428	3.7902	1.3417		
	M4	1.0760			3.7743	5.8213	4.4844	1.3696	1.8398	1.1249
H3b	M1									
	M2	1.0390			2.1474	3.5906	4.2967			
	M3	1.0612			2.0184	3.5257	4.0421	1.1478		
	M4	1.0741			2.0369	3.5493	4.7176	1.1532	1.5613	1.0436

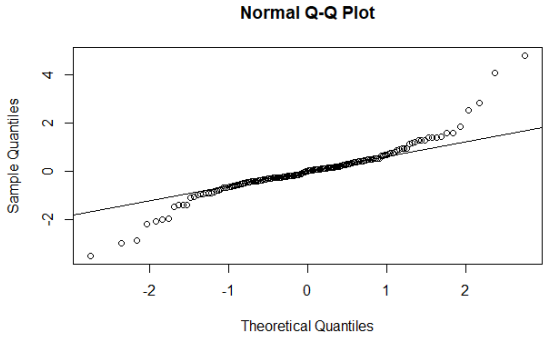
Hypo-thesis	Dependent Variable	Model	Other Tests: Skewness Residuals (Norm. distr. of Residuals)	Other Tests: Kurtosis Residuals (Norm. distr. of Residuals)	Other Tests: Breusch-Pagan test: p-value (Homoscedasticity)	Other Tests: check_outliers (Outliers)
H1	ROA	M1	0.619	8.2850	0.1515	'No outliers detected'
		M2	0.6584	8.0049	0.0767	'No outliers detected'
		M3	0.0041	7.5806	0.0129	'No outliers detected'
		M4	0.0294	74.207	0.0273	'No outliers detected'
	ROE	M1	-0.2631	9.0987	0.4397	'No outliers detected'
		M2	-0.1480	8.2138	0.1071	'No outliers detected'
		M3	-0.3567	8.2913	0.0002	'No outliers detected'
		M4	-0.3409	8.1065	0.0007	'No outliers detected'
H2a	ROA	M1	0.5966	8.3039	0.1090	'No outliers detected'
		M2	0.6465	8.0426	0.0661	'No outliers detected'
		M3	0.0135	7.7385	0.0143	'No outliers detected'
		M4	0.0378	7.5746	0.0310	'No outliers detected'
	ROE	M1	-0.2979	9.3028	0.6926	'No outliers detected'
		M2	-0.1777	8.3740	0.1407	'No outliers detected'
		M3	-0.3874	8.4807	0.0003	'No outliers detected'
		M4	-0.3718	8.3015	0.0011	'No outliers detected'
H2b	ROA	M1	0.7682	8.7999	0.8693	'No outliers detected'
		M2	0.7231	8.3206	0.1064	'No outliers detected'
		M3	-0.0112	7.4223	0.0103	'No outliers detected'
		M4	0.0108	7.2977	0.0218	'No outliers detected'
	ROE	M1	-0.1857	8.7251	0.0902	'No outliers detected'
		M2	-0.1338	8.1520	0.0486	'No outliers detected'
		M3	-0.3550	8.2569	0.0001	'No outliers detected'
		M4	-0.3335	8.0299	0.0003	'No outliers detected'
H3a	ROA	M1	2.7617	12.6888	0.0151	'No outliers detected'
		M2	2.6285	13.0037	0.0860	'No outliers detected'
		M3	1.8873	8.0241	0.0997	'No outliers detected'
		M4	1.9354	8.1252	0.2942	'No outliers detected'
	ROE	M1	2.0170	7.2374	0.4043	'No outliers detected'
		M2	2.0630	7.5540	0.7975	'No outliers detected'
		M3	1.6827	6.6960	0.1058	'No outliers detected'
		M4	1.7418	7.2719	0.2703	'No outliers detected'
H3b	ROA	M1	-2.0456	7.1417	0.3065	'No outliers detected'
		M2	-1.9280	7.3817	0.4846	'No outliers detected'
		M3	-1.8361	6.9445	0.2678	'No outliers detected'
		M4	-1.6631	6.1484	0.1643	'No outliers detected'
	ROE	M1	-1.8152	9.0001	0.1116	'No outliers detected'
		M2	-1.3471	7.3913	0.0261	'No outliers detected'
		M3	-0.8628	6.3766	0.0005	'No outliers detected'
		M4	-0.8309	6.1648	0.0016	'No outliers detected'

