Preferences for carbon information

A Discrete Choice Experiment with Swedish non-professional investors

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Degree project/Independent project • 30 credits
Swedish University of Agricultural Sciences, SLU
Faculty of Natural Resources and Agricultural Sciences/Department of Economics
Environmental Economics and Management - Master's Programme
Degree project/SLU, Department of Economics, 1530 • ISSN 1401-4084
Uppsala 2023

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Credits:	30 credits
Level:	Second cycle, A2E
Course title:	Master thesis in Business Administration
Course code:	EX0904
Programme/education:	Environmental Economics and Management – Master's Programme
Course coordinating dept:	Department of Economics
Place of publication:	Uppsala
Year of publication:	2023

Title of series:	Degree Project/SLU, Department of Economics
Part number:	1530
ISSN:	1401-4084

Keywords:	discrete choice experiment, investment preference, GHG target, carbon information, target progress, carbon disclosure, non-professional investors, impact investing, sustainable and responsible investments, SRI.

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Abstract

GHG targets, an aspect of carbon disclosure are an integral part of corporate carbon management and overall carbon accounting. GHG targets and the target-related attributes – including target difficulty, target progress, and external validation of target as a science-based target, along with past GHG emission performance are attributes related to carbon information that is increasingly included in the corporate carbon disclosures. However, challenges persist questioning the relevancy of the targets and the effectiveness of its role, not only to corporate carbon management but also to external stakeholders. In this study, the focus is on non-professional investors. Impact investing is a relatively underexplored domain, there is unsettled uncertainty about what implication can carbon information, specific to GHG targets and the target-related attributes, have on investment decision-making. Therefore, this study conducted a discrete choice experiment with a panel of Swedish Non-professional investors to examine the roles of these attributes in influencing investors' preferences on impact investment choices.

The findings from this research study show that GHG attributes are relevant for investors in prioritizing their impact investment choices. The results show the highest preference for target progress followed by target difficulty which is higher than the target being externally validated as science-based. Additionally, the results showed the highest negative estimates for GHG emissions lower than the industry average suggesting aversion towards companies with higher emissions. These results show that these attributes are relevant for investors in making impact investment decisions. However, investors also take other conventional fund attributes like expected return and level of risk associated with the investment alternative into consideration while making investment decisions. The results show the positive return is at least expected even though the willingness to pay estimates from the results suggest that the non-professional investors are willing to forgo part of their expected marginal return for the level of GHG attributes that indicates positive and higher environmental commitment and performance.

Keywords: discrete choice experiment, investment preference, GHG target, carbon information, target progress, carbon disclosure, non-professional investors, impact investing, sustainable and responsible investments, SRI.

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Abbreviations

AIC	Akaike Information Criterion
BIC	Bayesian Information Criterion
CDP	Climate Disclosure Project
CFA	Confirmatory Factor Analysis
CLM	Conditional Logistic Model
CSR	Corporate Social Responsibility
CSRD	Corporate Social Responsibility Disclosures
DCE	Discrete Choice Experiment
EU	European Union
GHG	Greenhouse Gases
GRI	Global Reporting Initiative
HMNL	Heterogenous Multinominal Logit
IIA	Independence of Irrelevant Alternatives
IID	Independent and Identically Distributed
IPCC	International Panel on Climate Change
MNL	Multi Nominal Logit
RUT	Random Utility Theory
SBTs	Science-based Targets
SBTi	Science Based Target initiative
SEM	Structural Equation Modeling
SLU	Swedish University of Agricultural Sciences
SRI	Sustainable and Responsible Investments
UN	United Nations
WCS	Weighted Composite Score
WTP	Willingness to Pay

1. Introduction

This section includes the background and the problem statement, followed by the aim and objectives of the study and its scope and delimitations. It is then followed by an outline section.

1.1 Background

In recent times, public interest in impact investing has picked up momentum. For instance, a study shows that investments in sustainable assets total 35.3 trillion US dollars in 2020 across the key financial market in Europe, the United States, Canada, Australasia, and Japan together (GSIA, 2021). This amount was about 22 trillion US dollars in 2016 and about 30 trillion US dollars in 2018. This demonstrates a gradual but increasing shift toward sustainable and impact investing. Impact investing refers to investment practices whereby investors seek to make contributions to social and environmental values in addition to generating economic benefits and financial gains. Moreover, the emergence of policies, frameworks, and regulations requiring companies to report on sustainability practices has also increased sustainability reporting practices such as carbon disclosures globally (GRI, 2021; Andrew and Baker, 2020). For instance, with the global calling for limiting global temperature to 1.5 degrees Celsius (IPCC, 2018) by reducing net emissions, in this context, companies are also recognizing the urgent need to address climate change. It has led to a significant increase in the reporting of carbon emissions and related information about performance and practices (GRI, 2021). Consequently, carbon disclosures are gaining popularity among corporations and the public equally.

Literature on impact investing and the impact of carbon reporting suggests more impact investors are seeking information about companies' emissions and environmental impacts. And they are also increasingly making efforts to align their investments with sustainability (Clark et al., 2015). In this context, investors value information related to greenhouse gas (GHG) emissions and the level of intensity as well as companies' action for mitigating the negative impact which is disclosed in the carbon disclosures. This allows them to make informed investment decisions. Carbon disclosures include information about emission intensity, carbon targets, emission reduction actions that are undertaken, and other key performance indicators related to carbon performance. In addition, studies show environmental risks – for example, higher carbon emission intensity, can significantly affect the financial performance of a company. This makes carbon information related to companies' carbon emissions, and

companies' emissions reduction goals increasingly important to investors (Wang, 2023; Emambakhsh et al., 2022; Clark et al., 2015).

This study focuses on non-professional investors *(also referred to as retail investors, individual investors, or private investors and is used synonymously in the latter part).* Non-professional investors refer to the group of investors who has limited competencies and skills in evaluating available investment alternatives in comparison to other professional investors. They mostly invest in small amounts compared to larger institutional investors. Nevertheless, research has shown a significant role of retail investors in financial markets (Kumar and Lee, 2006). Additionally, the share of contribution from the retail investor in impact investment is growing globally. For instance, it comprises 25% of the total value of investments held in sustainable assets in 2020 compared to 11% held in 2016 (GSIA, 2021). These trends indicate the growing interest of the retail investor, but it is still only a quarter of the total value of the investment in impact-investment assets indicating a potential for further growth in the future. Therefore, this study intends to investigate the effects of the attributes related to carbon information on non-professional investors' preferences for impact investment choices, with an intention to further contribute to the field of impact investing.

1.2 Problem statement

Emergence and improvements in standards and reporting framework have given rise to voluntary reporting (Andrew and Baker, 2020) of the disclosures. But the 'sustainability gap' persists (Milne and Gray, 2013) suggesting a discrepancy – for example, between the prevalence of disclosure practices and the substantial level of progress the company needs to attain an adequate impact. Additionally, while carbon targets are highly material for both companies and investors, and most companies now set their emissions reduction targets (Johnson et al. 2019), having targets alone is insufficient to achieve the necessary emission reductions (Wang and Sueyoshi, 2018). It is also reported that companies often omit their baseline emissions and additionally, Scope 3 emissions which are more challenging to calculate in their carbon disclosures (ibid). This has several consequences – for example, inadequate targets leading to greenwashing which indicates that organizations are failing to achieve substantive progress that is needed for positive impacts. Additionally, the lack of availability of baseline data limits comparisons, thus, affecting investors' ability to make informed impact investment decisions.

Additionally, Wang and Sueyoshi (2018) suggest fewer companies have stringent targets that are aligned with the Intergovernmental Panel on Climate Change (IPCC) climate goal. Further, a study indicates companies are failing to disclose all key indicators, with only 0.4% out of 12,337 companies, included in the study, disclosing all key indicators in their sustainability reports (CDP, 2023). Consequently, it is emphasized that setting ambitious climate targets for companies helps to close the gap between the current level of GHG emissions and a desired level of emissions that is sustainable. It is suggested that companies setting difficult, ambitious targets have a higher rate of completing these targets (Ioannou et al., 2016). Furthermore,

adopting Science-based targets is suggested to ensure that these emission reduction goals are effective and are aligned with the IPCC goals (Faria and Labutong, 2019). However, the challenges remain in examining the effectiveness of SBTs in influencing individual investors' decisions related to impact investing as the investors may have differing criteria for what counts as effective targets.

Therefore, all the practical challenges discussed above suggest that further research is needed to fully understand the potential practical implications of having science-based targets (SBTs), higher target difficulty levels for emissions reductions, the status of progress, etc., for driving investors' decisions related to sustainable investment. This is further supported by Arnold and Artz (2015). It can be inferred that carbon information – including emission intensity, emission reduction targets, and status of progress, is significant in directing the attention and motivation of investors, facilitating investment, and tracking progress. In addition, carbon disclosure, carbon management, performance, and assurance are the four main streams in carbon accounting (He et al., 2021). Thus, carbon information is equally relevant for managing the company's carbon aspirations and other sustainability strategies and practices from the carbon accounting perspective.

Research Gap

The practical problems and the challenges discussed above undoubtedly highlight limitations that prevail in carbon disclosures *(an aspect of corporate carbon management and carbon accounting).* Additionally, it also highlights the significance of information related to carbon disclosure, for example – emissions intensity, emissions targets, etc., indicating the level of progress in facilitating impact-investment decisions. However, the majority of the existing research on impact investing and the impact of carbon disclosures, for example – Johnson et al. (2019), Matsumura et al. (2014), Clarkson et al. (2015), and Paetzold et al. (2022), etc. focus mainly on the general implication of carbon disclosure on investment decisions. Additionally, the existing literature on ESG and impact investing, for example – Bassen et al. (2019), Friede et al. (2015), Jaggi et al. (2018), Paetzold et al. (2022), use a market-valuation approach where aggregate market data related to stock prices are used for analyzing investment decisions.

Moreover, during the preliminary literature review, no specific studies that studies about GHG targets were found that use Discrete Choice Experiments (DCE) to examine the preference of non-professional investors in the context of impact investing. This suggests, despite the growing interest in impact investing, there is limited research in this specific area related to GHG targets within the domain of impact investing. Additionally, a study indicates a relatively underexplored state of impact-investing research as being exploratory and emphasize more confirmatory studies (Agrawal and Hockers, 2021), one of the domains in impact-investing being the studies related to non-professional investors' preferences for carbon information (Bassen et. al., 2019; Johnson et al., 2019). Thus, a novel topic, as this one, investigating the relevancy of carbon information, for instance – by examining the effect of GHG targets *(and the related attributes),* specific to carbon information, on the non-professional investors'

preferences using choice experiments would add to the existing but underexplored domain of impact-investing research.

1.3 Research aim, objectives, and research questions

This study aims to investigate and understand the effects of the different attributes related to carbon information on non-professional investors' preferences for investment choices in the context of impact investing.

To fulfill the aim of the study, it analyses the stated preferences of Swedish non-professional investors to answer the following research questions.

1. What direct and indirect effects do the carbon information attributes have on the Swedish non-professional investors' impact investment preferences?
2. What are the willingness-to-pay estimates for different carbon information attributes?
3. What socio-economic and behavioral variables are associated with the stated choice preferences of Swedish non-professional investors?

1.4 Scope and delimitations of the study

This study is limited to the geographic focus of Sweden. Although existing research on individual behavior towards impact investing covers two parallel strands, namely professional investors, and other private investors it only includes the study of Swedish non-professional investors' preferences. Moreover, the specific focus is on only one aspect of corporate sustainability reporting, i.e., carbon disclosure but in the context of impact investing. This study is limited and only considers topics about carbon disclosures including attributes related to carbon information that are reported in the sustainability reports. Attributes related to carbon information that are studied in this research study includes information related to carbon emissions *(or GHG emissions used synonymously hereafter)* which is also referred to as the company's GHG intensity, emission reduction targets, and the GHG targets-related attributes. Additionally, other methodological limitations are addressed in the limitation section in the latter part of this report.

