



SCHOOL OF
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Success Factors of Climate-Tech Startups

A Study of VC-backed Climate-Tech Ventures in the Nordics

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Abstract

Purpose: To tackle the challenges that arise with climate change, climate-tech ventures become increasingly important. However, due to the novelty and high degree of innovation, leading to information asymmetries, these ventures face investment barriers. By increasing the understanding of climate-tech ventures' success factors, we aim to lower these barriers and help VCs and climate-tech ventures join forces.

Methodology: Building on related theory, we tested the influence of founding team characteristics on climate-tech venture performance. For this purpose, we analyzed a sample of 141 climate-tech ventures, all located in the Nordics and conducted a regression to determine the influence of the different team characteristics.

Findings: Our study reveals that in the selected sample neither previous work expertise, entrepreneurial experience, charity engagement nor team diversity of venture teams had a significant impact on the revenue growth of VC-backed climate-tech ventures. Hence, these findings suggest that the prevailing view that certain characteristics of a founding team strongly influence startup performance cannot be confirmed for climate-tech.

Implications: As our research found that with increasing age climate-tech venture revenue growth decreases, VCs should in-depth assess scalability of the business model as it might mitigate this observed phenomenon. Further, as this study solely integrated revenue growth as a performance measure for climate-tech ventures, incorporating other indicators of performance such as the number of employees might detect other distinct correlations.

Contribution: By developing a theory-based framework for relevant team characteristics of climate-tech ventures we contribute to the field of sustainable entrepreneurship as this can be applied to different methodological approaches, for instance, a qualitative exploration or broader samples. Furthermore, the findings give insightful anchoring points for future research to increase the understanding of climate-tech success factors.

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List of Abbreviations

ESG:	Environmental Sustainable Governance
NGO:	Non-Governmental Organization
SDG:	Sustainable Development Goals
SPSS:	Statistical Package for the Social Sciences
VC:	Venture Capitalists
VIF:	Variance Inflation Factor

1 Introduction

The first chapter of the study will present the background of our research, define the research problem, and introduce the research question. Subsequently, the purpose of the study will be explained.

1.1 Research Background

“The next 1000 unicorns won't be search engines or social media companies, they'll be sustainable, scalable innovators – startups that help the world decarbonize and make the energy transition affordable for all consumers.” – Larry Fink (2022, n.p.)

In his annual letter to CEOs, Larry Fink, the chief executive of BlackRock, the world's largest asset manager, writes about his prediction of how vitally important the role of sustainable entrepreneurship will be in the future (Fink, 2022). Climate change, resource scarcity, and humanitarian crises are more present than ever (UN, 2021). To mitigate the environmental, societal, and economic risks of climate change, global warming needs to be limited to 1,5 degrees requiring innovation for emission reduction and removal. To conserve scarce resources, new forms of production need to be invented (UN, 2021).

Research suggests that sustainable entrepreneurship plays a crucial part in achieving these goals, however, it is still severely under-researched (Sung & Park, 2018; Pacheco, Dean & Payne, 2010; Parrish, 2010; Criscuolo & Menon, 2015; Bergset, 2015). Changing market conditions, such as the increasing demand for sustainable products, lead to new opportunities, ready to be exploited by alert entrepreneurs. For instance, decarbonization and the pursuit of the energy transition, however, they require new underlying environmental technologies (Mrkajic, Murtinu & Scalera, 2017). Climate-tech startups are ventures that use environmentally friendly technologies to decarbonize potentially harmful effects of their business model or even create sustainable benefits, e.g., by generating renewable energies (PwC, 2021). Since the climate-tech sector is still in its infancy, entrepreneurs, and capital provider such as venture capitalists (VCs) inevitably have insufficient managerial knowledge and experience, leading to a higher risk of failure and uncertainty, the so-called managerial valley of death (Criscuolo & Menon, 2015; Ghosh & Nanda, 2010).

1.2 Research Problem

Entrepreneurs are widely recognised as key players in the innovation process and can therefore have a fundamental impact on society's transition towards sustainable development (Trautwein, 2021; Mrkajic, Murtinu & Scalera, 2017). However, the development of environmentally friendly products and services often involves a high capital investment (Mrkajic, Murtinu & Scalera, 2017; Cohen & Winn, 2007), high risks due to the uncertainty and novelty of the technology and longer development times, which implies that investors can only benefit from the returns at a later stage (Ghosh & Nanda, 2010; Ginsberg & Marcus, 2018). Moreover, climate-cautious VCs need to identify companies with a promising concept to generate earnings while having a positive impact on sustainable development (Bocken, 2015). Traditionally VCs focus on equity growth, whereas sustainable VCs need to consider the triple bottom line approach which also includes societal and environmental goals (Elkington, 1997). Due to a lack of experience in assessing and growing sustainable startups and exemplary cases this comprehensive assessment poses a challenge for the investors (Bocken, 2015; Criscuolo & Menon, 2015; Ghosh & Nanda, 2010).

Furthermore, the demand of sustainable startups for high capital investment is not fully met as they were generally less likely to attract venture capital, which posed a disadvantage for their growth (Mrkajic, Murtinu & Scalera, 2017; de Lange, 2017; Randjelovic, O'Rourke & Orsato, 2003). However, over the last years, this phenomenon changed in the Nordics. In these countries, sustainable ventures became more likely to gain funding compared to non-sustainable startups (Danske Bank, 2021).

However, according to the Intergovernmental Panel on Climate Change (IPCC) (2022), the world may not be able to keep global warming below 1,5 degrees Celsius, and it will be broken in 10-20 years. To stop the breach, investments in sustainable solutions of over \$2,1 trillion will be necessary between 2022 and 2025. As a result, greater investments are required to meet the sustainability objectives (Cumming, Henriques & Sadorsky, 2016). Therefore, taking the Nordic countries as an example, more research is essential to understand what constitutes the success of sustainable ventures, so that they can increase their chances of accessing external financing and VCs mitigate investment risk in sustainable ventures.

1.3 Research Question

Following Larry Fink's (2022) prediction that climate-tech startups will increasingly succeed, and due to the lack of existing findings as well as the novelty of the climate-tech sector more research can support sustainable entrepreneurs understand how to improve their investment proposals and guide VCs in the selection of promising ventures (Mrkajic, Murtinu & Scalera, 2017). Next to the business model and the industry, the founding team itself can impact the success of a venture immensely (de Mol, 2019; Bocken, 2015). Although research on success factors of teams, in general, is an extensively researched area (e.g., Brattstrom, 2019), the generalisability of results to different sectors is not as well researched, making it difficult to derivate industry-specific recommendations (Carter, Mead, Stewart, Nielsen & Solimeo, 2019). In line with this, distinguishing features of successful climate-tech venture teams have not been researched yet. Thus, our research aims to analyse the characteristics of VC-backed climate-tech founding teams and their influence on venture performance to further develop the existing theory on sustainable entrepreneurship. Based on this, we would like to provide guidelines for the actors involved; giving sustainable entrepreneurs an understanding of which characteristics of their founding team are important when seeking funding and on the other side improve VCs' understanding of climate-tech startup investments. Therefore, we aim to fill the lacking and ambiguous research on the field of sustainable entrepreneurship (Gupta & Dharwal, 2021) and propose the research question:

*How do the characteristics of a founding team influence the success of climate-tech startups?
- On the example of VC-backed climate-tech startups in the Nordics*

To answer this question, we will start with a literature review to summarize the most recent findings. Thereafter, we will conduct a quantitative empirical study to analyse the success factors of VC-backed sustainable ventures and develop a viable framework for VCs to improve their assessment of founding teams.

1.4 Purpose of the Study

The main purpose of this study is to develop an understanding of the success factors of successful and VC-backed sustainable startups. More particularly, we will focus on the characteristics of the founding team as these are expected to have a decisive influence on startup performance and to gather detailed insights.

Furthermore, we will only look at startups in the Nordics: comprising Sweden, Denmark, Norway, Finland and Iceland, as Nordic VCs are more experienced in the selection process of climate-tech ventures and can therefore serve as role models for other countries (Danske Bank, 2021). As existing research lacks depth on the success factors of sustainable startups and empirical evidence is scarce (Sandberg & Alvensson, 2011), the conducted study aims to contribute to the current literature by addressing the shortcomings. Besides, because we are exclusively examining VC-backed enterprises, this research will provide practical implications for sustainable entrepreneurs seeking VC funding, allowing them to enhance their assessment of their venture's appeal and avoid potential flaws in their proposals (Franke, Gruber, Harhoff & Henkel, 2008). Furthermore, as VCs are considered experts in determining promising new ventures, the evaluation criteria they apply to startups can also be seen as success factors for emerging firms (Shepherd & Zacharakis, 2002; Franke et al., 2008). Thus, we do not focus on climate startups in general but success factors of VC-backed climate-tech startups as these findings will serve as a guideline, especially for VCs and scalable growth-oriented ventures to suitably address the challenges of climate change. Finally, we aim to propose a guideline which can help startups in the selection process, reduce investment risk and thus accelerate the growth of sustainable ventures through VC funding in the future.

1.5 Results

Our research showed that none of the examined team characteristics were found to significantly affect the venture performance of climate-tech ventures. Only, the age of a startup and revenue growth were negatively correlated. However, the revenue growth of successful startups usually follows a progressive development which exceeds the relatively short timeframe analysed in our research (Martin, 2016). This leads to the conclusion that after digressive revenue growth in the early stage, climate-tech startups might reach incremental growth at later stages due to longer development times of environmentally friendly technologies and consumer adoption cycles. In line with this, the investment horizon of VCs in climate-tech startups could be extended to participate in the potential growth in later stages. Moreover, our suggestion for VCs is to holistically assess climate-tech ventures regarding the team, business model, industry, financial forecast, and especially scalability instead of overstating the magnitude of specific founding team traits in their decision-making process.