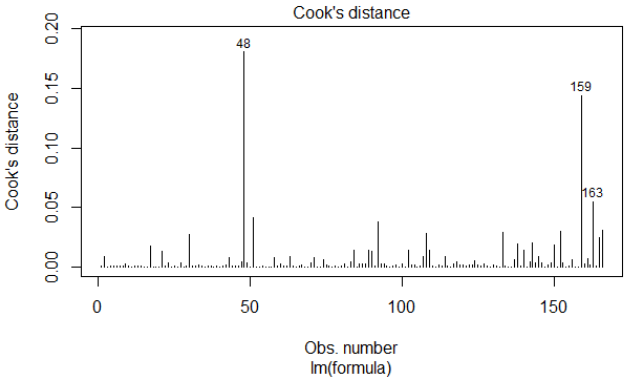
Appendix 6: Graphical Diagnostic Test Results (H1)

ROA, Model 1

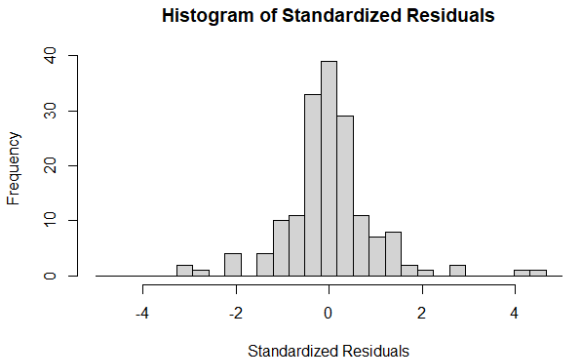


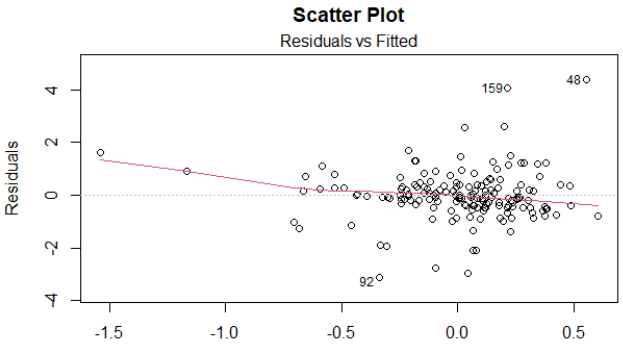


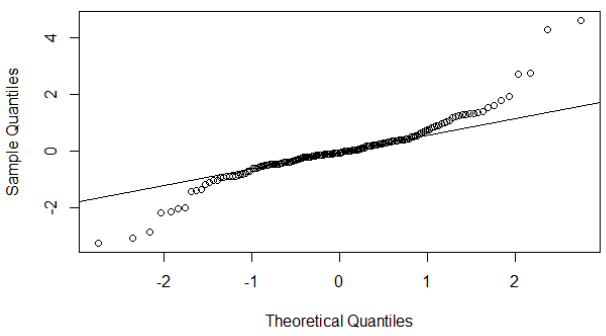


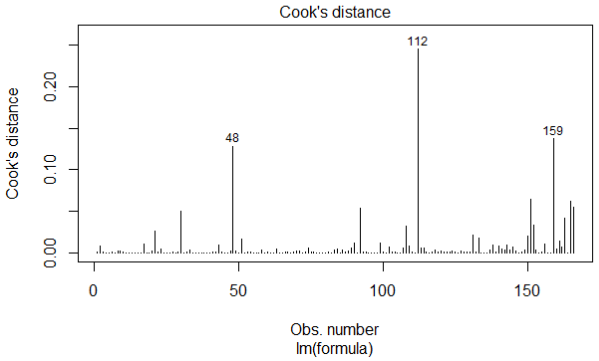


ROA, Model 2