1.5 Outline of the Report

This report is divided into six sections. The first section is the introduction chapter. It is followed by a chapter on literature review and hypotheses development. Section three then describes the methodological approach followed by the fourth part which presents the results. Additionally, the fifth section is the discussion chapter, and the last section is the concluding chapter which concludes the study.

2. Literature Review and Hypotheses Development

This section presents a literature review on carbon disclosures and impact investing describing several attributes of carbon information and the potential effects of those attributes on non-professional investors' preferences in the context of impact investing. In doing so these topics related to carbon disclosure and impact investing are also assessed from the perspectives of legitimacy theory to gain insight into the interaction between these attributes and the implication of those interactions on the investors' preferences. Additionally, perspectives from behavioral finance are used to assess and gain insights into different socioeconomic and behavioral factors that are associated with preference heterogeneity. Altogether, these concepts and literature motivate the development of hypotheses and the analysis of this study.

2.1 Carbon information attributes and its investment implications

Literature on carbon disclosures and impact investing has shown the significance of carbon information in managing carbon information and impact investment decisions (Apostolakis et al., 2018; Dahlmann et al., 2019; Freiberg et al., 2021; Johnson et al., 2019; Kleffel and Muck, 2022). These papers highlight the impact of this information on the shareholders' value and investors' decisions as well as its effects on corporate sustainability performance. Having said that, carbon reporting *(or carbon disclosure, hereafter used synonymously)* is an aspect of sustainability reporting that reports about a company's commitment to addressing climate change through reporting on its environmental, social, and governance performance that is material to stakeholders (GRI, 2016). Moreover, sustainability reporting has evolved and has become a part of a company's integrated reporting to meet the information needs of stakeholders. Furthermore, more recent developments are impact reporting which includes quantified data about the firm's environmental impacts and its contribution to sustainability goals (Busch et al., 2021; Howard-Grenville, 2021).

Several factors relating to the carbon information attributes have implications for investment preferences. Studies have shown that not only the historical emissions information including greenhouse gas (GHG) emission performance but also forward-looking information including carbon targets are key to the transition to a low carbon economy (Freiberg et al., 2021; TFCD, 2017; Wang et al., 2022). Additionally, the increasing significance of variables such as target

difficulty, target progress, and Science-based target validation are identified as other key information that is included in carbon disclosure (Dahlmann et al., 2019; Freiberg et al., 2021).

Overall, the literature emphasizes the significance to assess firms' carbon performance, disclose their progress toward ambitious reduction goals, and set science-based targets to understand their carbon footprint to achieve the effectiveness of their climate goals related to carbon emission (Dahlmann et al., 2019; Freiberg et al., 2021; Johnson et al., 2019). Therefore, an in-depth understanding of key attributes related to carbon information is significant for setting reporting frameworks and carbon management and, equally important is to understand the effects of carbon information for driving impact investment decisions (Dahlmann et al., 2019; Johnson et al., 2019).

2.1.1 GHG emissions performance

Literature suggests that higher levels of GHG emissions negatively affect a firm's value, but the magnitude of how the firms are affected varies by region and study (Chapple et al., 2013, 2013; Griffin et al., 2017; Matsumura et al., 2014; He et. al., 2021; Clarkson et. al., 2015). In addition, research on the impact of environmental performance suggests that negative *(positive)* corporate social responsibility (CSR) has a negative *(positive)* impact on investment decisions (Haji et al., 2021; Johnson et al., 2019). Furthermore, Johnson et al. (2019) points out, that the types of emissions management strategy disclosed including – for example, switching to renewable energy sources, carbon offsets and carbon pricing mechanisms, etc., do not affect the scores of companies that are already above the industry average GHG emissions intensity, but it does affect the scores of companies that are below the average.

Disclosure of information on positive carbon performance impacts can lead to reputational benefits and improved stakeholder relationships for companies while demonstrating a positive correlation between ESG performance and company value (Dahlmann et al., 2019; He et al., 2021). Moreover, Barber et al. (2021) show that positive environmental impacts have the highest willingness-to-pay estimates indicating investors are willing to pay higher prices for green stocks. Similarly, a study by Jo and Harjoto (2012) found that companies with higher environmental ratings have higher market value. This suggests that environmental performance is positively valued by investors. In this context, private investors have the potential to contribute significantly to climate change investments, with a multiplier effect that attracts additional capital. Additionally, empirical studies have shown that investment in sustainable funds is growing, but this represented only a minuscule proportion of the total investment in conventional funds and suggests the opportunity for growth (GSIA, 2021).

Overall, carbon emissions performance has a positive impact on enterprise value (He et al., 2021). It serves as a moderator variable, affecting the relationship between environmental disclosure and firm value. This shows the importance of carbon emissions management in increasing enterprise value and its potential benefits in increasing the value of other environmental information. However, it is important to consider other aspects of carbon

management strategy, as emissions performance is not the only predictor of future performance and impact.

Hypothesis 1: *The probability that the investors will choose investment alternatives increases with lower past GHG emissions.*

2.1.2 Carbon targets as the elements in carbon disclosures

Disclosure of environmental information is significant to investors. Not only past emissions performance but also an expectation for future environmental performance is material. As such, carbon targets of firms depicting their action plans to curb GHG emissions are significant for managing the companies' carbon aspirations. Several other aspects such as emissions strategy credibility, accountability, materiality, stakeholder engagement, supply chain sustainability, etc. are also equally important to investors. However, this study specifically focuses on carbon targets besides past emission performance. Several studies have examined the presence of carbon targets (Johnson et al., 2019; Luo and Tang, 2014), the difficulty (Dahlmann et al., 2019; Freiberg et al., 2021; Ioannou et al., 2016), and carbon management and target achievement (Johnson et al., 2019) in the context of sustainability performance and decision making.

Target difficulty

Carbon targets are integral tools for corporate planning and management control and are used in internal carbon management systems to achieve climate goals (Flamholtz et al., 1985; Luo and Tang, 2014; Schaltegger and Csutora, 2012). Targets help plan, coordinate, review, and allocate resources to help companies achieve their carbon reduction goals (Arnold and Artz, 2015). They also signal progress to investors and relevant stakeholders. In this context, target difficulty, an attribute of interest in this study, is a key element of the target-setting process (Freiberg et al., 2021; Locke and Latham, 2013). This suggests that a challenging carbon reduction target if achieved, can have a large impact on corporate climate goals. Therefore, setting challenging carbon targets is critical to encourage corporate commitment to carbon reduction goals. Goal-setting theory suggests that the difficulty of a goal is positively associated with performance, leading to increased effort, intensity, and attention to planned activities, as well as the discovery of innovative solutions to problems (Locke and Latham, 2013.).

As most large companies worldwide have some type of carbon target, it is critical to explore not only the impact of the presence of the target but also the effectiveness of the targets and their impact on impact-investment preferences, as this is an under-researched area (Johnson et al., 2019). Therefore, it is critical to understand the nuances of how the difficulty of achieving a carbon target affects investor preferences.

Hypothesis 2a: *The probability that the investors will choose the investment alternative increases with a higher level of target difficulty.*

Science-based Targets

Science-based targets (SBTs) are targets approved by the Science-based Target Initiative (SBTi) and *align firms' target levels of emissions reductions with the Paris Agreement's guidelines (i.e.,' 1.5-degree Celsius decarbonization pathways')* ensuring the target difficulty is maintained for *scope 1* and *scope 2* related emissions (SBTI, 2020a, 2020b). Additionally, Freiberg et al. (2021) found that validation of targets as SBTs is positively associated with a target difficulty having higher levels of emission reduction goals. This has implications for the company's environmental performance, for instance, a study by Ioannou et al. (2016) suggest companies with more difficult target has a higher rate of target achievement suggesting companies' commitment toward climate objective – for instance, IPCC net zero decarbonization pathways. To link with a study by Flammer (2021) that suggest commitment toward sustainability signal investors to positively react toward the company, it can be argued SBTi validation of emissions reduction targets can positively impact a company's reputation and further the company's financial performance and drive substantive innovation that is needed to maintain the reputation in long run.

However, while SBTs can enhance a company's symbolic legitimacy *(see 2.1.3 for discussion on symbolic legitimacy)*, studies suggest that their effectiveness in driving substantive change is limited (Christensen et al., 2021; Dahlmann et al., 2019). Investors may prioritize other factors when making investment decisions, and there is the possibility of "greenwashing" (Bassen and Kovács, 2020), which may lead to a misalignment between SBTi-approved targets and actual emissions reduction efforts. Dahlmann et al. (2019) also note that the impact of SBTi validation on investment decisions may depend on the preferences and priorities of specific investors. Nevertheless, SBTs being relatively new and emerging practices for emissions target setting, it remains to explore the effects of SBTs on overall carbon management, their relevancy to impact investors, and their potential legitimizing role. Or additionally, the question remains if it is yet another tool for signaling and symbolizing label to legitimatize the claims made by the corporations. However, in this study, only the relevancy of SBTs indicating the potential effect of SBTs on investment preferences is taken into consideration.

Hypothesis 2b: *The probability that the investors will choose the investment alternative increases with the validation of targets as being science-based targets.*

Target progress

Sustainability performance and progress toward sustainability targets positively influence investor decisions (Johnson et al., 2019; Milne and Patten, 2002). Progress toward targets demonstrates the firm's commitment to sustainability (ibid.). In addition, this corresponds to the finds by Johnson et al. (2019) discussed earlier, that investors are more likely to invest in companies that have made substantial levels of progress toward achieving those targets besides just having set the emission reduction targets. Additionally, companies that have made progress on their targets are more likely to actively engage with their investors on climate-related issues. Target progress and achievement can also signal to investors that a company can implement

plans, mitigate future climate risks, improve its reputation, and secure economic benefits (de Villiers et al., 2014; He et al., 2021).

However, it is important to note that the effectiveness of targets in influencing investor behavior may depend on certain attributes, such as their specificity, difficulty, and alignment *(for example with SBTi climate goals)* (Bjørn et al., 2022; Dahlmann et al., 2019; Giesekam et al., 2021). In addition, factors related to legitimacy *(see Chapter 2.13)* also affect the effectiveness of target progress in influencing investment preferences. Companies need to provide transparent and timely disclosure of their progress toward targets, as investors may prioritize actual progress toward emissions reductions when making investment decisions (Dahlmann et al., 2019).

Hypothesis 2c: *The probability that the investors will choose an investment alternative increases with the 'on track' status of target progress*.

2.1.3 Relationship among the attributes of carbon information

Symbolic and Substantive legitimacy

To better understand, the relationship between attributes of carbon information – including GHG emissions performance and GHG targets related attributes *(i.e., target difficulty, target progress, and science-based targets)* and its implications to investors' preferences, it is assessed through the perspective legitimacy theory (Schuman, 1995; Mayer and Rowan 1977). The notional idea is that companies disclose information related to their operation and business activities to justify their actions, in order words, to legitimize them. While pragmatic legitimacy, moral legitimacy, cognitive legitimacy, and regulatory legitimacy are all key dimensions of legitimacy theory, this study mainly uses symbolic and substantive legitimacy to assess the effects of carbon information on investors' preferences. As this study is mainly concerned with the investors' perceptions of symbolic gestures – for instance, using SBTs or reporting GHG intensity information in their corporate disclosures and how they affect investors' preferences, and comparing it with substantive actions – for example, impacts and outcomes of companies' carbon management strategies and tangible actions.

Symbolic and substantive legitimacy are different ways that companies can establish and maintain their legitimacy. On the one hand, symbolic legitimacy is mainly about managing the perceptions of the investors and creating a positive image and reputation by using symbolic actions and gestures – for example using the SBTi label, communicating target achievement, etc. indicating its claims on GHG emissions performance. On the other hand, substantive legitimacy is about the impacts and outcomes of the organization's actions – for example, an ambitious target showing not only commitment but also substantive progress and action showing the companies' progress toward meeting its emission reduction targets (Perez-Batres et al., 2012; Rodrigue et al., 2013; Dahlmann et al., 2019).