2 Theoretical Framework

This chapter elaborates on the existing literature related to the stated research question to provide a theoretical framework as a base for this study. In the first part, the phenomenon of sustainable entrepreneurship, the triple bottom line approach and climate-tech startups are defined and explained. The second part presents the term venture capital and classic VCs evaluation criteria. The chapter concludes with the findings on the success factors of sustainable startups which serve as a base for the development of hypotheses.

2.1 Sustainable Entrepreneurship

According to Schumpeter's school (1934) the entrepreneur *creates* new opportunities by causing an imbalance in the market, while Kirzner's school (1973) states that the entrepreneur merely identifies these imbalances or inefficiencies and then *exploits* the opportunities. However, based on these schools, Shane & Venkataraman (2000) introduce the approach of seeing entrepreneurship as the process of recognizing and exploiting opportunities, which we will adopt for this thesis. Schumpeter (1939) argues that entrepreneurial ventures also foster innovation in larger corporations, accelerating the adoption of new solutions (Croitoru, 2017). The resulting importance of entrepreneurship for the economy as a contributor to growth and job creation has been acknowledged for several decades (Parrish, 2010). Furthermore, entrepreneurship is expected to have a major impact on the maintenance and improvement of socio-ecological systems as it is seen as a "force for change" (Parrish, 2010), driving radical transformation through innovation (Hall, Daneke & Lenox, 2010). Entrepreneurship that focuses actively on fostering that transformation, is often called sustainable entrepreneurship (Hoogendoorn, van der Zwan & Thurik, 2019).

In addition to economic goals, sustainable entrepreneurship pursues other non-economic goals that involve nature and people (Hoogendoorn, van der Zwan & Thurik, 2019). The aim is to protect the environment and create added value for people and communities. By exploiting opportunities, products and services can be designed to sustainably benefit the economy, the environment, and the individual (Shepherd & Patzelt, 2011). A sustainable business is characterized first and foremost by a sustainable entrepreneur, whose motivations are often different from typical entrepreneurs (Bocken, 2015). They usually strive to solve or positively influence social and environmental problems, such as climate change, social injustice, poverty and many more (Hoogendoorn, van der Zwan & Thurik, 2019). A sustainability-driven

entrepreneur considers the firm as a means of generating benefit streams through the conservation of resources, with the underlying logic of using human and natural resources in a way that enhances and sustains the quality of their operations as much as possible (Parrish, 2010). Moreover, the sustainable entrepreneur is required to possess certain skills to succeed in the creation of a sustainable venture (Bocken, 2015). The overall aim of a sustainable entrepreneur is to balance economic health, social equity, and environmental resilience within its venture (Bocken, 2015). These three goals are also called the approach of the “triple bottom line” which will be outlined in the next chapter (Bocken, 2015).

2.1.1 Triple Bottom Line

As described by Elkington (1998), the underlying logic of the triple bottom line approach assumes that sustainable development is essential to alleviate the impact of a wide range of global challenges such as climate change, poverty, and social inequalities. Sustainable development is defined as “[...] *the development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs*” (Brundtland, 1987, p.16). The triple bottom line approach furthermore indicates that sustainable development should be pursued together with the sustainable aspect of economic goals (Elkington, 1998). Moreover, according to Schumpeter (1934), entrepreneurs create a disequilibrium in the market which fosters innovations that have the potential to disrupt the market and stimulate the society towards sustainable development (Hall, Daneke & Lenox, 2010). According to the triple bottom line approach, the challenge of being a sustainable business is mastering and balancing these three lines: economic bottom line, social bottom line, and environmental bottom line (Elkington, 1998).

Social Bottom Line

The success of the social bottom line can be explained by the social capital of an organisation (Elkington, 1998). This includes human capital (public health, skills, and education) as well as the potential health and wealth of the society that could be created by the business.

Economic Bottom Line

To decide whether a venture is economically sustainable the term economic capital needs to be introduced (Elkington, 1998). Economic capital is the aggregate value of assets fewer liabilities and comes in two forms: Physical capital (including machinery and equipment) and financial capital.

Environmental Bottom Line

The environmental bottom line can be explained by a firm's goal to preserve natural capital. Natural capital consists of three types; "critical", "renewable/replaceable", or substitutable". The first type comprises the capital which is crucial for the preservation of life and the integrity of ecosystems; the second type comprises the capital which can be renewed (e.g., through breeding or resettlement of fragile ecosystems), repaired (e.g., environmental restoration or desert rehabilitation) or replaced (e.g., through the increasing use of artificial substitutes such as solar panels in place of limited fossil fuels).

All these three bottom lines have so-called shear zones, i.e., areas where they overlap, and which may also lead to dilemmas (Elkington, 1998). Due to the comprehensiveness of the triple bottom line approach, we will not refer to all three areas in this study. As argued in the introduction, climate change is one of the most pressing issues of our time. To do this subject justice we will focus on environmental sustainability in our research and thus only consider the environmental and the economic bottom line. To follow this purpose and explain the main object of this study, we will continue by creating a common understanding of the term climate-tech startup.

2.1.2 Climate-Tech Startups

Environmental sustainability can be explained as a solution to preserve natural resources, often by focusing on climate-friendly technologies and innovations (Galdeano-Gómez, Aznar-Sánchez & Pérez-Mesa, 2013) that reduce carbon emissions and mitigate the severity of global warming (Hall & Helmers, 2009). Previous literature has not yet agreed on a unified definition of environmentally friendly innovation, products, and startups (Sdrolia & Zarotiadis, 2019). However, all three utilize technologies which create direct or indirect benefits for the environment, alleviating or restoring human-caused environmental damage (e.g., pollution clean-up, higher energy and resource efficiency, reduced carbon emission and environmental degradation) (Hall & Helmers, 2013).

Based on this, in the context of this thesis, we refer to environmentally sustainable startups as climate-tech startups, which either use environmentally friendly technologies to mitigate the harmful effects of their business model, indirect benefits, or even create sustainable benefits, e.g., by generating renewable energies, direct benefits (Hall & Helmers, 2013). Solar power, wind power, food waste technology, green hydrogen production, and low greenhouse gas foods

and proteins are the top five technologies with over 80% of future emissions reduction potential (PwC, 2021). Moreover, investments from private equity and VCs in climate-tech ventures increased by 210% in 2021 to US\$87,5 billion. However, according to the IPCC (2022), to reach the target of limiting global warming to 1,5 degrees, investments in sustainable solutions need to continue growing to \$2,1 trillion in the years 2022 and 2025.

2.2 Venture Capital

Gathering the necessary resources is a critical component of a successful transition from a concept to the creation of a venture, and it can accelerate the growth of sustainable ventures. One elementary resource is financial capital. Raising external financial capital can promote the viability of startups (Bocken, 2015). Particularly, venture capital plays a key part in nurturing early-stage ventures as it can act as a catalyst to grow sustainable ventures (Randjelovic et al., 2003; Bocken, 2015).

VCs act as ‘gatekeepers’ as they identify and select high-potential ventures and thereby influence the emergence of new businesses (Marcus, Malen & Ellis, 2013; Baum & Silverman, 2004). Wright and Robbie (1998) define the term venture capital as a long-term investment of risk equity by professional investors in startups with the primary objective of capital gain. Next to financial resources, VCs also offer access to a broader network, guidance in day-to-day operations, legitimacy, and reputational transfer (Berger & Udell, 1998; de Clercq et al., 2006). This is necessary, to cope with the high levels of uncertainty and information asymmetry between entrepreneurs and capital providers (Wüstenhagen & Teppo, 2006; Glücksmann, 2020). Especially, businesses with high scalability and thus growth potential are preferred by VC investors (Bocken, 2015; Wright & Robbie, 1998). Following this, favoured industries are information and communication technology and biotech (Wüstenhagen & Teppo, 2006; de Lange, 2019).

The investment period of VCs is rather long-term and usually ends two to eight years after the initial funding (Wüstenhagen & Teppo, 2006). For sustainable investments, the investing period can often be extended (Bocken, 2015). To realise their profits, VCs aim to exit either through an Initial Public Offering or a trade sale (Wüstenhagen & Teppo, 2006). However, based on the riskier nature of the investments a profit is not guaranteed. Nandaa, Samilab and Sorenson (2020) illustrate that VCs can expect returns of more than 400% when companies go public, but the most common outcome is an almost complete loss of the initial investment.

Thus, mastering the evaluation of venture proposals and improving the selection of investments is extremely valuable for VCs to reduce the risks of write-offs and enhance their likelihood of equity growth. As investments in sustainable ventures are still insufficient to address the global challenges arising due to climate change (IPCC, 2022), insights into the success factors of VC-backed startups can function as a guideline to help decrease investment risk.

2.2.1 Venture Capital Evaluation Criteria

Understanding the investment evaluation criteria of VCs has received significant scholarly interest in the past as VCs are considered experts in identifying promising startups and thus, their evaluation criteria can be seen as success factors for early-stage ventures (Dimov, Shepherd & Sutcliffe, 2007; Shepherd & Zacharakis, 2002; Franke, Gruber, Harhoff & Henkel, 2008). Furthermore, it can help ventures that seek funding to judge their potential and improve their proposals. Additionally, it gives an aggregated view for VCs on the commonly used criteria and enables them to compare their judgement to competitors (Franke et al., 2008). Based on a literature survey Franke et al. (2008) found that the evaluation criteria for assessing the venture proposal can be divided into four main categories:

1. The product/service offering
2. The market/industry
3. The startup team
4. The financial returns to be expected by the venture

Following the resource-based view, the assortment of resources plays a key role in predicting the performance of a firm (Miloud, Aspelund, & Cabrol, 2012). In line with this, the team is constantly ranked as one of the top three most important characteristics of a venture to receive VC funding (Franke et al., 2008). To specify the characteristics of a venture team Franke et al. (2008) conducted an empirical analysis. The results show that the most valued criteria were *relevant professional experience*, *educational background* and *university degree* and *prior job experience*. Furthermore, the authors concluded that the most preferable teams have relevant job experience, and their educational backgrounds are mixed. In accordance with the described theory, recent research conducted by Gompers, Gornall, Kaplan, and Strebulaev (2020) found that the most important evaluation criteria by VCs is the *management team*. The findings suggest that when assessing the management team the VCs consider *ability*, *industry experience*, *passion*, *entrepreneurial experience*, and *teamwork*.