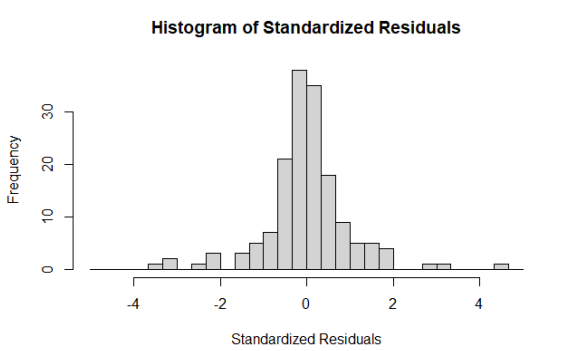


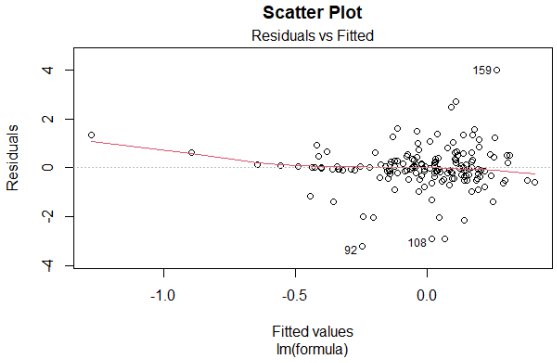


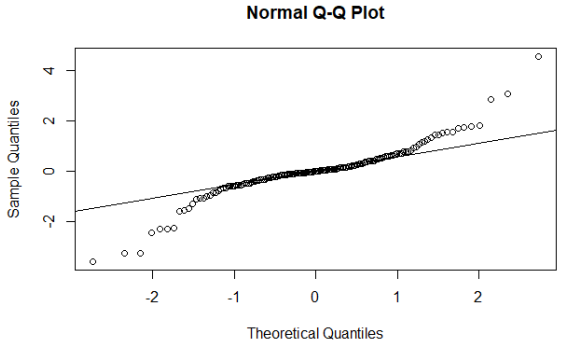


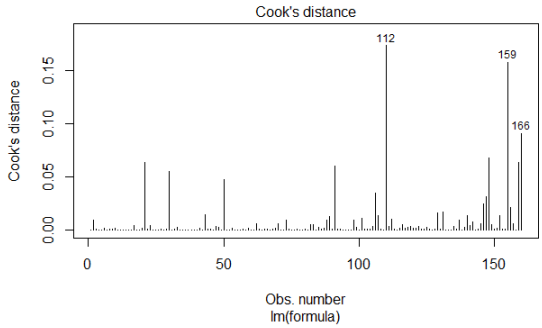


ROA, Model 3

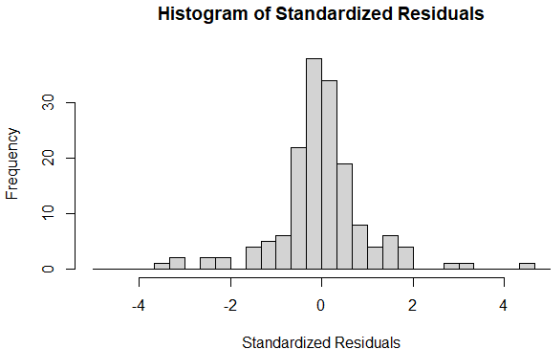


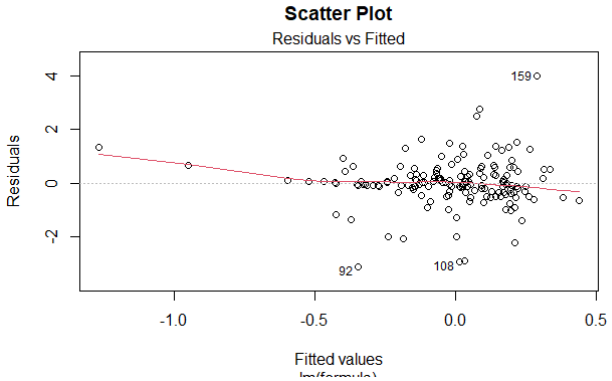


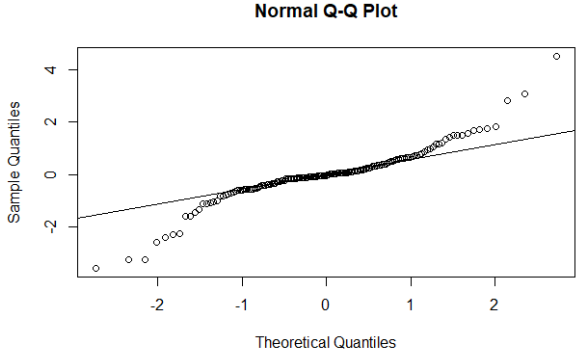