Interactions and their implications

Besides the direct effects of the attributes discussed earlier, studies suggest preferences of investors are influenced by other factors such as the priorities of the investors as well as the interactions and trade-offs between the attributes of carbon information (Johnson et al, 2019; Haji et al., 2021; Dahlmann et al., 2019; He et al., 2021). Specifically, this study focuses on understanding the interactions between these carbon attributes and the effects of these relationships on investment choices. For instance, studies suggest a positive relationship between target difficulty and carbon performance suggesting that setting a difficult target will increase the level of positive environmental performance (Dahlmann et al., 2019; Freiberg et al., 2021). However, companies may also be setting less ambitious targets to ensure that they are achievable and do not negatively impact their performance (Dahlmann et al., 2019; He et al., 2021). In addition, more difficult carbon reduction targets are associated with better carbon performance up to a certain point, and the effects of target difficulty on carbon performance vary among groups and are affected by target flexibility (Arnold and Artz, 2015). Furthermore, it is suggested that adopting SBTs may lead to increased target difficulty for companies due to higher levels of ambition and complexity (Dahlmann et al., 2019; Freiberg et al., 2021).

Moreover, from the legitimacy perspective, the legitimacy of a firm's environmental performance claims can also affect stakeholders' attitude and behavior toward the firm's reputation and improves competitiveness over its peers (Dahlmann et al., 2019; He et al., 2021). This suggests that it is a crucial factor in determining the effectiveness of science-based target labels. However, it is important to distinguish between the symbolic and substantive nature of legitimacy, with symbolic legitimacy being based on labels and surface-level attributes, and substantive legitimacy stemming from concrete actions and outcomes (Christensen et al., 2021; Dahlmann et al., 2019; Giesekam et al., 2021; Walenta, 2020). While the symbolic legitimacy of SBTs label is essential, signaling a firm's commitment to sustainability and climate change. However, legitimacy also requires credible and transparent performance indicators, targets, and reporting to maintain it in the long run (Burritt and Schaltegger, 2010; Rodrigue et al., 2013). For instance, firms' SBTs claims can be further strengthened by substantive achievement, specifically with on-track target progress status, target achievements, and better GHG performance.

This underscores the importance of attributes such as target progress, target difficulty, and past performance and interactions between them. Moreover, studies have shown that firms with a track-record target achievement, or on track to progress toward target completion are more likely to be perceived as legitimate by impact investors (Dahlmann et al., 2019; Freiberg et al., 2021; Milne and Patten, 2002). Firms that exhibit progress in meeting targets are more attractive to investors as progress improves the effectiveness and legitimacy of firms' claims on their targets and emission performance (Dahlmann et al., 2019; Giesekam et al., 2021; Walenta, 2020). Overall, legitimacy of science-based targets, for example, is a complex issue and legitimacy claims require both symbolic and substantive elements to be effective. Therefore, it is of high importance to have an in-depth understanding of the interaction between carbon information attributes, for example, SBTs with other attributes of concern to assess and

understand the effects of these relationships on investment behavior. This facilitates an understanding of how these attributes can best be integrated into broader corporate sustainability strategies in driving actual emissions reductions (Bjørn et al., 2022; Walenta, 2020).

Hypothesis 3a: *'On-track' progress status of a target externally validated as science-based increases the probability of the choice to invest.*

Hypothesis 3b: *'On-track' progress status of a more difficult target increases the probability of the choice to invest.*

Hypothesis 3c: *Higher than industry average past emissions even in the presence of a science-based target reduce the probability of an investment choice.*

Table 1. Overview of Hypotheses.

Hypotheses	**Description**
Past GHG emission performance	
Hypothesis 1	*The probability that the investors will choose investment alternatives increases with lower past GHG emissions*
Carbon targets attributes	
Hypothesis 2	
A	*The probability that the investors will choose the investment alternative increases with a higher level of target difficulty.*
B	*The probability that the investors will choose the investment alternative increases with the validation of targets as being science-based targets.*
C	*The probability that the investors will choose an investment alternative increase with the 'on track' status of target progress*
Interactions	
Hypothesis 3	
A	*The 'On-track' progress status of a target externally validated as science-based increases the probability of the choice to invest.*
B	*'On-track' progress status of a more difficult target increases the probability of the choice to invest.*
C	*Higher than industry average past emissions even in the presence of a science-based target reduce the probability of an investment choice.*

2.2 Impact investing

Impact investing and related areas – environmental social governance (ESG), and Sustainable and responsible investment (SRI) are often used interchangeably. Commonality includes sets of ESG factors that guide fund managers and investors in selecting sustainable companies for

their portfolios based on different sustainability strategies and themes (Eurosif, 2018; Sjöström, 2014). Impact investing is an aspect of SRI and they both share a goal of generating positive social and environmental outcomes alongside financial returns. However, impact investing is a more focused approach that emphasizes measurable social or environmental impact alongside financial returns (Ormiston et al., 2015; Wood et al., 2013). While impact investing is a specific type of sustainable investing, it differs in its emphasis on measurable impact and the four key components of intentionality, additionality, measurement, and accountability (Bugg-Levine and Emerson, 2011).

In this context, impact investors are inspired to align their investments with the Paris Agreement's goal of limiting global warming to 1.5°C above pre-industrial levels which is discussed in the earlier sections. Moreover, equally important are for impact investors to ensure the effectiveness of impact investments using the scientific approach for carbon measurement, and verification to get an understanding of the knowledge for carbon targets and appropriate evaluation criteria to evaluate investment choices (Popescu et al., 2021; Dahlmann et al., 2019; Freiberg et al., 2021). However, besides carbon information attributes discussed above, existing literature on impact investing – for instance, Lagerkvist et al. (2020) use the risk-return profile as one of the key attributes determining preference for sustainable and responsible equity funds. Similarly, Barber et al. (2021) state, that although financial returns on impact investment funds can be marginal to conventional investments, investor's decisions are significantly influenced by the financial returns. Therefore, it was deemed important to include conventional attributes relevant to investment decisions – for example, risk and return, which are the other two key attributes in this study besides the attributes related to carbon information which were already discussed in earlier sections.

2.2.1 Relationships between risk, return, and carbon information attributes.

Literature on impact investing and the impact of carbon reporting suggests companies are better environmental performance shows better financial performance (Clark et al., 2015; Eccles et al., 2014). Moreover, a study by (Barber et al., 2021) shows that better environmental performance has the highest willingness-to-pay estimates. However, it should also be noted, in impact investing, risk-return preferences vary. Some impact investors prioritize social and environmental impact over financial returns, but not all (Eccles et al., 2014; Khan et al., 2016). However, the risk-return profile of impact investors can vary depending on the specific context and investment strategy, as well as various factors, including the investor's financial situation, investment goals, long-termism vs. short-termism and personal values, and other behavioral variables (Louche et al., 2019; OECD, 2014). The willingness to accept lower returns and higher risk was not uniform across all types of impact investments, with only some investors willing to accept higher levels of risk in exchange for potentially higher returns and higher environmental performance (Gutsche and Ziegler, 2019; Apostolakis et al., 2016; Barber et al., 2021).

Overall, the level of carbon information attributes could affect the willingness to pay, and trade-offs between financial returns and sustainability performance may exist in impact investing (Barber et al., 2021; Clark et al., 2015; Eccles et al., 2014). However, the relationship between target attributes and investors' willingness is a complex subject matter and requires further investigation. Having said that, this study examines willingness to pay (WTP) for the key attributes related to carbon information. As carbon is one of the most material subjects and all these issues discussed in the earlier chapters like target and related attributes are becoming more prominent and are even mentioned in the EU Corporate Sustainability Reporting Directive. Therefore, this study will seek to find out the willingness to pay specific to these carbon target attributes. However, in the context of this study, return is used as a substitute for the price, indicating a decrease in marginal expected annual return representing the opportunity cost that is barred by the investors for some level of carbon information attributes.

2.2.2 Sustainable investment behavior

The traditional neo-classical assumption is that the investment decisions are based solely on financial considerations – for example, expected profits or any forms of economic benefits that can be derived (Markowitz, 1959). However, recent research suggests that investors may consider a broader range of factors, including cognitive biases, emotions and other behavioral factors and non-financial factors, as shown by the increasing market demand for sustainable and responsible investment (Statman, 2014;Hofmann et al., 2009). Other than the carbon information attributes discussed in the earlier section, investment preferences in impact investing are also influenced by other socio-demographic, cognitive, and behavioral variables which are discussed below. Analyzing these demographics, cognitive variables might be useful for the characterization of preference heterogeneity and might therefore be relevant to derive a better understanding of the effects of carbon information attributes.

Socio-demographic variables

Non-professional investors' preferences for carbon information in impact investing may be influenced by gender, age, education level, and income (Cheah et al., 2011; Escrig-Olmedo et al., 2013; Nilsson, 2009). Higher education levels may increase awareness of carbon emissions impact on the environment and prioritize carbon information in investment decisions, while higher income may provide more resources for investment in SRI funds (Cheah et al., 2011; Nilsson, 2009). In addition, gender norms and values may also play a role in determining preferences for carbon information. In this context, this study uses socio-economic characteristics including – the level of household income, education, size of monthly investment, and size of locality *(see chapter 3.5.3 for a list of socio-economic measures used in the heterogeneity test)* to account for individual-specific preference heterogeneity for carbon information.

Cognitive and behavioral variables

Research suggests that investors' attitudes are important drivers of their investment. For instance, environmental consciousness and risk aversion influence investors' attitudes toward

sustainable investing (Cheah et al., 2011; Wins and Zwergel, 2016; Gutsche and Ziegler, 2019). Individuals inclined toward climate and social activism who have pro-social attitudes and a strong concern for the environment will more likely choose to invest in impact-investment funds over conventional funds. Further, those who perceive that impact investment funds align with their ethical values and code of conduct tend to be more loyal and patient toward impact investment (Peifer, 2014; Hofmann et al., 2009). Moreover, intuition and beliefs, determined by cognitive constructs, also drive investment behavior. In addition, investors' environmental beliefs, social norms, and values can affect investment behavior and motivate investors to invest in SRI funds and affect their priority for impact investments (Cheah et al., 2011; Wins and Zwergel, 2016; Nilsson, 2009; Palacios-González and Chamorro-Mera, 2018).

Additionally, cognitive-related variables and personality traits also significantly influence investors' attitudes and behavior toward impact investing (Escrig-Olmedo et al., 2013; Wins and Zwergel, 2016; Apostolakis et al., 2016, 2018). Further, the level of knowledge and understanding about impact investment is positively related to favorable attitudes toward sustainable investing. Investors' attitude being favorable or not favorable affects their priorities for carbon-related disclosure in investment decisions (Escrig-Olmedo et al., 2013; Nilsson, 2009). In addition, the higher analytical indicating ability of the investors to effectively process and evaluate complex information, such as carbon-related data, for making informed investment decisions could affect their impact on investment choices (Escrig-Olmedo et al., 2013).

In this context, factors related to the behavioral and cognitive aspects of the investors affect the investors' preferences for carbon information. In this study, seven factors including – the perceived importance of sustainable fund labels (Apostolakis et al., 2016; Lagerkvist et al., 2019) by investors for making impact investment decisions, the relevance of climate objectives for investors, investors' attitude toward climate change (Kleffel and Muck, 2022; Apostolakis et al., 2016), investors knowledge, social norms (Kleffel and Muck, 2022), warm glow (ibid) indicating satisfaction and happiness associated to doing something good, and investors need for cognitions are used as measures to account for individual-specific preference heterogeneity *(see chapter 3.5.3 for overview showing list of behavioral measures used in this study).*

3. Methods

This section describes the research approach and research design used in this study. It is then followed by a description of the data collection, quality and ethical considerations, some limitations and the data analysis methods that are used for analysis in the study.