To conclude, the evaluation criteria in the selection process of VCs offer a variety of anchoring points to assess the venture and increase the likelihood of venture performance. However, research also points out that not all categories apply to the same industries equally, e.g., in the healthcare sector-specific professional experience is emphasized as the most important factor (Gompers et al., 2020). Thus, it is important to investigate how these criteria behave when it comes to climate-tech ventures. To explore this further, we summarize the current research on the success factors of sustainable startups and develop hypotheses to apply to climate-tech ventures.

2.2.2 Success Factors of Climate-Tech Ventures

The number of climate-tech ventures is steadily growing, thus, to address the global challenges that arise due to climate change, investments in sustainable ventures are becoming increasingly important (Bocken, 2015; Demirel, Rentocchini & Tamvada, 2019). Compared to traditional startups, sustainable startups face higher investment barriers and capital needs are not sufficiently addressed (de Lange, 2017; Randjelovic et al., 2003; Bergset, 2015). To change this and follow the example of the Nordic countries, research into the success factors of climate-tech ventures is essential (Bocken, 2015).

A qualitative study by Bocken (2015) suggests key success factors for sustainable ventures to act as a guideline for the selection process of VCs. The three main success factors include innovation in the business model (e.g., novel value propositions), collaborations (between companies, and industries) and a strong business case (sustainability alone is not enough). Additionally, in line with the traditional venture capital evaluation criteria, another important success factor for sustainable startups is “*the formulation of a great team*” (Bocken, 2015, pp. 654). However, as not all characteristics apply to the same industries equally (Gompers et al., 2020) it is uncertain what characteristics determine a great sustainable venture team (Demirel, Rentocchini & Tamvada, 2019). Thus, we will now continue to develop hypotheses about great climate tech teams based on literature and related research fields.

Professional experience

The positive influence of the entrepreneur's specific professional experience on the performance of a venture has already been well discussed and examined in the literature, for example in Wasserman (2012). Since existing literature barely focuses on analysing the performance or evaluation criteria of climate-tech startups in general (Demirel, Rentocchini & Tamvada, 2019)

there is a gap when it comes to the influence of specific work experience of the founders. Even though some researchers suggest low industry knowledge allows for a more open-mindedness (Walsh, 1995), entrepreneurs with higher industry experience are usually more likely to avoid substantial problems based on previous experience (Wasserman, 2012). In addition, industry experience helps in assessing opportunities and prevents overly optimistic decisions. This applies even more in sectors with high uncertainty, such as the technology industry (Cassar, 2014). Moreover, climate-tech startups often produce complicated goods and services that demand specific expertise which can be obtained by related work experience to increase the entrepreneur's ability to build the proposed idea (Gompers et al., 2020). Therefore, since we define climate-tech ventures as firms mitigating or solving environmental issues with environmentally friendly technologies, a tech-related industry experience is expected to be favourable.

H1.1: The professional experience of founding teams in technology increases the performance of climate-tech startups.

Moreover, climate-tech firms act in a different environment than most ventures, being not only cost-intensive but also highly influenced by legal and governmental regulations (Groot & Pinske, 2015; Mrkajic, Murtinu & Scalera, 2017; Demirel, Rentocchini & Tamvada, 2019). A lack of transparency and extensive paperwork can pose tremendous barriers for climate-tech founders (Groot & Pinske, 2015). The entrepreneurs must overcome market and institutional barriers which makes the endeavours to build a sustainable venture even more challenging (Pacheco, Dean & Payne, 2010). Hence, entrepreneurs with political or judicial backgrounds may be able to develop a greater understanding of public administration and policies or even influence governmental institutions to increase the payoffs of sustainable practices (Pacheco, Dean & Payne, 2010).

H1.2: The professional experience of founding teams in politics or law increases the performance of climate-tech startups.

Prior founding experience

When examining the prior experience of the entrepreneurs, there is strong evidence that prior founding experience is beneficial for the venture (Wasserman, 2012; Nahtata, 2019). Missing experience of a first-time founder leads to a lack of understanding of common dilemmas, such

as making the right hiring decisions. Moreover, prior startup experience leads to a more positive attitude towards failure (Politis & Gabrielsson, 2007). It could be concluded that this positive attitude leads to a higher likelihood of taking risks. This attitude is assumed to be valuable in a newly emerging industry that requires a high degree of innovation such as the climate-tech sector. Hoogendoorn, van der Zwan & Thurik (2016) found that particularly sustainable entrepreneurs are exposed to a market, characterised by uncertainty, and thus are exposed to an increased fear of failure, which again highlights the importance of previous startup experience. Thus, we conclude that climate-tech entrepreneurs prior startup experience will have a positive impact.

H 2.1: Prior founding experience of founding teams increases the performance of climate-tech startups.

Furthermore, serial entrepreneurs are habitual in commercializing innovations, proving their ability to invent, create a business and earn resources from it (Yun, Lee, Park & Zhao, 2019). Moreover, serial sustainable entrepreneurs are highly incentivized by collaborative innovation systems (Yun et al., 2019). As Bocken (2015) identified collaborations between sustainable ventures and larger corporations as a success factor, having a founding team with serial entrepreneurs might increase the openness to collaborate. Additionally, due to the complex nature of the climate-tech sector and the difficult alignment of environmental and economic goals (Elkington, 1997), such as high R&D expenses and profitability, we assume that serial entrepreneurs are conducive to coping with the aforementioned challenges as they are more experienced in entrepreneurship.

H2.2: Serial entrepreneurs within founding teams increase the performance of climate-tech startups.

Team size

The appropriate team size is positively related to new venture performance (Jin, Madison, Kraiczy, Kellermanns, Crook & Xi, 2017). Whilst every addition to the team can add human, social and financial capital increasing the team size accordingly leads to higher coordination efforts and communication inefficiencies (Wasserman, 2012). Human capital refers to the skills and experiences of an individual, social capital includes their network and financial capital the disposable investment that can be contributed to the new venture (Wasserman, 2012).

Moreover, teams that bring together individuals with varied views have access to a wider range of information. Furthermore, they process and interlink knowledge in different ways resulting in higher levels of creativity and innovation capacity, which is essential for climate-tech ventures (Beyhan & Findik, 2022).

To scale quickly, climate-tech teams must have a broad range of skills. Moreover, we assume that the control and equity motivation of being a single founder (Wasserman, 2012) are less determining as sustainable entrepreneurs follow economic and ecological goals. Additionally, due to the market, which demands highly skilled people, innovation abilities and high financial capital, we assume that the benefits of a larger team outweigh potential communication inefficiencies.

H3: The larger the founding team, the better the performance of a climate-tech startup.

Diversity

There have been numerous studies about the composition of founding teams in general (Jin, Madison, Kraiczy, Kellermanns, Crook & Xi, 2017; Haas & Mortensen, 2016). One typical phenomenon that influences the choice of a potential co-founder is homophily (Ruef, Aldrich & Carter, 2003). Homophily is the inclination to associate with others who have similar features, such as gender, race, or personality. This is critical because it builds trust and understanding among a new venture team. Moreover, Wassermann (2012) states that homogeneity decreases the time to develop an effective work relationship, improves communication and facilitates a common organizational identity.

However, according to Jin et al. (2017), a team with more heterogeneous backgrounds facilitates managerial decision-making. The aggregation of different skills and experiences results in functional diversity being an indicator of higher organisational growth, improved communication, and innovation (Ruef, Aldrich & Carter, 2003). Especially teams who work in dynamic, unstable markets are more capable of coping with these circumstances if they are more heterogeneous (Stewart, 2006). This is due to the variety of resources from which they can draw when faced with equivocal and non-routine problems (van Knippenberg & Schippers, 2007). This coping capability is highly relevant for the climate-tech sector, as it is rapidly evolving and severely influenced by governments and incumbents. Furthermore, specifically, a lack of business education is supposed to create challenges for environmentally friendly

ventures (Bergset, 2018) and thus, we differentiate between professional diversity in work experience and educational diversity. The hypotheses regarding the team composition of climate-tech startups are as follows:

H4.1: A founding team with different educational backgrounds increases the performance of a climate-tech startup.

H4.2: A founding team with different professional backgrounds increases the performance of a climate-tech startup.

Charity experience

Another success factor of new ventures is the entrepreneur's passion and purpose (Gompers et al., 2020). Additionally, altruistic behaviour facilitates the creation of sustainable innovations (Patzelt & Shepherd, 2011). To indicate the underlying motivation and a founder's passion for sustainability, we believe that founders who volunteered or worked in non-governmental organization (NGOs) before having transferred their motives into measurable actions prove their intrinsic intention and encouragement for their environment. Furthermore, charity and NGO experience shows a certain level of commitment. This dedication can facilitate the consideration of the environmental impact of a business model from the start which reduces complexity and costs for the product development later (Johansson, 2002). Therefore, we conclude:

H5: The charity experience of founding teams increases the performance of climate-tech startups.

2.3 Summary of the Theoretical Framework

This chapter provides a summary of the theoretical framework for our research on the success factors of climate-tech ventures. In summary, sustainable entrepreneurship is a major force to foster sustainable development, driven by the sustainable entrepreneur who aims to master the triple bottom line approach. Startups that impel decarbonization by utilizing environmentally friendly technologies are called climate-tech ventures. To accelerate the growth of this sector VCs play a key part in nurturing young ventures. They act as 'gatekeepers' to identify and select ventures and thus, impact the emergence of new businesses. Mastering the evaluation of venture proposals of investments is extremely valuable for VCs to reduce the risks of write-offs. For

startups that seek funding, insights into successful VC-backed ventures can help them judge their potential and improve their proposals.