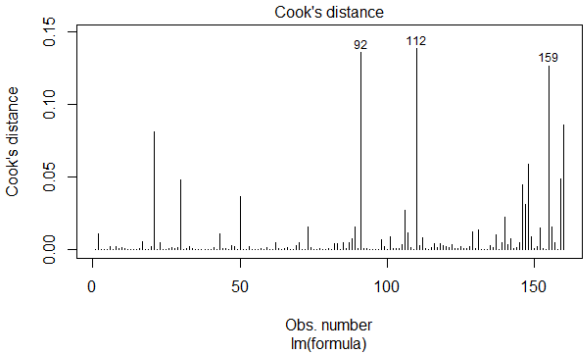


ROA, Model 4

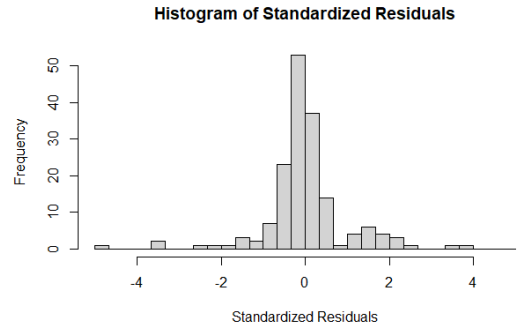


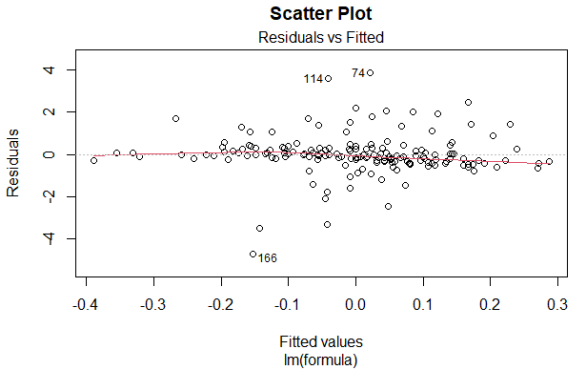


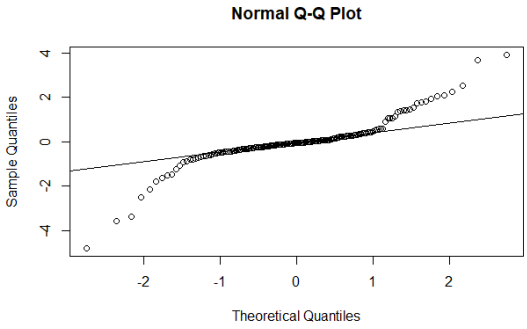


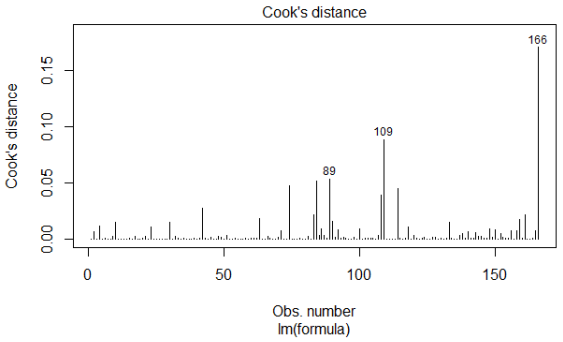


ROE, Model 1

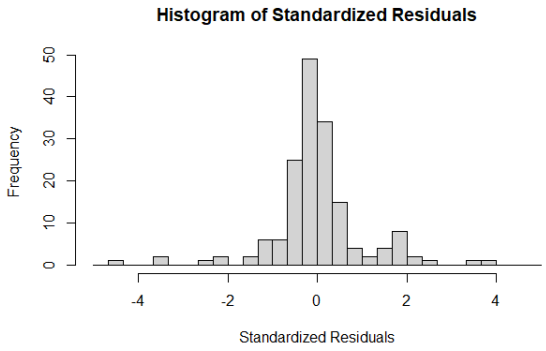


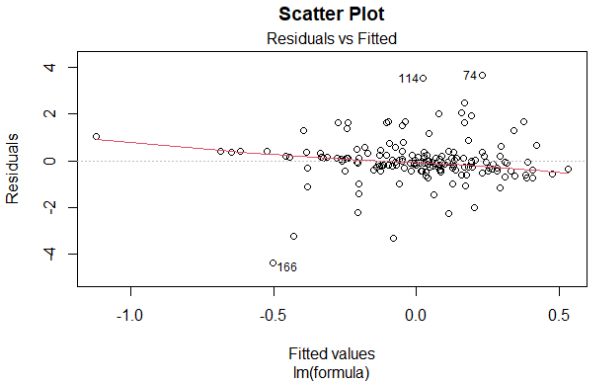