3.1 Research philosophy

Researchers' notion about the nature of reality indicating their principles, beliefs, and assumptions about reality shapes the development of knowledge in research (Bell et al., 2022; Saunders et al., 2019). These sets of beliefs and assumptions which are often referred to as ontological and epistemological perspectives of the researchers, and the methods that are used by the researcher in the research study together form the basis for and are referred to as a research philosophy. This research philosophy determines the methodology depicting the process, means, and modus operandi for conducting the research study (Bell et al., 2022; Creswell, 2009; Guba and Lincoln, 1994). In this context, this study uses quantitative data collected inside Sweden. The researcher follows an objectivist perspective. It implies the researcher can observe the interactions and relationship between the social phenomena – practices related to carbon disclosure *(i.e., reporting of carbon information)* and the social actors involved in the process or transaction *(i.e., Swedish non-professional investors),* independently without interfering as the observer (Bell et al., 2022; Slevitch, 2011).

Moreover, it is suggested that the ontological perspectives followed by the researchers provide the logical foundation and dictate the epistemological position (Slevitch, 2011). In this study, the author follows a positivist epistemological approach. Positivist epistemology is characterized as using scientific and empirical methods to observe and measure social phenomena to generate knowledge based on objective and quantifiable data (Saunders et al., 2019; Bell et al., 2022). Having said that, this study uses an experimental design to conduct a Discrete Choice Experiment (DCE) to gain insights into the effects of the carbon information on non-professional investors' preference for different impact investment alternatives. Consequently, this study follows methodological individualism implying the role of human behavior *(investors' preferences)* as the key unit of analysis for understanding social and economic phenomena – effects of carbon information disclosed in carbon disclosures (Hodgson, 1996).

3.2 Research design

Saunders et al. (2019) suggest qualitative and quantitative approaches as two broad methodological approaches covering groups of methods that are used in research studies, however, in some cases a mixed approach – combinations of both qualitative and quantitative research are also used. The choice of methods dictates the methodological assumptions and tools of analysis of the research study (Bell et al. 2022). As this study aims to investigate the non-professional investors' preferences for carbon information using the responses from Swedish participants *(i.e., Swedish non-professional/ retail investors)* for impact investment choices. Therefore, accordingly, mainly a quantitative approach is followed, and this study relies on comprehensive statistical tools and regression analysis based on the quantitative dataset that allows one to measure underlining phenomena and derive a generalizable result from the data collected from the survey for the topics that are being studied.

However, it should be noted that in the initial stages, a few preliminary steps related to a mixed approach were followed to motivate hypothesis development and direct the process of experimental design to ensure the content validity of the topics that are included while designing the survey questionnaire. Thus, before finalizing the experimental design *(in this study, a discrete choice experiment is used as part of the experimental design)* a brief literature review was conducted as a part of the broader experimental design. This helps to ensure the validity of the contents and minimize the likelihood of making incorrect assumptions about the topic of interest, these topics thus used in the study were carefully established through a literature review (Rubio et al, 2003). Thus, a deductive approach to logical reasoning was used and the hypothesis used in this study was formulated based on existing theoretical assumptions and the literary discourses and findings that were reviewed during the preliminary literature review. This was then tested for empirical applicability or viability using quantitative techniques including the methods to examine stated choice preferences which are discussed in the latter part of this methodology chapter (Bell et al., 2022).

3.2.1 Literature review

In this study, a narrative literature review was conducted, mainly, using existing literature on impact investing and carbon disclosures. The focus was on studies related to the investors' preferences and the impact of carbon disclosures on investments. Additionally, studies related to the legitimacy of carbon disclosures, investment behavior, and carbon management were reviewed. Information from these literary sources was used to formulate research questions and additionally to motivate the hypothesis and decide the methods for this study. This approach is also in line with the suggestion of Robson and McCartan (2016) where the authors have emphasized conducting an initial literature review to understand the current state of research, to get familiarity with the backgrounds, concepts, and definitions used, and as well as for identifying the gaps and limitations or the areas of uncertainty about the topic of interest. To ensure that the quality of the literature and its trustworthiness is maintained, for the most part, peer-reviewed journals were used. In addition, the review is based on the search results from the Primo – the SLU library database, Scopus, Web of Science, JSTOR, and ScienceDirect

libraries' database and search engine. The following keywords and combinations were used for the literature search: "stated choice preferences", "investor preference", "carbon information", "Carbon targets", "impact-investing", "sustainability performance", "discrete choice experiment" "science-based targets" etc. However, as this topic is underexplored and relatively new, emphasis was placed on the few key foundational research studies and a few other recent studies concerning investor preference for carbon information, and the studies examining the relationship between impact investment fund attributes related to carbon disclosures in the context of impact-investing and overall corporate carbon management.

3.3 Experimental design

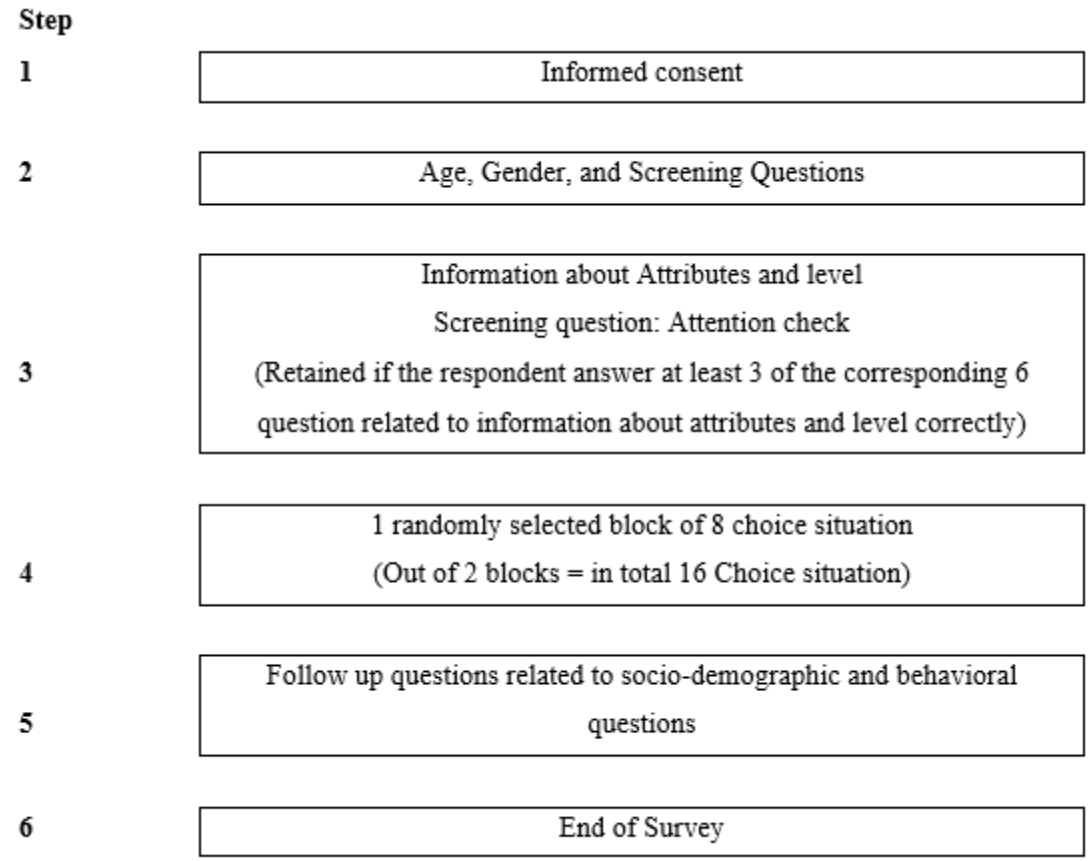

Figure 1. Overview of experimental design (own illustration)

Following the deductive reasoning and quantitative approach to the research design, an experimental design using a discrete choice experiment has been used in this study. First, an online survey, using a market research company was used to distribute the survey questionnaire for the discrete choice experiment (DCE). In addition, a few other questions related to socioeconomic characteristics and behavioral aspects of the individual investors were included in the questionnaire, as this study seeks answers not only to the potential effects of carbon information attributes on investors' preference but also answers for other variables that could

potentially explain the heterogeneity in individual-specific preferences for impact carbon information attributes. Further, other questions related to screening criteria which are significant to reduce errors and inconsistency were included. As this study studies the trade-off between different attributes that are included as part of experimental design, DCE was considered as appropriate method. DCE being a trade-off methodology, it can effectively assess the utility of stated investment alternatives associated with different levels of attributes for some particular choice situation thus facilitating comparison to gain insights into the relative utility individual investors associate with investment alternatives (Louviere et al., 2010). In addition, DCE is rooted in random utility theory (RUT), which is a well-established theory of choice behavior (Louviere et al., 2010; McFadden 1974).

Additionally, the consent form was included at the beginning of the survey. It was then followed by information about the content of the survey and questions about demographics *(see Fig 1 for an overview and see Appendix 1 for the survey questionnaire)*. Additionally, the following section provided an overview of the attributes of carbon information and attributes that were used in the choice experiments describing what it means. Prompts for choice cards were then included. It was divided into two blocks containing different choice scenarios for each block. However, only one block including eight different choice scenarios *(i.e., choice card – each choice card represents one specific choice scenario with different levels of attributes for each alternative)* was then coded to randomly assign each block to separate respondents during the survey using Qualtrics web application software. The latter part of the section included the follow-up questions related to other socio-economic characteristics and behavioral aspects.

3.3.1 Discrete Choice Experiment

DCE is a popular tool that is used to study individual preferences, individual-specific preferences, and class heterogeneity. According to Louviere et al. (2010), DCE allows and facilitates researchers to conduct empirical studies related to preferences in applied fields and to understand how individuals make choices. It is also used in calculating the Willingness to pay (WTP) estimates. As DCE are subject to the study of relative utility for different alternatives to assess the preferences for alternatives, it is regarded as an appropriate method to study preferences as the random utility model (RUM used is rooted in the RUT (Skreli et al., 2017; Louviere et al., 2010). On this assumption, DCE was followed, and the choice scenarios *(i.e., choice cards depicting different choice situations)* were presented to individual Swedish non-professional investors along with the other sets of questionnaires in the form of an online survey. Each choice card represented investment alternatives and an option to opt out *(see Figure 2 for an example of choice sets)*. The two main alternatives differ in their attribute levels for each choice scenario. However, it should be noted that this study uses a stated preference model, where actual preferences are not directly observed (Louviere et al., 2010). Nevertheless, this approach of indirectly assessing preferences using stated choices has been suggested to have a level of external validity which implies there is some level of generalizability compared to the other direct methods related to preference elicitation (Lagerkvist et al., 2020; Louviere and Islam, 2008).

Additionally, determining the mix of attributes and levels is significant in DCE design and that these combinations are presented in choice sets it is crucial to get the most efficient design that minimizes the errors. Therefore, the efficient experimental design was used to maximize the information obtained for each choice set while minimizing the number of choice sets required (Hensher et al., 2015). Bateman et al. (2004) stress the significance of a statistically efficient subset of possible alternatives for the choice experiments. To achieve this, Ngene software was used to generate a D-optimal efficient design comprising two blocks with eight choice sets each and three choice alternatives per choice set (ChoiceMetrics, 2014; Hensher et al., 2015). D-optimal designs optimize the choice set construction based on the D-optimality criterion which is based on the Fisher information matrix and maximize the determinant of the information matrix. This leads to efficient estimation of preference parameters and reduced standard errors (Hensher et. al., 2015). However, the priors used to estimate the efficient design using Ngene were uninformed except for the conventional fund attributes (i.e., risk category and expected annual return) which were adopted from Lagerkvist et. al. (2020).