As investments into climate-tech ventures should significantly increase to meet the 1,5-degree goal, in-depth knowledge on the success factors of climate-tech startups is even more critical. One of the most important resources of a venture is the founding team. Hence, we identified success factors of venture teams regarding the work experience, founding record, team size, diversity and charity activities and derived hypotheses for climate-tech ventures which will be tested in this research. The developed conceptual model can be seen in figure 1.

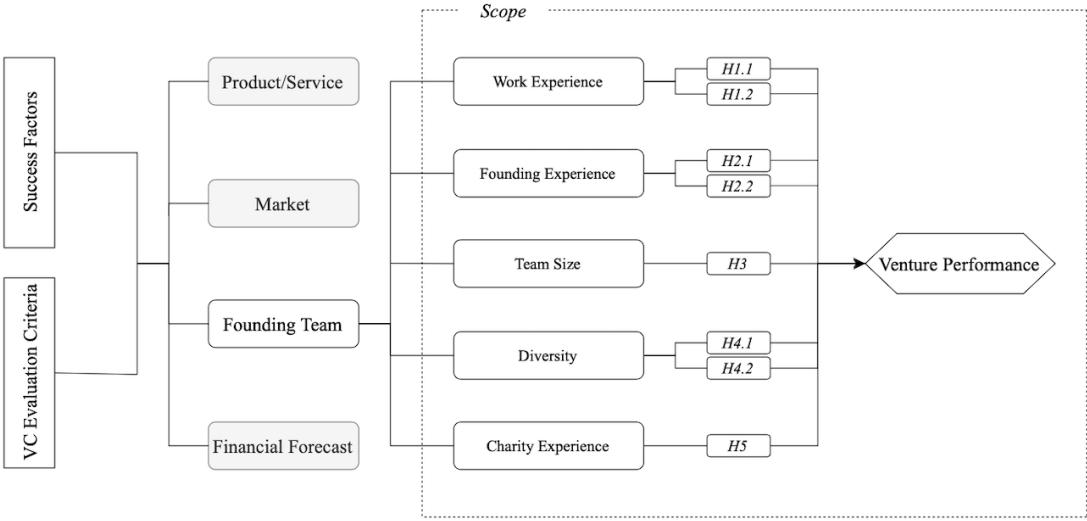


Figure 1: Theoretical Framework

3 Methodology

The following chapter will describe the methodology of the research. First, we will introduce the research logic. Then, the chapter will encompass the research design, followed by the data collection process and the description of the sample. Finally, the analysis of the collected data will be elucidated.

3.1 Research Logic

Although research on the success factors of climate-tech businesses is still in its early stages, we chose a deductive approach since we identified existing theories in adjacent fields that were suitable for hypotheses development (e.g., a qualitative study by Bocken, 2015). Moreover, the deductive approach is appropriate to explain a causal relationship between the variables to be examined. Finally, deduction allows for the generalisation of results as we are aiming to develop a guideline for VCs and startups to provide insights for climate-tech investments (Saunders, Lewis & Thornhill, 2016). To increase the level of generalisation the deductive approach should be combined with a quantitative research method, which we will further explain in the next chapter.

3.2 Research Design

To confirm or refute our proposed hypotheses this research follows a multi-method quantitative study. This multi-method approach helps to overcome the weaknesses of using only one method, pursuing a more comprehensive path to data collection, analysis, and interpretation (Saunders, Lewis & Thornhill, 2016). To analyse the influence of team characteristics on the success of VC-funded climate-tech startups, we will be using different sources of secondary data. The principal advantage of relying on secondary data is that this data is often of higher quality compared to the data that could be obtained through own elicitation (Smith, 2006; Vartanian, 2011).

The starting database is Dealroom, a commercial database provider from Amsterdam (Dealroom, 2022a). We selected Dealroom as it has a particularly strong focus on Europe compared to other database providers (Retterath & Braun, 2020). In Dealroom we identified the startups to be researched. To classify companies, Dealroom applies a definition that is consistent with ours and is mentioned later in this chapter.

After identifying the startups to be studied, we built our database from multiple resources, mainly the companies' websites and the LinkedIn profiles of the founders. This is common in business research, as for most research questions it is unlikely to find all the necessary information in one source (Saunders, Lewis & Thornhill, 2016). Subsequently, the collected data was classified and analysed to determine the influence of team characteristics on the success of climate-tech ventures, by performing a multitude of multiple linear regression analyses (Gallo, 2015).

3.3 Data Collection and Sample

To collect the necessary data, we proceeded in three steps. First, we started by identifying climate-tech ventures in the Nordics, then we acquired the information on the founding team and finally we accumulated the revenue growth data of the ventures.

3.3.1 Startup Identification

To identify the startups to be studied, we used Dealroom to determine the sample of climate-tech ventures. Dealroom starts by labelling firms as impact startups, if they address one or more of the United Nations (UN) Sustainable Development Goals (SDGs) (Dealroom, 2022b; UN, n.d.). A more detailed elaboration of the SDGs can be found in appendix A. To assess this, Dealroom manually and continuously reviews the venture's publicly disclosed information, like the business model, mission statement, and case studies. Thereupon, they share PwCs' definition of climate-tech as "*a broad set of sectors which tackle the challenge of decarbonizing the global economy*", to identify this specific type of impact venture (PwC, 2021, n.p.; Dealroom, 2022b). This definition is in line with the definition of climate-tech ventures from our underlying theoretical framework. Furthermore, as we would like to comprehend what differentiates successful VC-backed startups and create a guideline for VCs to increase their share of successful investments, we decided to select ventures that received VC funding.

After identifying this group of climate-tech ventures, we selected the founding or headquarters location. In the context of this study, we will look at the Nordics. Following the RobecoSAM (2021) Country Sustainability Ranking, a comprehensive framework for analysing countries performance on a wide range of environmental, social, and governance (ESG) metrics, Sweden leads the ranking, just ahead of its neighbours Finland, Norway, Denmark, and Iceland.

The Nordics have established their top position since the start of this database in 2000 and meet high sustainability standards across all three ESG dimensions (RobecoSAM, 2021). Thus, the Nordics can act as a role model for other countries to accelerate sustainable development worldwide. To increase the actuality of our results and only look at companies that are still considered startups we selected companies that were founded since 2012. More so, to make sure that there is already a track record of measurable performance data we did not incorporate startups founded after 2019. Through this set of filters, we arrived at n=210 startups. However, during the research, we validated the founding year by comparing the entrances about the companies on the founder's LinkedIn and the information provided on the startup's website with the information on Dealroom and based on that excluded three ventures which were founded before 2012, resulting in n=207. In summary, the criteria for selection are shown below in table 1.

Table 1
Venture Qualification Variables

Variable	Qualifier
Industry	Climate-Tech, per PwCs' definition (2021)
SDG	Climate Action (13), Affordable and Clean Energy (7), Responsible Consumption and Production (12), Life on Land (15), Clean Water and Sanitation (6), Life Below Water (14)
Funding	Have received VC-funding
Founding Year	Between 2012 and 2019
Headquarter Location	Sweden, Denmark, Finland, Norway, and Iceland

3.3.2 Founding Team Characteristics

After being able to find 207 startups that fit our criteria the process of identifying the founders followed. Whenever Dealroom offered information on the founding team, we verified it by analysing the LinkedIn profiles of the stated founders. In case Dealroom did not supply this data, we utilized other sources which were found through online searches e.g., Retriever, Crunchbase or company websites. This again was then cross-checked with the information accessible on the founders' LinkedIn.

In total 426 founders were identified. Eventually, we analysed specific data for each founder:

- *Age*
- *Higher education*
- *Professional experience and years of experience*
- *Startups founded and years of experience*
- *Charity or NGO experience*

Whilst looking at the profiles the categories of higher education and work experience were immediately classified. To classify education we differentiated between *Business, Technology, Politics & Law* and *Other*. All study programmes that comprise the principles of business, management and economics were classed into business education (Cambridge Dictionary, 2022a). Studies that deal with engineering and the application of scientific knowledge e.g., for industrial purposes were assigned to tech education (Lexico, 2022a). Furthermore, the category of politics or law education includes courses that study governments and political structures or the system of rules and regulations of a particular country (Cambridge Dictionary, 2022b; Lexico, 2022b). However, we did not treat the categories as mutually exclusive e.g., if a founder studied Engineering and Management it was classified into both categories. Other education was used to designate academic studies that did not fit into these categories.

We applied a similar approach to the prior job experience of founders, which was classified into *Tech, Politics & Law* and *Other*. Computing, engineering, and related positions were assessed to tech experience, whereas political and law experience includes working positions in governmental institutions, like ministries, and law firms. An exemplary overview of the classification is given in the following table.

Table 2
Categorisation of Team Characteristics

Main Category	Subcategory	Examples
Job experience	Tech experience	Design Engineer, IOS Developer, IT Consultant, Software Developer, CTO
	Politics & Law experience	Senior Attorney, Head of Legal, Lawyer, Director of the Congressional Anti-Terrorism Caucus, Senior Policy Advisor
	Other experience	Management Consultant, CEO, Marketing Manager, Business Development Manager, Sales Assistant, Operations Manager

Furthermore, we analysed the educational background of the founders to determine educational diversity. Here, we defined a team as diverse if the overall founding team received two or more different types of education. The corresponding categorisation overview can be found in table 3.

Table 3
Diversity Categorisation

Main Category	Subcategory	Examples
Higher education	Business education	Management, Marketing, Entrepreneurship, Finance, Operations Management, Economics
	Tech education	Engineering, Computer Science, Biotechnology, Engineering Physics, Technology
	Politics & Law education	International Law, Political Economy, European History, Politics and Law
	Other education	Physics, Biology, Fashion Design, Psychology, Chemistry, Geology

Finally, if the investigated LinkedIn profiles were incomplete or the information was insufficient to gather the necessary data, we used estimations and deviations which are further described in the table 4, to achieve a complete database.