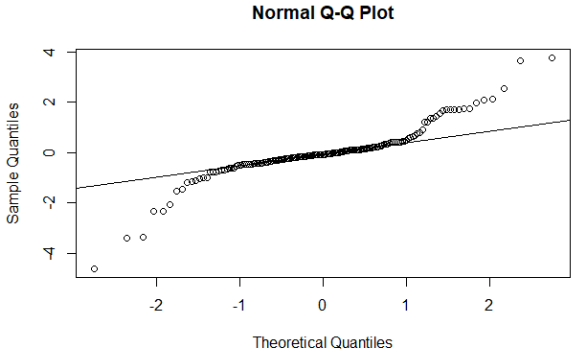


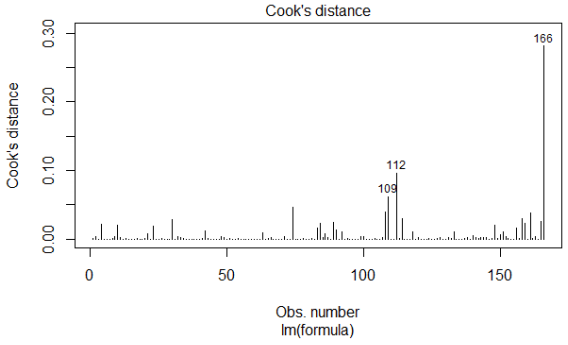


ROE, Model 2

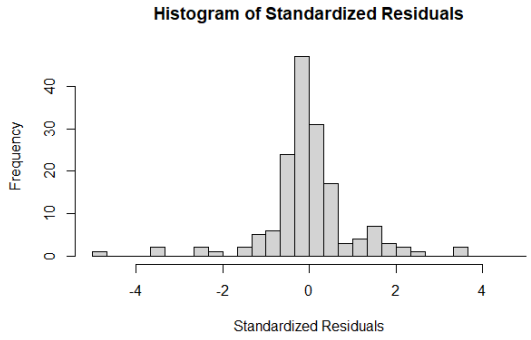


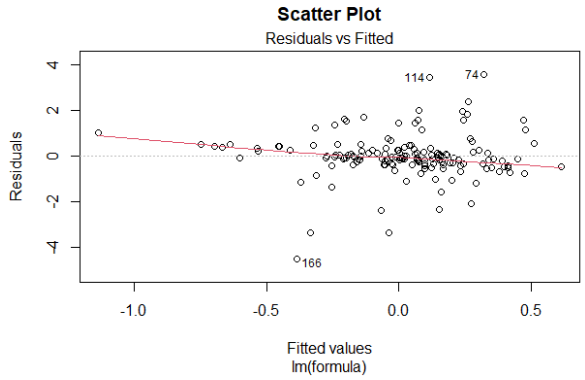


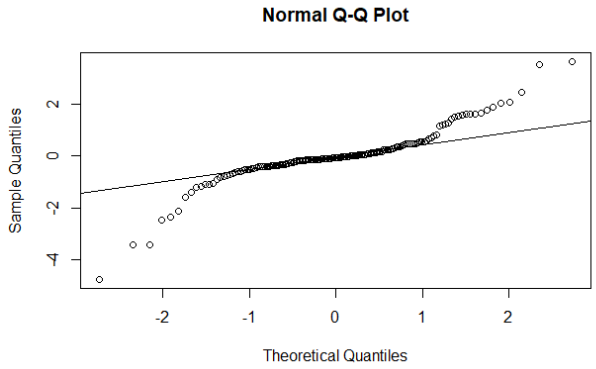


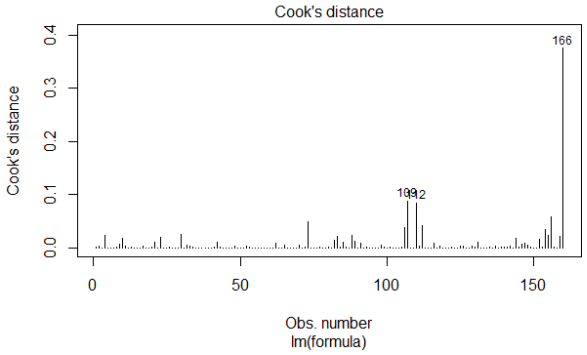


ROE, Model 3









ROE, Model 4