	Alternative A	**Alternative B**
Greenhouse gas emissions	Much higher than the industry average	Much lower than the industry average
Target level for reducing emissions	Target to reduce GHG emission by 30%	Target to reduce GHG emission by 45%
External target approval	Science-based target	-
Goal achievement	On track to meet its 2030 emissions target	Not on track to meet its 2030 emissions target
Expected return	14%	10%
Risk indicator	Risk-class 4, ± spread of 12%-20%	Risk-class 5, ± spread of 20%-30%

- ❑ **I chose alternative A.**
- ❑ **I chose alternative B.**
- ❑ **If these are the only options to choose from, I refrain.**

Figure 2. Example of choice-set

3.3.2 Attributes

This section describes different attributes and their levels (Table 2). These were determined based on the preliminary literature review. Besides the 4 key attributes related to carbon information, two other attributes related to conventional investment funds are included in this study. Including expected annual return as a substitute for price also allows the researcher to estimate WTP for attributes related to carbon information suggesting decreasing marginal return indicates the opportunity cost bared by the individual investors. (Keir and Keir, 1983).

A detailed description of how these attributes were presented to participants in the online survey can be found in Appendix 1.

Table 2. Overview of attributes and their levels.

Attributes	**Levels**
Attributes related to carbon information.	
- *GHG Emissions*	*3 levels* including – *Much lower* than the industry average, a*bout the industry average*, and *much higher* than the industry average.
- *Target Difficulty or Target Reduction Level*	*4 levels* – target to reduce GHG emission by *15%; 30%; 45% and 60%*
- *External Target Approval (Validation or external approval from SBTi)*	*2 levels* – target *approved and validated by SBTi* as being science-based targets (SBTs), and target *not validated by SBTi.*
- *Target Progress*	*2 levels – 'on track'* to meet the company's 2030 GHG target level, and *not 'on track'* to meet the target level
Attributes related to conventional investment funds.	
- *Expected Return*	*4 levels* – Expected Annual Return rate of: - *6%; 10%; 14% and 18%*
- *Risk Indicator*	*3 levels: Risk class 4,* medium level, with a historical *spread in returns of 12%–20% per year;* Risk class *5*, medium level, with a historical spread in returns of *20%–30% per year; Risk class 6*, high level, with a historical spread in returns *of 30%-80% per year.*

GHG emissions:

Based on the literature review (Chapter 2) this study determines several levels of GHG emissions which are then associated with the investment alternative. These levels of attributes depict different scenarios depicting the contribution of firms' GHG emissions associated with some particular investment alternative. It illustrates the level of a firm's GHG emissions intensity as an indicator to allow comparisons between two alternatives presented in the choices.

A firm's GHG intensity can be similar to (about) the industry average or (much) higher or (much) lower than the industry average. In this study, emission intensity about the industry average is considered as the baseline which is used as a reference for comparing the other level (treated as categorical dummy variables in the analysis) – i.e., GHG emissions much higher (or lower) than the industry average emissions. Determining a reference category can be arbitrary (Cohen, 1991; Hensher et al., 2015). However, for interpretational advantage, it is logical to

use the average level of emissions as a reference category based on the theoretical assumption and objective of this study as this study is concerned with measuring the effect of higher or lower levels of emissions on stated choices.

Target difficulty:

It outlines the company's plan to reduce its emissions intensity by a certain year, i.e., the year 2030 as the target horizon (IPCC, 2018). Additionally, 2019 is the used as baseline year (SBTI, 202b). It also corresponds to the United Nations Sustainable Development Goals' 2030 agenda. In this study, target difficulty consists of four levels with target reduction levels of 15%, 30%, 45%, and 60% by 2030 implying 15% as the least difficult target and 60% as the most difficult target. However, it should be noted that perceived relevancy and appropriateness about the levels of target difficulty are subjective and depends on individual perceptions about the practicality of targets for overall GHG emission reduction. Additionally, it only covers intensity targets for scope 1 and scope 2 emissions, i.e., emissions resulting from the sources that companies own and emissions resulting from the purchase of energy from third-party suppliers, respectively (SBTi, 2020a, 2020b). Further, scope 3 emissions are from sources that are not owned or controlled by the companies.

External target approval:

It comprises 2 levels – the target being approved and validated as SBT by external organizations like the Science Based Targets Initiative (SBTi) and targets that are not validated as the science-based target by external sources. Validation of the target as science-based ensures that targets are aligned with recent science-based emission criteria and the standards that the company should maintain to meet the objective to keep global warming below 2 degrees Celsius (SBTI, 2020b). In addition, for SBTs, only the targets with difficulty levels to reduce their GHG intensity by 45% and 60% by 2030 were applied as being difficult targets to approach realism and maintain the external validity of this study. This was done by imposing conditions in the Ngene while designing DCE.

Target Progress:

Target progress includes – the 'on track' status of target progress, a level that indicates that the target to reduce emissions is being fulfilled implying that the company has been able to reduce emissions on an annual pace and level to meet its target after adopting the target Additionally, a level that states the opposite, i.e., companies being not on track to meet their objectives.

Expected return:

This shows the annual expected return from investment in choice alternatives representing the investment that is supposedly made by the respondents. It includes four levels 6%, 10%,14%, and 18% indicating the lowest to highest future returns respectively. It was adapted from Lagerkvist et al. (2020). However, the assumption is that it represents the expected return which are forecasted rates based on the company's past financial performance, and, therefore, the participants were thus informed that actual returns could vary.

Risk Indicator:

The risk attribute is adopted from Lagerkvist et al. (2020) where it is used as one of the fund attributes to investigate investment preference for different sustainable and responsible equity funds. However, the spreads used in this analysis are updated with recent data from Fondbolagens förening (2022). The risk indicator shows the spread or the variance for return for the investment fund over the years implying a higher number indicates the higher risk. It includes three levels and the level with risk category 4 is considered as the baseline used for comparison with two higher levels – risk category 5 and risk category 6.

3.3.3 Data collection and survey

In the process, a set of questionnaires (Appendix 1) was rolled out to the panel of participants consisting of Swedish non-professional investors to gather information about their preferences and investment practices as well as relevant socio-economic and demographic profile. The questions used in the survey were mainly adapted from previous research to maintain and increase reliability (Bell et al., 2022). For instance, the study by Apostolakis et al. (2018), and Kleffel and Muck (2022) were used as a point of reference for designing a survey questionnaire aimed at understanding participants' preferences, attitudes, social concerns, and risk aversion. Additionally, the work of Lagerkvist et al. (2020) among a few other references was also used as references for topics return, risk, and other demographic and behavioral aspects that were considered as being significant in understanding the investors' preferences and individual-specific preference heterogeneity.

The data were collected in March and April of the year 2023. A Swedish market research company was consulted to gather responses from the selected participants from a Swedish survey panel. It is in line with the discussion about the application of a web-based self-administered survey for DCE (Hoyos, 2010). Additionally, the assumption is that the sample of participants represents the general Swedish population in terms of age and gender. However, self-completed questionnaires may have challenges – for example, respondents have difficulty understanding questions which might lead them to skip questions (Bell et al., 2022). It was evident from the completed sample. A total of 434 respondents opened the survey. However, only 241 completed the survey and even out of 241 who completed the survey a total of 99 respondents dropped out from the final dataset which is used for analysis because they didn't meet the different screening criteria. However, it was a crucial process to maintain the consistency and reliability of the nature of the data collected (ibid). The reasons why the responses were dropped were mainly because either they did not pass the screening test which required them to pass the attention check implying to at least answered half of the prompts in block 3 (Appendix 1) correctly. Answering at least half of them correctly meant that they were attentive and had read the information carefully which was crucial to gain familiarity with the subject matter.

Furthermore, in this study, the questions used were choice sets and most of the questions that were used were closed questions to ensure that questions were easier to process (Bell et. al.

2022). Additionally, the survey was programmed in Qualtrics. Nevertheless, DCE has its limitations. The hypothetical nature of DCE experiments may introduce hypothetical bias in the results which can affect the reliability of the response and can ultimately undermine the validity of the results. Therefore, a cheap talk script was used in the survey to reduce the risk of inflated values or hypothetical bias as it has been shown to decrease the degree of inflated values in DCEs (Carlsson et al., 2005; Lagerkvist et al., 2020). One example of the cheap that was used in the survey is as follows:

> "In the following, you will be presented with eight different choices for this impact investment. Investing 1000 SEK per month over a 7-year period could for various reasons be a challenge. Therefore, please make the utmost effort to have your choice of underlying investments really reflect what you think is important in this type of impact investment. Consider each situation independently from your previous choices". (Appendix 1)

3.3.4 Assumptions

During the design, few assumptions were needed to ensure that the participants in the survey have a uniform frame of reference, therefore, allowing the researcher to reach a conclusive result. The first assumption was the researcher need a uniform fixed hypothetical amount available to participants in the survey to invest. It was suggested, Swedes, most commonly, save about 1000 to 2000 SEK in a month (Fondbolagens Förening, 2018a, 2018b). Accordingly, this led to the first assumption of this study that all the participants in the survey are facing a situation where they have 1000 SEK available per month which they can invest. The second assumption is related to the timeframe of the investment. It was assumed longer time is required to appropriately account for trade-offs related to cost-benefit associated with investments, therefore, a 7-year timeframe was given for all participants.

Additionally, in this study, only equity funds are included in the survey but with varying rates of expected return per annum to simplify the experiment. According to Fondbolagens förening (2018a, 2018b), equity funds are the common fund to invest in Sweden. These limitations imposed in the study also limit the complexity, which means that the parameters that the participants need to include in their trade-off are now limited and it is now easier for them to make a valid judgment and reduced the problem related to context validity. For instance, these assumptions allowed the participants to have a uniform mindset and it reduces the probability of respondents automatically selecting investment alternatives with fast returns thus avoiding the results that are skewed towards investment alternatives with fast returns. Moreover, it also prevents infeasibility problems *(i.e., unbounded problems)* pertaining to alternatives that are presented in the survey from being incompatible with the participant's frame of reference and experiences by providing them with predefined objectives in the questions (Louviere et al. 2010).

3.4 Quality and ethical considerations

3.4.1 Quality

Literature on methodologies emphasized the concerns related to the quality of collected data in quantitative data including the reliability, consistency, and validity of the data collected and methods that are used in the process, i.e., data collection (Bell et al. 2022; Hoyos, 2010; Creswell, 2009). In addition, transparency and replication are the other two criteria for determining the quality of research which indicates the generalizability of the results that are reliable (Bell et al. 2022). Therefore, to allow the reader to judge the reliability for themselves, the study is explained in detail and the survey is included in Appendix 1 to ensure transparency and replication by future studies.

In addition to the screening criteria that is discussed earlier, minors representing ages below 18 were excluded from the survey to limit the error in data collection and improve the reliability and consistency of the data collection process. Additionally, to ensure measurement validity which assesses the reliability of measures used in the study, measures and examples of survey questions from the previous study were used as points of reference and often in some instances adopted, for instance from the work of Apostakis et al. (2016), Kleffel and Muck (2022). This helped to minimize the risk of not measuring the intended purpose. Besides that, this study used uses statistical techniques associated with reliability – for example, Cronbach's alpha, to ensure internal consistency and reliability of the latent construct (Chapter 3.5.3). However, it should be noted that, while the study included several attributes so that a realistic picture of choice alternatives is attained and ecological validity is maintained (Bell et al., 2022). Here, a limitation can be the available number of investment alternatives to choose from because in real-life settings investors have more than 2 options they can choose from.

External validity, on the other hand, is related to the generalizability of the results of a study beyond the scientific context to motivate – for instance, in the context of this study, public policy related to investment strategies and designing impact investment funds (Bell et al., 2022). The generalization of results from a quantitative study mainly depends on statistical power. In general, the number of participants in the sample size is associated with the statistical power of the analysis which can either undermine the external validity or overvalue the small effects by transforming these small differences into significant differences leading to misguidance (de Bekker-Grob et al., 2015). In this study, the final sample size used in the study consist of 142 respondents after dropping invalid responses. Though a sample size of 142 respondents may be associated with lower statistical power, nevertheless, this is in line with the sample size recommended by (Louviere and Islam, 2008). Additionally, the participants were randomly selected from an online survey and there were about equal numbers of men and women, therefore, have a strong level of external validity as it could be generalized. However, at the same time, it should be noted that it is still the participant who joined the survey, and the survey is based inside the geographical location of Sweden therefore external validation could be limited within certain groups of population with specific characteristics.