Table 4
Deviations and Estimations

Category	Description	Estimation
Age	Birthday was not public on LinkedIn	If the founders included the starting year of their bachelor studies, we assumed that they were 20. Accordingly, if we only had the year when they started their Master, we assumed that they were 23. If we only had the year of the first job experience and we could presume foregone studies, we assumed the founder was 25 at that point. If the LinkedIn profile indicated practical education, we supposed that the founder was 18 when they started working.
Education	The field of study indicated was not clearly technical	In case a subject was not clearly technical we looked up the description of that program to estimate the technical part. Thus, the following cases were determined as tech education: pilot, marketing engineering, architecture, and sustainable energy production.
Experience	Years of experience were vague	If someone worked part time for a period, we took half of the years to increase comparability as we measured full-time experience. Moreover, short internships (less than 6 months) did not count as work experience.

3.3.3 Revenue Data

Average revenue growth is an important way to measure the performance of climate-tech ventures and was therefore used for the assessment specifically because of the following three reasons. First, most startups are not profitable in the first years as they reinvest their earnings and especially sustainable companies take long development times (Wasserman, 2012; Bergset & Fichter, 2015; Bocken, 2015; Mrkajic, Murtinu & Scalera, 2019). Thus, key performance measures like earnings could distort an accurate representation of venture success. Secondly, we used growth as it is a relative figure increasing comparability of the values and, finally, a common measure to quantify startup performance (Gorgievski, Ascalon & Stephan, 2019).

To collect the revenue data for the examined startups, we manually retrieved the revenue on the databases Orbis and Retriever, both private database providers for financial business data. To ensure comparability of the data, all revenue figures were converted into one currency. The exchange rates are based on the website of the European Central Bank (ECB, 2022a). The euro was chosen as the comparative currency as the currency fluctuations with the examined currencies are comparatively low (ECB, 2022b), and the date of data collection, April 27, 2022, was chosen as the reference date for the exchange rates. However, not all startup revenue information was accessible online, leading to a final sample size of n=141.

3.4 Ethical Considerations

In order to adhere to all ethical standards for conducting research, we followed the ethical framework by Diener and Crandall (1978; in Bell, Bryman & Harley, 2019): avoidance of harm, informed consent, privacy, and preventing deception.

- *Avoidance of harm*: All information that was obtained about the founders was anonymized to ensure that the founders are not identifiable.
- *Informed consent*: As secondary data was used and all information gathered was publicly available online, mainly based on the founders' LinkedIn a consent to use the data can be assumed as the participants published the information deliberately and voluntarily.
- *Privacy*: Since no nondisclosed private data was used in this research the protection of privacy is considered as given.
- *Preventing deception*: Due to the nature of using secondary data, any type of deception for this research can be excluded.

3.5 Data Analysis

The data collected was analysed in a multiple linear regression analysis to model the relationship between the eight independent explanatory variables that represent the team characteristics and the dependent response variable, the new venture performance, whilst regarding two control variables. A multiple linear regression shows the estimated impact of multiple independent variables on one dependent variable (Uyanık & Güler, 2013). This is a beneficial characteristic of the regression contrary to just checking correlations, since then the direction of the relation is not possible to infer (Saunders, Lewis & Thornhill, 2016; Harrell, 2001). Statistical Package for the Social Sciences (SPSS) was used to analyse the 141 observations. In the next section, the independent and dependent variables are specified in more detail.

Dependent variable

- *Log10_Revenue_Growth*: To measure the performance of climate-tech startups we calculated the dependent variable, average revenue growth over the given years. To increase normal distribution we used the logarithm, which we will elaborate on later.

Independent variables

- *Tech_Ex*: The first independent variable describes the cumulative professional experience of the founders in the field of technology in the years up to the founding of the startup examined.
- *Pol_Law_Ex*: This variable describes the cumulative work experience of the venture team in the field of politics and law in the years up to the founding of the startup under investigation.
- *Diverse_Ed*: The educational diversity variable is a dummy variable indicating whether the founding team has diverse educational backgrounds (appendix B).
- *Diverse_Ex*: The experience diversity variable is a dummy variable that indicates whether the founding team has diverse professional experience (table 2).
- *No_Of_Founders*: The team size includes the number of all founders of a startup.
- *Years_Of_Founding_Ex*: In this case, the years were cumulated in which the entrepreneurs had already gained experience in self-founded startups before creating the startup examined.

- *No_Of_Startups_Founded*: This variable describes the cumulative number of startups the entrepreneurs have founded before.
- *Charity_Ex*: This variable is also a dummy variable that reflects whether a member of the founding team has previously worked for the common good, such as a charity or an NGO.

Control variables

- *Age_Of_Founders*: The control variable age of founders denotes the average age of all founders whose data we have collected for the respective startup.
- *Age_Of_Startup*: The second control variable describes the age of the startup at the end of 2021 based on the founding year.

The control variables are meant to test if the independent variable's effect on the dependent variable is unbiased by taking into consideration that the control variables might affect both the dependent and independent variables (Harrell, 2001). For example, the average age of the founding team could have an impact on the association between professional work experience and venture performance, as an increasing age goes along with greater experience. A similar logic applies to the age of the startup as startups' revenue growth rates could presumably be affected by the age of the firm since revenue growth rates might decline over time. The following figure shows an overview of all the variables of the regression model and their links.

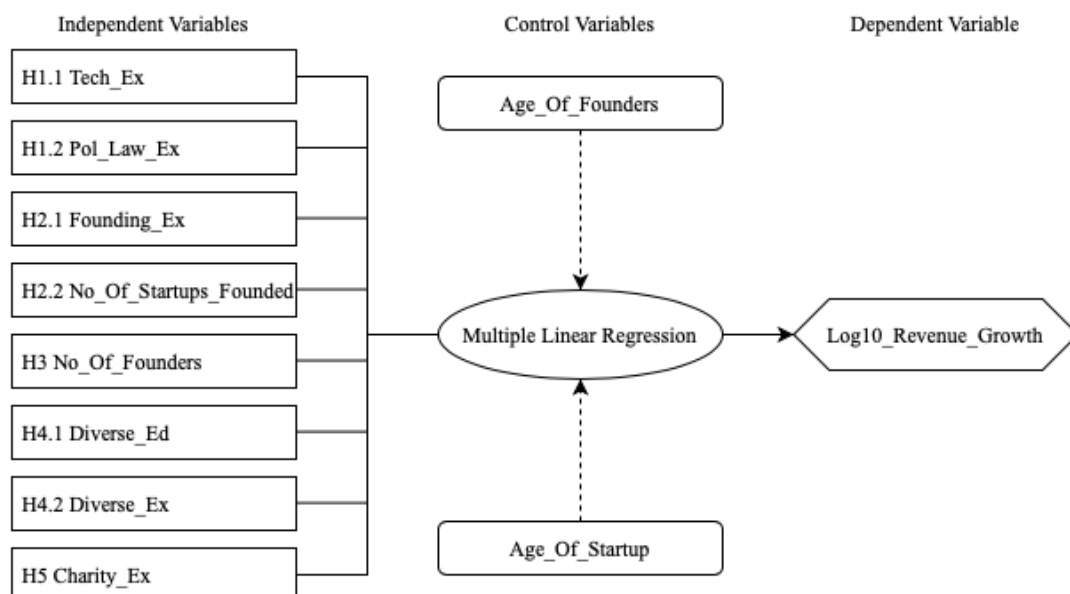


Figure 2: Regression Model

Transformation of the variables

To be able to conduct the regression analysis and receive the best possible results, we decided to convert some of the variables, as can be seen in table 5. The years of professional experience in tech, politics and law, team size, founding experience and the number of startups founded did not change from the initial type. Diverse education, diverse experience and charity experience were string variables, saying yes or no. To be able to perform a regression we coded them into dummy binary variables with 0 for no and 1 for yes. The revenue growth, as well as the age of the founders, were collected individually, corresponding to each year or founder we could find the data for. For the regression, we calculated the mean for each startup's revenue growth and the age of the founders. The founding year was transformed from an ordinal value into the age of the firm and therefore a ratio by deducting the founding year from 2021 since this is the last full year that we collected revenue data for.

Table 5

Transformation of the Variables

	Variables	Type	Pre-Trans	Conversion	New Type	Post-Trans
	Ind_Tech_Years	Ratio	Numeric	Sum	Ratio	Numeric
	Ind_Pol_Law_Years	Ratio	Numeric	Sum	Ratio	Numeric
	Diverse_Ed	Binary	String	Sum, Dummy	Binary	Numeric
	Diverse_Ind	Binary	String	Sum, Dummy	Binary	Numeric
I	No_Of_Founders	Ratio	Numeric	n.a.	Ratio	Numeric
	Years_Of_Founding_Ex	Ratio	Numeric	Sum	Ratio	Numeric
	No_Of_Startups_Founded	Ratio	Numeric	Sum	Ratio	Numeric
	Charity_NGO	Binary	String	Sum, Dummy	Binary	Numeric
D	Log10_Revenue_Growth	Interval	Numeric	Mean	Interval	Numeric
	Average_Age	Ratio	Numeric	Mean	Ratio	Numeric
C	Age_Of_Startup	Ordinal	Numeric	2021- founding year	Ratio	Numeric

Normal Distribution

The higher the standard deviation of a variable, the less likely it is that the mean value corresponds to reality and would therefore also apply to other values from other data, as outlier values have a large influence and thus distort the overall picture (Saunders, Lewis & Thornhill, 2016; Harrell, 2001). It is therefore important to create a relatively normal distribution for revenue growth. The histogram of the dependent variable, revenue growth, was strongly

positively skewed (fig. 2). With a value of 6,080, the skewness for the dependant value was remarkably outside the recommended acceptable range of ± 1 (Uyanık & Güler, 2013). To reduce the high skewness and create a normal distribution we used a \log_{10} . Because the logarithm causes the high values to lose extremity and move closer to the other values, hence a more accurate and reliable representation of data can be created (Harrell, 2001; Heumann, Shalabh & Schomaker, 2016). Methods such as winsorization or the removal of strong outliers were not possible due to the high skewness and comparatively small data set (Ch'ng & Mahat, 2017). To create the \log_{10} for the revenue growth, all values of a variable must be greater than zero. Since negative revenue growth figures up to -1 (-100%) were observed, we added +2 to all values and thus shifted the data set to the right by unit two. Two is the smallest round unit that was suitable to shift the values to the positive side. As one can see in the histogram (fig. 2), the $\text{Log10_Revenue_Growth}$ turned out to be closer to a normal distribution than the original variable. Hence, the regressions were conducted with the transformed dependant variable.

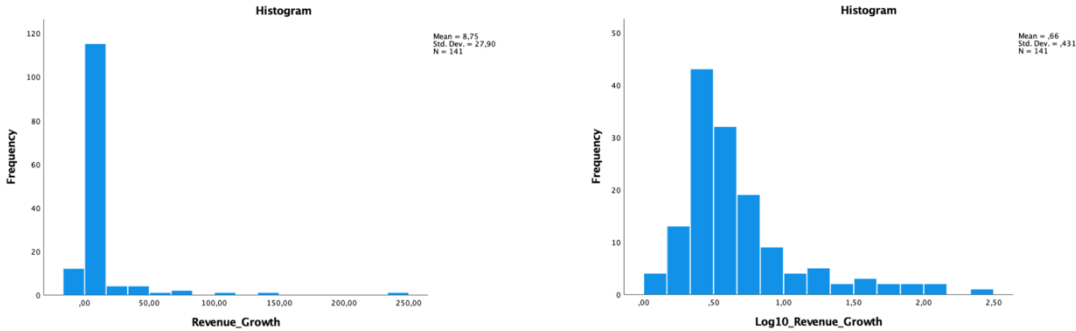


Figure 33: Normal Distribution Revenue Growth

The following table provides all transformed variables included in the analysis, along with the number of observations, mean, standard deviation and the lowest and highest observations.

Table 6

Descriptive Statistics

Variable	N	Mean	Standard Deviation	Min	Max
Tech_Ex	141	11,67	13,41	0	70
Pol_Law_Ex	141	0,52	2,10	0	17
Diverse_Ed	141	0,69	0,47	0	1
Diverse_Ind	141	0,71	0,46	0	1
No_Of_Founders	141	2,09	1,03	1	6
Founding_Ex	141	4,52	8,16	0	63
No_Of_Startups_Founded	141	1,24	2,02	0	18
Charity_Ex	141	0,28	0,45	0	1
Log10_Revenue_Growth	141	0,66	0,43	0	2
Age_Of_Founders	141	34,97	8,88	20	62
Age_Of_Startup	141	5,38	1,94	2	9

4 Findings

In this chapter, we present the most important findings of our empirical research. To begin we discuss the descriptive statistics of the study, including a multicollinearity check, as well as the correlation between the independent variables. This is followed by the regression analysis and the evaluation of its findings.

4.1 Descriptive Analytics

To accurately interpret the results of the regression analysis, multicollinearity, and correlation between the independent variables should be precluded since they might influence the accuracy of the results (Uyanık & Güler, 2013; Heumann, Shalabh & Schomaker, 2016).

Collinearity

If two or more independent variables are strongly correlated, meaning the values of one variable can be predicted by the values of the other and the change in one variable would cause an adjustment in another, this is called collinearity, provoking the model results to vary considerably (Johnston, Jones & Manley, 2017; Harrell, 2001). The existence of considerable collinearity in a multiple linear regression model suggests that the analysis's conclusions may be questioned, owing to a lack of estimation accuracy (Salmerón, García & García, 2018). In that case, the variables should be removed from the regression. The degree of collinearity can be measured by the Variance Inflation Factor (VIF) (Uyanık & Güler, 2013). We chose to review the researcher-recommended small sample size threshold of a VIF of 2,5 (Braun & Yuan, 2006; Johnston, Jones & Manley, 2017). The highest VIF found in the overall regression of this study was 2,033, implying that none of the variables had to be removed (appendix B).

Correlation

To determine whether the different independent variables can be integrated into one regression, some simple associations between the variables were examined. Thereby, variables that affect success, and influence each other are divided into individual regressions to mitigate the potential distortion of the regression results. To analyse the correlation between two ranked variables, Spearman's ρ correlation coefficient is used (Saunders, Lewis & Thornhill, 2016). In our case the three variables *Diverse_Ed*, *Diverse_Ind* and *Charity_Ex* are such variables, since they are binary, ranked 0 or 1. Diverse education and diverse professional experience are strongly correlated (table 7), having both p-values of $<0,001$, whereas a significance level below

$p=0,05$ is considered relevant (Heumann, Shalabh & Schomaker, 2016). One can assume that founders with different educational backgrounds will also work in different professions later. Moreover, a founding team with previous charity activities is also correlated with a more diverse team. This is also not entirely unexpected, as it can be anticipated that a team with different backgrounds increases the likelihood that someone within the team will also have experience in charity. For our analysis, this means that we must conduct three separate regressions on these variables, to avoid flawed results

Table 7
Spearman’s ρ Correlation Matrix

		Diverse_Ed	Diverse_Ind	Charity_Ex
Spearman's rho	Diverse_Ed	Correlation Coefficient	1,000	0,479
		Sig. (2-tailed)		< 0,001
		N	141	141
	Diverse_Ind	Correlation Coefficient	0,479	1,000
		Sig. (2-tailed)	< 0,001	0,002
		N	141	141
	Charity_NGO	Correlation Coefficient	0,314	0,256
		Sig. (2-tailed)	< 0,001	0,002
		N	141	141

Furthermore, when investigating the correlation between ratio variables, the Pearson correlation coefficient needs to be applied which is illustrated in table 8 (Saunders, Lewis & Thornhill, 2016). The matrix of the ratio variables evinced further correlation of the independent variables. One rationale for this is that three of the five variables are measured in years. Therefore, the years of founding experience are strongly related to years of professional experience in technology and number of startups founded. Unexpectedly, work experience in politics and law is not significantly associated with any other variable. However, this can be justified by the relatively low number of observations – a total of 17 teams with experience in that field and a mean of 0,52, compared to a mean of 11,67 in tech (table 6). Finally, it is striking that the number of founders is related to the number of founded startups and the years of experience in technology but has no significant correlation with the founding experience. By discovering these correlations, we opted to run all regressions except the one for H.1.1 and H.1.2 separately to eliminate distorted values.

Table 8

Pearson Correlation Matrix

		Tech_Ex	Pol_Law_Ex	No_Of_Founders	Years_Of_Founding_Ex	No_Of_Startups_Founded
Tech_Ex	Pearson Correlation	1	-0,128	0,203	0,310	0,322
	Sig. (2-tailed)		0,129	0,016	< 0,001	< 0,001
	N	141	141	141	141	141
Pol_Law_Ex	Pearson Correlation	-0,128	1	0,039	-0,090	-0,068
	Sig. (2-tailed)	0,129		0,646	0,291	0,422
	N	141	141	141	141	141
No_Of_Founders	Pearson Correlation	0,203	0,039	1	0,065	0,169
	Sig. (2-tailed)	0,016	0,646		0,446	0,045
	N	141	141	141	141	141
Years_Of_Founding_Ex	Pearson Correlation	0,310	-0,090	0,065	1	0,666
	Sig. (2-tailed)	< 0,001	0,291	0,446		< 0,001
	N	141	141	141	141	141
No_Of_Startups_Founded	Pearson Correlation	0,322	-0,068	0,169	0,666	1
	Sig. (2-tailed)	< 0,001	0,422	0,045	< 0,001	
	N	141	141	141	141	141

4.2 Control Regression Analysis

The following section presents the main findings of our control regression analysis. The strength of the correlation between the independent or control variables and the dependent variable is measured by the R^2 or adjusted R^2 , an indicator for goodness of fit on a scale from -1 to +1 whereas a value close to zero suggests a low fit (Saunders, Lewis & Thornhill, 2016). Many researchers use the regular R^2 as their key indicator (Akossou & Palm, 2013). Nonetheless, we opted for the adjusted R^2 since the R^2 on its own increases incrementally whenever a new variable is added to the analysis, adjusted R^2 penalizes the model for adding new variables and therefore creates a better indicator for actual differences in the change of the value when adding more variables (Harrell, 2001). We aim to investigate whether the control variables have a considerable effect on the relation between the independent and dependent variables. It is therefore important to first conduct the regressions with just the control variable and the dependent variable, to then see how the introduction of the independent variable alters the performance of the regression model (Harrell, 2001). Moreover, the p-value indicates whether the regression is significant. A p-value below 0,05 represents that the observations are statistically significant and thereby the hypothesis can be either confirmed or rejected (Saunders, Lewis & Thornhill, 2016).

There has been no verifiable impact if the p-value was bigger than 0.05, implying that the null hypothesis is true. The adjusted R² and p-value are the values that we will use to analyse the level of significance and the comparison with the independent variable. In the table with the results from the regressions performed, the F-value and R² are also included since they are important values that provide context for the other values and further underpin the results.

The regressions of the control variables and the dependent variable illustrate that the adjusted R² is comparatively low with values of 0,048 and 0,013. That means that the age of the start-up explains 0,48% of the variation in the revenue growth variable, and the average age of the founders explains 0,13%. Subsequently, the independent variables were added, and we observed how the adjusted R² value changed.

Table 9

Control Variable Regression 1

Control Variable: Age_Of_Startup				
Variables	R ²	Adjusted R ²	F	p
Log10_Revenue_Growth	0,055	0,048	8,130	0.005

Table 10

Control Variable Regression 2

Control Variable: Age_Of_Founders				
Variables	R ²	Adjusted R ²	F	p
Log10_Revenue_Growth	0,020	0,013	2,855	0.093

4.3 Independent Regression Analysis

The following section presents the main findings of our independent regression analysis. The adjusted R² increases, when the additional variable improves the regression model more than what would be anticipated by chance (Harrell, 2001). Thereby, it can be observed if the independent variable adds value to the regression.