3.4.2 Social-desirability response bias

According to Roberts (1996), social-desirability response bias occurs if stated attitudes by the participants in the research studies do not match their actual behavior in a real-life setting. It is mainly reasoned that the individual (i.e., participants) gravitate towards answers that are socially correct or at least to answers conforming to widely accepted by society. For instance, it can be very true for participants with some concern for climate change and sustainability to choose answers that show fewer negative impacts on the environment. But in real-life setting investors in general make investment choices not only based on positive environmental performance associated with the impact-investment assets but also considers trade-off between other factors like risk. Moreover, it is more prevalent when the topics are sensitive and if the answers are not anonymous (King and Brauner, 2000; Roberts, 1996). Therefore, to address and reduce the risk of social-desirability response bias, anonymity was maintained. Additionally, conditional channel questions were used to eliminate the mismatch between the stated response and the validity of the response. The response was eliminated as being invalid or biased and thus not reliable if one of the channeled questions to check the correctness of the response to the main question were wrong suggesting conditional criteria were not met. For instance, Table 4 depicts the number of participants who disclosed that they know about different labels of sustainable funds and the number of participants who knew and answered correctly.

3.4.3 Ethical Considerations

Bell et al. (2022) have emphasized ethical considerations as being highly significant in conducting research. It is suggested when interacting with individual participants which is the case in this survey, the researcher has an obligation to inform participants about the purpose of the survey and the broader research study that they are going to be part of. This also means that the respondents must know not only about the purpose of the research study but also about how their responses and the results will be used. Therefore, researchers should comply with recommended considerations related to the principles of anonymity, confidentiality, integrity, and voluntary participation (Kelly et al., 2003; Bell et al., 2022). In this context, when conducting the survey, the participants were fully informed about the aim of the research study they are going to participate in. Additionally, they were provided with a comprehensive explanation of each step within the survey, including how their answers would be used. This is in line with concerns, as discussed by Bell et al. (2022). Furthermore, anonymity was maintained throughout the study, and participation in the study was voluntary. All the participants were asked for their consent, and no deception was used while conducting the research study.

3.5 Data Analysis

The dataset containing the responses gathered from the survey has been analyzed following the multinomial logistic (MNL) regression model. Conditional logistic regression was used; data

sets were analyzed using the 'Clogit' command in STATA. The data were first transformed into a long format using a 'task id' as a group id where each group represents observations for a single choice indicating some specific choice scenarios. To further investigate the preference heterogeneity, a specific type of multinomial logistic model (MNL), a conditional logistic regression model with heterogeneity was applied using the 'clogithet' command in STATA. In addition to that willingness to pay (WTP) values for different attributes were estimated. Further discussion about analytical tools, models, and measures that motivate and that were used in this study is explained in the following sections.

3.5.1 Random utility theory

Random Utility Theory (RUT) provides the theoretical foundations for the analytical methods and tools that are used in the analysis of this research study. It is suggested attributes determine the utility of a product *(investment funds in the context of this study)* (Lancaster, 1966). Literature suggests researchers use DCE as one of the popular methods of analysis, which is embedded in RUT. DCEs are commonly used to identify and study individual preferences explained by the choice models for different attributes, empirically supported by Random Utility Model (RUM) (Skreli et al., 2017; McFadden, 19774; Louviere et al., 2010). RUT is useful for estimating the trade-offs that individuals make between attributes and calculates the preferences for each set of investment alternatives. The underlying assumption is that in these models, an individual's preferences for alternatives are explained by a utility function that reflects the utility that individuals derive from each alternative. It also suggests that there is a latent construct of utilities, which is not observable to researchers (Louviere et al., 2010). The utility consists of – a systematic component that is explainable which includes attributes that differentiate the alternatives and covariates which show the difference in an individual's choice, and a random component that is not explainable which includes all unidentified factors that affect the choice (ibid.). The equation for random utility is expressed as:

$$U_{in} = V_{in} + \mathcal{E}_{in} \qquad (1)$$

where *U* represents the random utility, *V* is the explained part and ε is the random component associated with the choice alternative *i* for individual *n*. The results are expressed in probabilities for individual *n* to choose alternative *i* and it is not an absolute representation that the individual will choose that alternative mainly due to the inclusion of a random component in the utility equation (Louviere et al., 2010). Therefore, it is possible to examine relative differences in the utility for alternatives and make comparisons about how modifications in various attributes influence the probability of selecting one over the others. This also suggests if some attributes are more desirable than others. The probability for an individual *n* to choose alternative *i* from among the range of different alternatives in the choice set is expressed as:

$$P(i|C_n) = P[(V_{in} + \varepsilon_{in}) > Max\ \left(V_{jn} + \mathcal{E}_{jn}\right)] \qquad (2)$$

where j represents all other alternatives that are available and Cn is all the available choice sets (Hensher et al., 2015; Louviere et al., 2010). DCE models can thus be derived from the equation

depending on the assumption of the distribution of ε_{in} which includes the preferences that are random in nature. In general, the probit models are based on the assumption that ε_{in} are normally distributed, while the logit model assumes that ε_{in} is independent and identically distributed (IID) (McFadden, 1973). In this study, a conditional logistic regression model including a standard model and a model with heterogeneity, is used.

3.5.2 Multinomial logit model

Conditional logit model

In this study, a specific type of MNL model, the conditional logistic regression model (CLM) is used to analyze the preferences for attributes of carbon information. The assumption is that all investors in the sample are homogeneous which also implies that heterogeneity is homogeneously affected by the control covariates, e.g., socio-economic characteristics, which are observed and interacted with. This also means that all participants have the same basic preferences or WTP. Nevertheless, it should be noted that the CLM model used here is fixed effect CLM, given the sample size, where fixed effects capture time-invariant individual-specific characteristics that are not included in the observed variables. It allows to control of variables that cannot be controlled and helps to account for omitted variable biases which are/or (cannot be) not measured or not available but are correlated with estimators. Additionally, it is suitable in cases when an individual-level analysis is done, as it is in this study when the focus of the study is preferences heterogeneity at the individual level.

The utility function for the logit estimation originates from the random utility component. The equation is:

$$U_{ijn} = \beta' X_{ijn} + \varepsilon_{\text{ijn}} \quad (3)$$

where, *U* represents the utility for choice alternative, this gives us:

$$Y_{nit} = \beta' X_{nit} + \varepsilon_{nit} \quad (4)$$

where, *Y* represents the investment-alternative choice *(i.e., investment alternatives A and B – see Figure 2)* reflecting the utility function, X is the vector of observed independent variables representing the attributes of investment alternatives in the survey *(i.e., 4 carbon information attributes, and 2 conventional investment fund attributes – see Table 2 for information about attribute)*. The coefficient vector β represents the vector of coefficients associated with attribute X indicating preferences that each individual *n* has for alternative *i* in choice situation *t* (McFadden, 1974; Hensher et al., 2015). The choice probability is calculated using the equation:

$$P_{nit} = \frac{exp(x_{nit}\beta')}{\Sigma_{j=1}^{j} exp(x_{njt}\beta')} \quad (5)$$

where *j* is the total number of alternatives (ibid.). The variable β' represents the vector of parameters to be estimated which captures average preferences across individuals, ε is independently and identically distributed (i.i.d.) extreme type 1 (Gumbel) distribution. Equation (5) shows the model for choice probability in the MNL model, this gives us a model for the MNL model with conditional logistic regression model as:

$$P_{nit} = \frac{exp(V_{nit})}{\Sigma_{j=1}^{j} exp(V_{njt})} \quad (6)$$

and,

$$V_{nit} = \beta' X_{nit} \quad (7)$$

V_{nit} represents the systematic utility of alternative *i* for individual n in choice situation *t*, and $\Sigma_{j=1}^{j} exp(V_{njt})$ represents the sum of the exponentiated utilities for all alternatives within the choice set In CLM, the focus is on the choice set rather than the individual level and P_{nit}indicates the probability that individual *n* chooses alternative *i* within the choice situation *t.* Additionally, this heterogeneity in error variance which is explained by observed variables is tested using heterogeneous MNL (HMNL) using *clogithet* in STATA (Hole, 2006; Lagerkvist et al., 2020). Further, the results for the models in this study are estimated using maximum likelihood estimation (Hensher et al., 2015). Nevertheless, to capture the individual-specific heterogeneity (HET) in the *clogit* with the HET model, the systematic utility component V_{nit} is decomposed into the following equation:

$$V_{nit} = \beta' X_{nit} + \gamma_n' Z_{nit} \quad (8)$$

where, Z_{nit} is the vector of observed independent variables associated with the individual-specific random effects or coefficients $\gamma_n'$and Z_{nit}captures the attributes or characteristics that vary across individuals and influence their individual-specific preferences. In the case of this study, it corresponds to the measures that are used as controls including socio-demographic and behavioral variables. The coefficients γ_n' reflect the heterogeneity in preferences for individuals. However, it should be noted that the heterogeneity assumption is the same for all respondents given the socio-demographic and behavioral characteristics.

Willingness-to-pay.

This study uses the results from the conditional logit regression to estimate the willingness-to-pay (WTP) value. WTP value represents the maximum amount of money or value, in this study – the maximum rate of expected return, that the individual *(i.e., nonprofessional or the retail investor)* is willing to sacrifice or will demand to invest in a particular investment alternative that is available to choose from. To estimate WTP using CLM, the estimated coefficient β' for independent variables *(i.e., the attributes in the CLM model)* is ***divided by*** the price coefficient (*in this study, by the coefficient β′of expected annual return).*

3.5.3 Measures for heterogeneity

In this study, multi-variate factor analysis is used to identify some latent constructs that are used as measures for heterogeneity in this study. It is described below followed by the description of measures representing socio-economic and behavioral aspects of the participants that were used in the analysis as measures for testing heterogeneity in preferences.

Multi-variate analysis

This study uses a combination of different methods of factor analysis to derive factors that were used as variable measures to test preference heterogeneity. It is in line with methods recommended by Hair et al. (2006). In DCE it is common practice to use factor analysis to identify and extract factors indicating the underlying dimensions that drive individuals' preferences for different attributes and the related levels in the experiments. Factor analysis helps to simplify the analysis and interpretation of the data. Accordingly, confirmatory factor analysis was conducted by applying one-layer structural equation modeling (SEM) using STATA software to derive factors for behavioral latent constructs based on sets of interrelated indicators.

One-layer SEM was conducted with sets of indicators *(see Appendix 1, Appendix 2, and Appendix 3 for information about sets of indicators)* to derive latent construct *(i.e., factors variable/ measure indicating latent construct)* from three or more indicator variables as it was advised to have at least three related indicators for each latent construct to ensure model identification, and to reduce problems related to statistical power, reliability, and validity of derived factor. Contrarily, a weighted composite score approach was applied to come up with a factor variable for sets of indicators with less than three indicator variables. Moreover, to ensure internal consistency between the items used as indicator variables and reliability of the latent construct indicating that correctly represent the latent behavior, Cronbach's alpha was assessed as a measure to test the average inter-item correlation between the items (indicators). Furthermore, all the indicators that were used to represent the latent factors *(i.e., variable measures – see Table 3 for description about measures used in this study)* were based on the preliminary studies to ensure content validity is maintained and thus factor derived represents the construct being measured.

Measures related to socio-economic characteristics.

Four different variable measures associated with socio-economic characteristics were identified based on the literature review (Chapter 2.2.2). A dummy variable for level of income, household *income above 60,000 SEK* was constructed based on income data to represent the two highest income groups *(1= income above 60,000 SEK and 0=other categories combined).* Similarly, the three other dummy variables – *elementary level of education (1=yes, and 0=otherwise, combined), area size less than 10,000 inhabitants (1= yes and 0= otherwise combine together),* and *average monthly investment above 5000 SEK (1= yes and 0= otherwise combine together)* were constructed from the corresponding data set related to education, inhabitant size, and size of the monthly investment. These measures represent a few key socio-

economic characteristics related to investors that can affect their investment behavior which is also discussed in Chapter 2.2.2.

Table 3. Overview of measures for heterogeneity.

Socio-economic variables	***Behavioral variables***
- *Household income above 60,000 SEK* - *Elementary level of education* - *Area size with less than 10,000 inhabitants* - *Monthly investment size above 5000 SEK*	- *Perceived importance of sustainable fund label for owns' impact investment decisions.* - *Relevance of the EU green deal objectives* - *Attitude toward climate change* - *Self-stated knowledge* - *Social norms* - *Warm glow* - *Need for cognition.*

Measures related to behavioral aspects.

Perceived importance of sustainable fund label for owns' impact investment decisions:

Chapter 2.1.3 discusses how the relative role of labels used as symbolic gestures to signal investors. Additionally in Chapter 2.2.2 it is discussed the role of cognition related factor like perception on investors decisions. Based on these premises, a dummy variable was constructed based on the data comprising answer to question asking the participants to choose labels that they consider as being significant for their own impact investment decisions. The sustainable fund labels that were used includes – European Union (EU) fund classification, Nordic Swan label fund, Morningstar *(see Appendix 1, Q.19 for description).* A dummy variable *'perceived importance of sustainable fund label fund for own' impact investment decisions'* was then constructed representing the response indicating those who selected at least one of the labels *(1= selected at least one sustainable fund label as being critical, and 0= otherwise)* as being critical for their investment decisions.

Relevance of the EU Green Deal objectives:

One layer SEM was conducted to derive the latent construct from the sets of indicators *(see Appendix 2 for statistics, alpha, and results, and Appendix 1 – Q.4.1 for a description of the questionnaire)* representing the attitude of participants *(discussed in Chapter 2.2.2)* to assess the preference heterogeneity. All the indicators have estimates for alpha greater than minimum acceptable criteria greater than 0.70 indicating a higher level of internal consistency among indicators used to derive the latent construct. Additionally, results from SEM show all the indicators with factor loadings above 0.50 recommendation indicating a strong relationship between the indicator variables and the latent factor (Hoyle, 1995; Hair et. al. 2006; Johnson and Wichern, 2002). Additionally, the indicators represent the EU Green Deal objectives (Fetting, 2020) that represent the EU policy initiatives on the transition to sustainability.

Attitude toward climate change:

It is adapted from Kleffel and Muck (2022). Investors' attitude toward climate change and their overall perception of the severity of climate change affects their impact on investment

decisions. One layer SEM was performed (Appendix 3) to derive a latent construct based on the answers where the participants about their concern for climate change (see Appendix 1, Q12). Both, the alpha reliability indicator and factor loadings for the items that were used to construct the latent variable show internal consistency and a strong relationship between the indicators and the latent construct – *attitude toward climate change* (Hoyle, 1995; Johnson and Wichern, 2002).

Self-stated knowledge:

As knowledge was found to be an important behavioral and cognitive factor affecting investors' preferences (Chapter 2.2.2). In this study, participants were asked if they knew about sustainability reporting, science-based targets, and accounting for GHG emissions to get an overview of their knowledge and awareness about sustainability funds. Ordinal scale rating was used to get an overview of their self-stated knowledge using the Likert scale *(I know very much – nothing at all).* Additionally, one-layer SEM (Hoyle, 1995; Johnson and Wichern, 2002) was conducted to derive the latent construct from the sets of indicators used in the survey (Appendix 4).

Social Norms:

It is adapted from Kleffel and Muck (2022). A question including two items representing social norms along with other items that required the Likert scale response *(strongly disagree to strongly agree – 7-point scale)* was presented to the participants *(see Appendix 1, Q13).* The questions included responses on the role of social connections and social contacts of respondents in making impact investment choices. Additionally, weighted composite scores (WCS) were obtained to come up with a factor based on the responses on those two indicators from the survey (Hair et al., 2006).

Warm glow:

It is adapted from Kleffel and Muck (2022) A Likert scale question *(see Appendix 1, Q13)* was presented to the participants to get an overview of their motivation for impact investment decisions. It aimed to assess the roles of intrinsic benefits (*i.e., satisfaction and happiness that investors associate with their impact investment decisions)* in impact-investments decisions. Additionally, the factor variable was obtained from WCS approach (Hair et al., 2006).

Need for cognition:

A Likert scale question to assess participants participants' preference for a task requiring complex skill sets and analytical ability was presented to the respondents to get an overview of their inclination toward a task requiring cognitive and analytical ability (Kleffel and Muck, 2023). WCS approach (Hari et al., 2006) was used to come up with factors for the sets of indicators that were used in the survey *(see Appendix 1, Q20).*

4. Results and Analysis

In this section, the results describing the demographic information about the participants are presented which is then followed by analysis results from discrete choice experiments.

4.1 Descriptive Statistics

Participants

Table 4 illustrates the summary of socio-economic characteristics of 142 participants. Of those 142 participants about 69 were female representing about half of the total sample. Similarly, more than 70% of them have at least high school or equivalent education, and above 60% with household monthly income above 30000 SEK. All 142 of the participants were at least 18 years and not above 75 years. Additionally, about 60% of the participants were currently living in towns with more than 50,000 inhabitants. No other questions about socio-economics characteristics were asked to keep the survey short.

Overview of savings and investment practices

The survey also included information related to investment experience and practices (Table 6) and information about self-stated knowledge by the participants about different labels for sustainable funds which is summarized in Table 5. As it is assumed a monthly investment of 1000 SEK in some impact investment alternative, it was deemed important to get an overview of participants' savings, knowledge about sustainable funds, and investment experiences and practices. It should be noted that, as the respondents were channeled depending on the answer to some nested-conditional questions, the *N* may differ.

Overall, the results show at least 126 which is about 90% have some kind of investment experience, nevertheless, the remaining participant who said no that they have not invested are also interested in future investments. Additionally, 51 participants answer about making monthly contributions over 1000 SEK, however, only 27 participants answered correctly for at least one of the questions when they were asked to choose the correct description representing the characteristics of different labels for sustainable funds (see Table 5 for summary, see Appendix 1 – Q16, Q17, Q18).

Table 4. Descriptive statistics – demographics.

Characteristics	**Number of Respondents (*N = 142)***
Gender	
Male	*69 (48.59%)*
Female	*71 (50.00%)*
Non-binary	*1 (0.70%)*
Others	*1 (0.70%)*
Age	
18-25	*21 (14.79%)*
26-35	*23 (16.20%)*
36-45	*19 (13.28%)*
46-55	*30 (21.13%)*
56-65	*30 (21.13%)*
66-75	*19 (13.38%)*
Household size	
Single persons household	*32 (22.54%)*
Two persons	*52 (36.62 %)*
Three persons	*25 (17.61%)*
Four persons	*21 (14.79%)*
Five persons and above	*12 (8.45%)*
Inhabitant size	
More than 150,000 inhabitants	*49 (34.51%)*
50,000 – 150,000 inhabitants	*39 (27.46%)*
10,000 – 50,000 inhabitants	*20 (14.08%)*
Less than 10,000 inhabitants	*27 (19.01%)*
Do not know	*7 (4.93%)*
Level of education	
Elementary school or equivalent	*9 (6.34%)*
High school or equivalent	*61 (42.96%)*
College/university up to three years	*43 (30.28%)*
College/university more than three years	*2 (1.41%)*
Other	*27 (19.01%)*
Household's monthly income	
Less than SEK 10,000	*1 (0.70%)*
SEK 10,001 - 20,000	*10 (7.04%)*
SEK 20,001 - SEK 30,000	*24 (16.90%)*
SEK 30,001 - 40,000	*20 (14.08%)*
SEK 40,001 - SEK 50,000	*17 (11.97%)*
SEK 50,001 - 60,000	*17 (11.97%)*
SEK 60,001 - 70,000	*19 (13.38%)*
more than SEK 70,000	*17 (11.97%)*
Do not want to specify	*17 (11.97%)*

Table 5. Summary of self-stated knowledge (showing the answers for correct and incorrect responses)

Variables/ Questions	**Number of participants who say Yes (N =142)**	**Number of participants who answered one correctly**
***Answers** (self-stated knowledge)*		
Nordic Swan label fund	*70*	*19*
Morning Star	*60*	*8*
EU Fund classification	*33*	*6*
Number of participants who answered at least one correctly		*27*

Table 6. Overview of investment practices.

Characteristics	**Number of respondents**
Investment Experience	***N = 142***
Yes	*126*
No (but planning to invest)	*16*
Investment practice	***N = 126[a]***
Monthly savings investments	*73*
Invested in individual occasions.	*75*
Through public pension schemes	*39*
Others	*14*
Not invested in financial markets	*18*
Instruments invested in	***N = 94[b]***
Equity Funds	*28*
Interest bearing securities.	*20*
Shares and fixed income securities (Mixed funds)	*14*
Shares	*30*
Derivatives (e.g., futures, options)	*4*
Others	*0*
No previous investments	*0*
Average monthly investment in SEK	***N = 62[c]***
Up-to 500	*1*
500-1000	*10*
1001-2000	*18*
2001-5000	*20*
More than 5000	*14*
Number of respondents who knew about Eco label funds	***34***

a Number of participants who said yes they have invested earlier.

b Number of participants who chose options other than pensions and none for investment practice.

c Number of respondents who has invested in bonds and or shares.

4.2 Results from MNL

Table 7 illustrates the results from the conditional logistic regression showing direct effects without accounting for preference heterogeneity. MNL-Model1 shows the direct relationship between the carbon information attributes and impact investment alternatives that were included in the DCE. While a positive and higher coefficient indicates a stronger average preference for that attribute and its corresponding level, the opposite is also true indicating aversion for the carbon information attributes. In addition, attributes, *target difficulty*, and *expected annual return* were assumed to have a linear relationship and thus have only one coefficient. *External validation of the target by SBTi* and *target progress* are binomial variables indicating a higher and positive value of coefficient showing a preference for targets that are approved by SBTs validation and 'on track' status of target progress respectively. Additionally, the remaining attributes are divided into levels thus showing relative preferences for each level where *industry average GHG emission* and *risk-category 4* are the reference category for levels associated with those attributes.

Table 7. Results from the conditional logit model showing the direct effects (Model 1).

MNL - Model 1	**Coef.**	**Robust S.E.**	**P > | z |**
Attributes:			
GHG Emissions			
- *Lower than the industry avg.*	*0.084*	*0.138*	*0.582*
- *Higher than the industry avg.*	*-0.812****	*0.152*	*0.000*
Target Difficulty	*0.966****	*0.313*	*0.004*
External validation of target from SBTi	*0.292****	*0.100*	*0.003*
Target Progress	*1.038****	*0.099*	*0.000*
Expected Annual Return	*8.534****	*0.928*	*0.000*
Risk indicator			
- *Risk class 5*	*-0.253*	*0.159*	*0.112*
- *Risk class 6*	*-0.349****	*0.095*	*0.000*
Optout (ASC)	*1.407****	*0.259*	*0.000*

Wald chi2(9):	*455.75*	Number of respondents:	*142*
Prob > Chi2	*0.000*	Number of observations:	*3408*
Pseudo R2:	*0.2236*	AIC:	*1955.982*
Log Pseudo likelihood:	*-968.990*	BIC:	*2011.187*

** p < 0.10; ** p < 0.05; *** p < 0.01; [95% Conf. Interval]*

The result shows that the parameter for *GHG emissions higher than the industry average* is statistically significant and has a negative coefficient. It suggests that participants, ceteris paribus, do not prefer to invest in funds including companies showing higher emissions than the industry average. *Target difficulty* and *external validation of target from SBTi* both have parameters that are significant at a 1% level and are positive. Moreover, in terms of the size of the effect, the target progress has the highest positive coefficient among attributes that belong to carbon information attributes. This suggests target with the *'on track' progress status* on

meeting the company's emission reduction targets has the highest positive effect for attributes belonging to carbon information. Additionally, both risk and return, the other two attributes belonging to conventional fund attributes have significant effects. The coefficient for *expected annual return* suggests a very strong positive effect which is the highest among all fund attributes that were used in this study, and it is significant with a p-value less than 0.01. This suggests return is still the major factor that participants will take into consideration while choosing among impact investment alternatives. Further, increasing *risk* on the other hand has negative estimates showing that investors are risk-averse, which was expected. Additionally, the Wald Chi-square statistic is 455.75 with 9 degrees of freedom. Furthermore, the associated p-value is reported as 0.00 which suggests, overall, the model is statistically significant, indicating at least 5 of the fund attributes have a significant effect on the stated choice presented to the participants.