Professional Experience

The adjusted R² decreases in all regressions related to the prior professional experience of the founders. When adding the *Tech_Ex* and *Pol_Law_Ex* to the *Age_Of_Startup* variable the value diminished from 0,048 to 0,040, and from 0,013 to -0,001 when adding them to the

Age_Of_Founders (table 9, 10 & 11). Hence, when the independent variable is included, the degree of variance in our dependent variable (*Log10_Revenue Growth*) that can be statistically explained by the independent variable decreases (Saunders, Lewis & Thornhill, 2016).

Prior Founding Experience

The adjusted R² decreases in all regressions related to the prior founding experience of the founders. When adding the *Founding_Ex* to the *Age_Of_Startup* variable the value diminished from 0,048 to 0,045, and from 0,013 to 0,008 when adding it to the *Age_Of_Founders* (table 9, 10 & 11). When adding the *No_Of_Startups_Founded* to the *Age_Of_Startup* variable the value decreases from 0,048 to 0,043, and from 0,013 to 0,006 when adding it to the *Age_Of_Founders* (table 9, 10 & 11). Therefore, when the independent variable is included, the degree of variance in our dependent variable (*Log10_Revenue Growth*) that can be statistically explained by the independent variable decreases (Saunders, Lewis & Thornhill, 2016).

Team Size

The adjusted R² decreases in all regressions related to the founding team size. When adding the *No_Of_Founders* to the *Age_Of_Startup* variable the value diminished from 0,048 to 0,042, and from 0,013 to 0,006 when adding it to the *Age_Of_Founders* (table 9, 10 & 11). Therefore, when the independent variable is included, the degree of variance in our dependent variable (*Log10_Revenue Growth*) that can be statistically explained by the independent variable decreases (Saunders, Lewis & Thornhill, 2016).

Team Diversity

The adjusted R² increases in one of the regressions related to the team diversity. When adding the *Diverse_Ed* to the *Age_Of_Startup* variable the value rises from 0,048 to 0,053, and from 0,013 to 0,015 when adding it to the *Age_Of_Founders* (table 9, 10 & 11). Yet, when adding the *Diverse_Ex* to the *Age_Of_Startup* variable the value diminished from 0,048 to 0,042, and from 0,013 to 0,006 when adding it to the *Age_Of_Founders* (table 9, 10 & 11). Therefore, when the independent variable about the educational diversity of the founding team is included, the degree of variance in our dependent variable (*Log10_Revenue Growth*) that can be statistically explained by the independent variable increases (Saunders, Lewis & Thornhill, 2016). For the diverse experience of the team, it decreases. Nevertheless, only the diverse education in combination with the age of the venture also shows overall significant regression results with a p-value of 0,009 and 0,019 (table 11).

Charity Experience

The adjusted R^2 increases in all regressions related to the charity experience within the team. When adding the *Charity_Ex* to the *Age_Of_Startup* variable the value rises from 0,048 to 0,058, and from 0,013 to 0,025 when adding it to the *Age_Of_Founders* (table 9, 10 & 11). Therefore, when the independent variable is included, the degree of variance in our dependent variable (*Log10_Revenue Growth*) that can be statistically explained by the independent variable rises (Saunders, Lewis & Thornhill, 2016). Nevertheless, only the charity experience in combination with the age of the venture is showing overall significant regression results with a p-value of 0,006 (table 11).

We found out that merely the variables *Diverse_Ed* & *Charity_Ex* increase the explanatory value for the variation in the revenue growth variable when adding them to the control variables. Additionally, the two variables only show significant regression results when adding them to the *Age_Of_Startup* control variable and not in combination with the *Age_Of_Founders*. Consequently, we will look at the individual regression results to examine whether they also show significant results on their own.

Table 11

Independent Variables Regression

Independent: Tech_Ex, Pol_Law_Ex				
Control Variables	R ²	Adjusted R ²	F	p
Age_Of_Startup (C1)	0,600	0,040	2,925	0,360
Age_Of_Founders (C2)	0,021	-0,001	0,960	0,414
Independent: Founding_Ex				
Control Variables	R ²	Adjusted R ²	F	p
Age_Of_Startup (C1)	0,058	0,045	4,267	0,016
Age_Of_Founders (C2)	0,023	0,008	1,596	0,206
Independent: No_Of_Startups_Founded				
Control Variables	R ²	Adjusted R ²	F	p
Age_Of_Startup (C1)	0,057	0,043	4,158	0,018
Age_Of_Founders (C2)	0,020	0,006	1,432	0,242
Independent: No_Of_Founders				
Control Variables	R ²	Adjusted R ²	F	p
Age_Of_Startup (C1)	0,055	0,042	4,040	0,020
Age_Of_Founders (C2)	0,020	0,006	1,418	0,246
Independent: Diverse_Ed				
Control Variables	R ²	Adjusted R ²	F	p
Age_Of_Startup (C1)	0,066	0,053	4,891	0,009
Age_Of_Founders (C2)	0,029	0,015	2,070	0,130
Independent: Diverse_Ex				
Control Variables	R ²	Adjusted R ²	F	p
Age_Of_Startup (C1)	0,056	0,042	4,078	0,019
Age_Of_Founders (C2)	0,020	0,006	1,430	0,243
Independent: Charity_Ex				
Control Variables	R ²	Adjusted R ²	F	p
Age_Of_Startup (C1)	0,071	0,058	5,294	0,006
Age_Of_Founders (C2)	0,039	0,025	2,782	0,065

4.4 Individual Regression Results

To examine whether the aforementioned variables show significant results on their own, we will look at the individual p-values. If they display values lower than $p=0,05$, we can conclude that they have a relevant influence on the revenue growth, and hence are statistically significant (Saunders, Lewis & Thornhill, 2016). To then further understand what kind of impact they have, we will analyse the unstandardised β -value. In the linear regression model, β is the alteration in the predicted value of Y per unit change in X (Harrell, 2001).

Examining the individual results of the single regressions, it can be noted that none of the variables has a significant influence on the dependent variable, as they all have p-values above 0,05 (table 12). According to the prior analysis, only the age of the venture, so the control variable, has a statistically significant result with a p-value of 0,005. Hence, none of the hypotheses can be refuted nor confirmed.

Therefore, we will take a closer look at the unstandardised β -value of the control variable. In the individual regression table, one can see the \log_{10} values to which the revenue growth would change with every step the independent variables are increasing. As startups age, revenue growth changes with each passing year. In order to find out the actual change in the value of the dependent variable – we need to inverse the \log_{10} of the β (-0,520) and subtract the two that we added in the beginning when we recoded the variable to put the value of the figures back into the original context. That process looks as follows:

$$\text{Inverse } \log_{10} \beta \text{ of } \textit{Age_Of_Startup}: 10^{-0,520} = 0,302$$

$$\text{Subtract 2: } 0,302-2 = -1,698$$

This calculation says that with every year the startup is older than the constant, which is 2 in our case since the youngest startup was founded in 2019, the revenue growth decreases by 169,8%.

We already emphasized before that the age of the startup has a significant impact on the revenue growth which also explains why the significant regressions in this analysis all were including that control variable. It is thereby also the driving factor that led to these results. Nevertheless, when looking at the individual variables (table 12), one can observe that none of these independent variables on their own show any significant results. For this reason, it is not purposeful at this point to further examine the unstandardised β -values of these variables to find out to what extent the team characteristics of a climate tech start-up can influence sales growth since the results will have no relevant evidence.

Table 12

Individual Regression Results

Variables	Age_Of_Startup (C1)		Age_Of_Founders (C2)	
	β	p	β	p
Constant	0,945	<0,001	0,905	<0,001
Control	-0,520	0,005	-0,070	0,093
<i>H1.1 + H1.2</i>				
Constant	0,967	<0,001	0,894	<0,001
Tech_Ex	-0,002	0,422	-0,001	0,817
Pol_Law_Ex	-0,006	0,722	-0,002	0,901
Control	-0,510	0,007	-0,006	0,206
<i>H2.1</i>				
Constant	0,948	<0,001	0,889	<0,001
Founding_Ex	-0,003	0,510	-0,003	0,555
Control	-0,050	0,008	-0,006	0,159
<i>H2.2</i>				
Constant	0,956	<0,001	0,904	<0,001
No_Of_Startups_Founded	-0,008	0,632	-0,003	0,865
Control	-0,520	0,005	-0,007	0,106
<i>H3</i>				
Constant	0,938	<0,001	0,906	<0,001
No_Of_Founders	0,003	0,931	-0,001	0,988
Control	-0,520	0,006	-0,007	0,102
<i>H4.1</i>				
Constant	1,026	<0,001	0,983	<0,001
Diverse_Ed	-0,098	-0,249	-0,089	0,260
Control	-0,055	-0,091	-0,007	0,073
<i>H4.2</i>				
Constant	0,968	<0,001	0,893	<0,001
Diverse_Ex	-0,023	0,777	0,013	0,877
Control	-0,054	0,005	-0,007	0,101
<i>H5</i>				
Constant	0,994	<0,001	0,992	<0,001
Charity_Ex	-0,122	0,125	-0,134	0,104
Control	-0,055	0,003	-0,008	0,047

5 Conclusion

This chapter draws inferences from the findings. Additionally, theoretical contributions and consequences for practitioners are offered. Finally, the study's constraints and ideas for further research are given in the concluding section.

5.1 Discussion

As research illustrates the characteristics of a founding team have a substantial impact on the success of a venture (e.g., Gompas et al., 2020). Therefore, hypotheses were derived to validate this phenomenon for founding teams of climate-tech ventures. However, our results suggest that the influence of the examined characteristics on revenue growth is not statistically significant. Thus, no direct implications can be derived for our initially developed framework as the anticipated success factors could be neither confirmed nor rejected. Only the age of a climate-tech startup negatively impacts performance. Hence, our research question cannot be adequately answered and the development of an elaborate guideline for VCs when assessing climate-tech venture teams is not possible. Furthermore, we will discuss potential reasons for this outcome that none of the hypotheses can be confirmed or refuted.

Sample

First, the examined dataset is relatively small which can compromise the internal and external validity of a study as small datasets usually have a higher variance which obscures the recognisability of clear results (Faber & Fonseca, 2014). Furthermore, access to financial capital and funding is often considered a driving force of sustainable ventures (Bocken, 2015). As VCs already function as a first quality assessment of the ventures the sole consideration of VC-backed startups entails that the sample is already biased which explains why most outliers were above the average and rarely below. Thus, a larger sample with VC-funded and non-VC-funded ventures could have added additional meaningfulness to the results.

Revenue growth as a performance measure

Another key rationale for the insignificance of the analysis is the selection of the performance indicator. First, revenue growth was found to follow a non-linear development which impedes the obtention of reliable findings as the different ages of the startups potentially distorted the averages (Saunders, Lewis & Thornhill, 2016). Specifically, volatility in revenue growth increased as ventures generated very little turnover in the first year and eventually grew strongly

in year two before the turnover curve flattened. Thus, as revenue is small or close to zero in year one, it is easier to achieve large growth rates because the numbers are overall smaller. On the one hand, this justifies why the revenue growth is significantly affected by the age of the firm as for startups founded in 2019 a maximum of two years of revenue data were incorporated, which will probably be the years with the highest growth rates. Regarding the impact of the age our findings suggest that each year after launch, the revenue growth decreases by 169%. On the other hand, this volatility can also elucidate the non-significant results, since this led to a high skewness in the normality test, even after the \log_{10} transformation when the curve was still positively skewed (a figure of the boxplot can be found in appendix c). Furthermore, a study by Murphy, Trailer, and Hill (1996) points out that there is little uniformity in performance measurement of entrepreneurial ventures among studies and instead, a wide variety of measures were used. Hence, including more performance indicators to predict success such as valuation, profitability or number of employees could have increased the likelihood of team characteristics showing significant effects (Gorgievski, Ascalon & Stephan, 2019). Especially, as climate-tech ventures might attract purpose-driven employees who add outstanding engagement, also called successful idealists (Linnanen, 2002), and thereby accelerate the progress of a venture (Patzelt & Shepherd, 2011), the employee growth could be a valuable performance indicator.

Relevance of the independent variables

Comparable to our study, Piva & Rossi-Lamastra (2018) researched the effects of founding teams on the obtention of crowdfunding. Similar to the observed findings in this research, other education and work experience, as well as industry-specific education and work experience, did not significantly influence the success of entrepreneurs in equity crowdfunding. This reveals a pattern that the determination of the influence of a construct such as team experience on the success of a venture is difficult to statistically prove. The reason could be that professional experience is a difficult construct to quantify and compare as for example Schmidt, Hunter, Outerbridge, and Goff (1986) found that higher job abilities are relatively independent of years of experience, especially in the first years. Thus, measuring the construct of work experience in years solely could explain why no significant relationship was proven. Furthermore, the classification of work experience in the category of technology was possibly too general to reflect distinctive characteristics of the founders as the field of technology is broad-reaching from developers to engineers.

Additionally, as no evidence was detected that team characteristics influence venture performance the proposed team features can still have a positive impact in another sample or measuring procedure. This leads to the general assumption that the importance of the team might have been overestimated in this study. As our developed theoretical framework illustrated, next to the team, the business model, industry, and financial forecast are also essential for venture success. Thus, a more holistic assessment of the venture, evaluating the team in combination with the other factors might be of greater explanatory value. For example, Raudeliunien, Tvaronaviciene and Dzemyda (2014) compiled a comprehensive framework for success factors of sustainable entrepreneurship which combines a sustainability dimension, regarding the use of resources, the ability to resist market pressure and stay value-driven, following a niche strategy, and mastering entrepreneurial skills.

5.2 Practical Implications

Firstly, building on the results found whilst keeping the limitations in mind, VCs should not solely focus on the characteristics of a venture team when investing in climate-tech startups as neither previous work expertise, entrepreneurial experience, charity engagement nor team diversity significantly affected revenue growth. However, VCs might still consider team features for other purposes than just financial success in terms of revenue growth for example to establish a good work relationship.

Furthermore, the findings showed that with the increasing age of a climate-tech venture revenue growth decreases and hence several implications can be drawn from this. First, the hockey stick pattern in revenue growth that VCs desire to see (Martin, 2016), might not apply to climate-tech ventures as the broad range of sectors might decrease the scalability that solely software-based, high-tech startups can achieve. Thus, when evaluating climate-tech ventures an in-depth analysis of the scalability of the business model might mitigate this observed phenomenon. Besides, more long-term investments (Mrkajic, Murtinu & Scalera, 2017; Bocken, 2015) could be a solution to participate in the enhanced performance, as incremental growth rates usually occur at a later stage (Martin, 2016). Moreover, to maintain increasing growth rates, sustainable startups might also consider enlarging their marketing budgets in the first years after the foundation.

5.3 Limitations

Whilst understanding the findings of this study, several limitations need to be considered which influence the reliability and validity.

Firstly, to identify climate-tech ventures the primary sample selection relied on the database Dealroom. This entails, that the data is not sourced from an official governmental institution, decreasing the reliability of the data available. Moreover, the primary sample could have been enriched by using other databases or manual online research to increase the sample size and receive more significant results. Another limitation is that only startups in the Nordic countries were investigated. As a result, our findings are context-dependent, and identical studies conducted in various cultural contexts may provide different outcomes (Bell, Bryman & Harley, 2019). However, because the Nordics are among the most environmentally conscious countries in the world, they provided the ideal setting for our research.

Secondly, the data quality of the characteristics of the founding team is limited as several information was missing and thus estimations were used. By cross-checking LinkedIn profiles with the companies' websites and news articles the completeness and accuracy of the founder characteristics were increased.

Thirdly, regarding the performance data only revenue growth was considered as a performance measure, however, to increase validity especially climate-tech ventures' success can also be assessed by their sustainability impact e.g., CO2 emission reduction. Moreover, for most ventures the revenue growth data was not available for all years since the founding date, therefore distorting the accuracy of the average. Finally, as we have analysed performance data until 2022, the Covid-19-Pandemic might also have differently affected on certain business models and age stages of ventures.

5.4 Directions for Future Research

Our findings can provide valuable ideas for future research. First, it would be interesting to conduct a long-term study with a larger sample and repeated observations of the same factors to determine whether the different analysed team attributes do show a significant impact on the performance of climate-tech firms. Furthermore, based on our limitations it could be insightful to assess if other countries with lower sustainability levels will lead to equal results or if team traits might affect venture performance differently. Additionally, next to team characteristics,

literature discussed success factors of sustainable ventures such as a novel business model or collaborations with larger corporations which could further be explored in a similar approach as this study.

Furthermore, as we found highly volatile revenue growth developments for climate-tech ventures it could be valuable to further investigate the innovation cycle and adoption rates of climate-tech products and services to improve strategic and financial planning.

Finally, because the literature on venture capital and climate-tech companies is still limited, researchers can identify many uncharted areas. Given that venture capital is not always the ideal approach to fund climate-tech ventures (de Lange & Vallerie, 2020), future research should investigate alternative funding options such as corporate venture capital, crowdfunding platforms, or governmental support to further support the emergence and growth of climate-tech ventures to reach the investment targets of the IPCC (2022) and improve the chances to limit global warming to 1,5 degrees.

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Appendices

Appendix A

SDGs

The 17 SDGs acknowledge that overcoming poverty and other forms of deprivation must be combined with efforts to enhance health and education, decrease inequality, and boost economic growth – all while fighting climate change and protecting our oceans and forests (UN, n.d.). The SDGs build the center of the 2030 Agenda for Sustainable Development which provides a shared roadmap for peace and prosperity for people and the planet today and in the future. This agenda was adopted by all UN Member States. The following table gives a short elaboration of the 6 SDGs that are closely related to climate-tech ventures.

SDG	Description
Climate Action (13)	Take immediate action to address climate change and its consequences.
Affordable and Clean Energy (7)	Ensure that everyone has access to energy that is affordable, reliable, sustainable, and modern.
Responsible Consumption and Production (12)	Ensure both consumption and production patterns are sustainable.
Life on Land (15)	Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, battle desertification, and stop and reverse land degradation and biodiversity loss.
Clean Water and Sanitation (6)	Ensure universal access to water and sanitation, as well as long-term management.
Life Below Water (14)	For sustainable development, conserve and sustainably utilise the oceans, seas, and marine resources.

Appendix B

Check for Collinearity

Model		Coefficients ^a								
		Unstandardized Coefficients		Standardized Coefficients		Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	t		Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1,168	,241		4,852	<,001	,692	1,644		
	Age_Of_Startup	-,049	,020	-,218	-2,468	,015	-,088	-,010	,887	1,127
	No_Of_Founders	,022	,045	,052	,491	,624	-,066	,110	,619	1,615
	Divers_Ed	-,099	,093	-,107	-1,071	,286	-,283	,084	,694	1,441
	Divers_Ind	,033	,098	,035	,339	,735	-,160	,227	,651	1,537
	No_Of_Startups_Founded	,002	,025	,009	,077	,939	-,047	,051	,511	1,958
	Years_Of_Founding_Ex	-,002	,006	-,043	-,364	,717	-,015	,010	,492	2,033
	Ind_Tech_Years	-9,446E-5	,004	-,003	-,025	,980	-,008	,007	,505	1,979
	Ind_Pol_Law_Years	,004	,018	,017	,196	,845	-,032	,039	,891	1,122
	Charity_NGO	-,142	,090	-,148	-1,580	,117	-,321	,036	,789	1,268
	Average_age	-,006	,006	-,116	-1,011	,314	-,017	,005	,527	1,897

a. Dependent Variable: Log10_Revenue_Growth

Appendix C

Normality Test after log10