4.3 Results of HMNL Model

Table 8 (Model 2A – 2C) illustrates the results from the HMNL model showing heterogeneity of preferences. It is based on the measures described in Chapter 3.5.3 *(see Table 3 for an overview)*. Model 1 (Table 7) was extended. Model 2A shows the results including the measures related to socio-economic characteristics. Additionally, Model 2B shows results of preference heterogeneity for behavioral aspects of investors and Model 2C takes into consideration both behavioral and socio-economic aspects to estimate individual-specific preference heterogeneity. Table 6 indicates all three parameters for socio-economic variables including *household income above 60,000 SEK*, *elementary level of education,* and *area size less than 10,000 inhabitants* except *average monthly investment above 5000 SEK* are statistically significant at 5% significance level across the two models (Model 2A and 2C). It can be observed that both *household income above 60,000 SEK* and a*rea size less than 10,000 inhabitants* have moderate levels of estimates suggesting these observed variables capture moderate preference heterogeneity.

Additionally, the scale parameter for the *perceived importance of sustainable fund labels for own's impact investment decisions* is statistically significant at a 5% level across models 2B and 2C, the scale parameter for *social norms* on the other hand is only statistically significant at a 10% level in model 2C. However, all other scale estimates representing the variability of preferences associated with measures related to behavioral aspect are insignificant suggesting these variable measures does not systematically affect the error variance. It implies they do not affect choice certainty. Moreover, the results also revealed that except for Model 2A with socio-economic measures, the independent attribute in Models 2B and 2C does not have coefficients that are not statistically significant at a 5% level. Furthermore, even if the significance level is relaxed at a 10% level it is observed that only a few of the attributes have estimates that are significant with a p-value that is lower than 0.10.

Table 8. Results from the HMNL model including direct effects (Model 2).

HMNL (Model 2A – C)	**Model 2A**	**Model 2B**	**Model 2C**
Attributes			
GHG emission higher than	*-0.729*	*-0.479*	*-0.561*
industry average	*(5.80)****	*(1.72*)*	*(1.78)**
GHG emission lower than	*0.132*	*0.099*	*0.153*
industry average	*(0.97)*	*(0.91)*	*(1.15)*
Target difficulty	*0.897*	*0.662*	*0.766*
	*(3.26)****	*(1.52)*	*(1.6)*
External validation of target by SBTi	*(0.226)*	*0.187*	*0.179*
	*(2.32)***	*(1.59)*	*(1.52)*
Target Progress	*(0.932)*	*0.652*	*0.756*
	*(9.61)****	*(1.72)**	*(1.78)**
Expected Annual Return	*7.843*	*5.069*	*6.009*
	*(8.78)****	*(1.78)**	*(1.82)**
Risk Class 5	*0.271*	*-0.164*	*0.228*
	*(1.87)**	*(1.17)*	*(1.31)*
Risk Class 6	*-0.293*	*-0.211*	*-0.238*
	*(3.39)****	*(0.41)*	*(1.31)**
Optout	*1.291*	*0.808*	*0.994*
	*(5.43)****	*(1.62)*	*(1.72)**
Standard Derivation:			
Socio-economic variables:			
Household income above 60,000 SEK	*0.376*	*-*	*0.337*
	*(3.16)****	*-*	*(2.74)****
Elementary level of education	*-1.158*	*-*	*-0.905*
	*(2.27)***	*-*	*(2.02)***
Area size with less than 10,000 inhabitants	*0.365*	*-*	*0.351*
	*(2.93)****	*-*	*(2.75)****
Average monthly investment above 5000 SEK	*-0.041*	*-*	*-0.015*
	(0.27)	*-*	*(0.09)*
Behavioural variables:			
Perceived importance of sustainable fund labels	*-*	*0.378*	*0.278*
for own's impact-investment decisions	*-*	*(3.28)****	*(2.43)***
Relevance of EU Green deal objectives	*-*	*-0.063*	*0.022*
for own's investing.	*-*	*(0.49)*	*(0.18)*
Attitude to climate change	*-*	*0.125*	*0.136*
	-	*(0.75)*	*(0.85)*
Self-stated knowledge	*-*	*-0.037*	*-0.036*
	-	*(0.8)*	*(0.81)*
Social norms	*-*	*-0.082*	*-0.087*
	-	*(1.58)*	*(1.70)**
Warm glow	*-*	*0.116*	*0.072*
	-	*(0.85)*	*(0.53)*
Need for cognition	*-*	*0.023*	*0.028*
	-	*(0.25)*	*(0.32)*
LR- chi2 (d.o.f):	*32.30 (4)*	*26.21 (7)*	*48.94 (11)*
Prob > Chi2:	*0*	*0.0005*	*0*
Log likelihood:	*-952.839*	*-955.884*	*-944.523*
AIC:	*1931.678*	*1943.768*	*1929.046*
BIC:	*2011.418*	*2041.91*	*2051.724*

** p < 0.10; ** p < 0.05; *** p < 0.01; For all models - Number of Participants = 142, Number of observations = 3408, [95% Conf. Interval]; | z | - value in Parenthesis*

4.4 Willingness to pay estimates.

Table 9. WTP for carbon information attributes.

WTP estimates	WTP	P > | z |	[95% Conf. Interval]
GHG emission higher than the industry average	*0.095***	*0.000*	*[0.0640595; 0.1261595]*
GHG emission lower than the industry average	*-0.010*	*0.587*	*[-0.0454088; 0.0257198]*
Target difficulty	*-0.113****	*0.002*	*[-0.1837018; -0.0304357]*
Target progress	*-0.122****	*0.000*	*[-0.1543653; -0.0920135]*
External validation of target by SBTi	*-0.034****	*0.005*	*[-0.0559972; -0.0091491]*
Risk class 5	*0.030*	*0.120*	*[-0.0702277; 0.0076755]*
Risk class 6	*0.041****	*0.001*	*[-0.0317662; 0.0499101]*

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 9 shows the results for WTP estimates using *expected annual return* as a substitute for price. The parameters used for calculations of WTP estimates were based on the results from Model 1 which is the main MNL used in this study. It displays WTP estimates at 95% confidence intervals depicting the upper bound and lower bound values. The result shows three negative estimates which are statistically significant suggesting the participants are willing to accept a negative marginal return for *target difficulty* with more difficult emission reduction goals (i.e., higher level of target difficulty), *target progress,* and *targets validated as science-based targets*. On the other hand, higher returns were expected to invest in funds of companies with *much higher levels of GHG emissions than the industry average*. The positive coefficient of 0.095 for GHG emissions higher than the industry average suggests impact investors on average seek more return for information suggesting negative emission performance. Additionally, it also implies that the investors may be less willing to accept a lower return as a trade-off for investing in firms with higher emissions. Moreover, *target progress* has the highest WTP estimates followed by *target difficulty*. Positive coefficients for these attributes suggest investors are willing to accept lower returns for investments in companies showing they are on track to meet their 2030 emissions target. The result suggests investors are willing to forego more than 10% of return for targets with 'on track' progress status and targets with higher levels of target difficulty. However, DCE often gives WTP estimates that are inflated as they are prone to context effects. For example, a participant selecting a much higher level of target difficulty when it is placed together to a higher difficulty level led to context effect. In addition, WTP is also prone to extreme response behavior, therefore, caution should be maintained while viewing these estimates. Overall, the results from WTP estimates suggest the prevalence of a negative preference or aversion toward firms with higher GHG emissions when it comes to accepting a lower return.

4.5 Results with interaction variables

Table 8 (Model 3A to 3I) expands the main model MNL – Model 1 to include interactions. IT illustrate the results including the interaction variables including four different interactions – interactions of *target progress* with target *difficulty*, *external validation of target by SBTi* and *higher GHG emissions*, interactions of *higher GHG emissions with target difficulty* and *external validation of target by SBTi*, interaction of *external target validation by SBTi with target difficulty* and interactions including all of them together in a single model. Additionally, the results show positive effect of interaction between target progress with target difficulty, interaction between higher emissions with external validation of targets by SBTi, and interaction between external approval of target by SBTi with target difficulty suggesting positive relationship between the attributes in effecting the investors preferences. However, it should be noted that none of the interactions have statistical significance in terms of p-value at any of the significant level 1%, 5% or 10%.

Table 10. MNL model with interaction terms (Model 3A - 3I)

MNL with interactions	Model 3A	Model 3B	Model 3C	Model 3D	Model 3E	Model 3F	Model 3G	Model 3H	Model 3I
Attributes									
GHG emission lower than	*0.076*	*0.117*	*0.04*	*0.055*	*0.085*	*0.091*	*0.088*	*0.062*	*0.06*
industry average	*(0.49)*	*(0.76)*	*(0.25)*	*(0.35)*	*(0.56)*	*(0.59)*	*(0.57)*	*(0.36)*	*(0.3)*
GHG emission higher than	*-0.813*	*-0.796*	*-0.692*	*-0.656*	*-0.913*	*-0.846*	*-0.896*	*-0.831*	*-0.703*
industry average	*(5.84)****	*(5.72)****	*(4.04)****	*(3.80)****	*(3.38)****	*(5.26)****	*(3.04)****	*(5.37)****	*(2.23)***
Target difficulty	*0.849*	*0.977*	*0.988*	*0.699*	*0.879*	*0.949*	*0.9*	*0.902*	*0.64*
	*(2.06)***	*(3.08)****	*(3.16)****	*(1.66)*	*(2.40)****	*(2.99)****	*(2.30)***	*(2.34)***	*(1.28)*
External validation of targets	*0.297*	*0.423*	*0.299*	*0.48*	*0.292*	*0.259*	*0.276*	*0.05*	*0.197*
by SBTi	*(2.93)****	*(3.00)****	*(2.94)****	*(3.26)****	*(2.90)**'*	*(2.00)***	*(1.8)*	*(0.05)*	*(0.19)*
Target Progress	*0.941*	*1.111*	*1.15*	*1.003*	*1.04*	*1.038*	*1.039*	*1.04*	*1.059*
	*(3.78)****	*(9.62)****	*(7.86)****	*(3.84)****	*(10.47)****	*(10.47)****	*(10.43)****	*(10.51)****	*(3.70)****
Expected Annual Return	*8.552*	*8.588*	*8.605*	*8.756*	*8.555*	*8.609*	*8.585*	*8.487*	*8.971*
	*(9.23)****	*(9.10)****	*(9.22)****	*(9.12)****	*(9.18)****	*(9.11)****	*(9.00)****	*(8.93)****	*(8.71)****
Risk Class 5	*-0.227*	*-0.349*	*-0.26*	*-0.318*	*-0.247*	*-0.253*	*-0.249*	*-0.242*	*-0.352*
	(1.34)	*(1.96)***	*(1.62)*	*(1.73)*	*(1.56)*	*(1.59)*	*(1.56)*	*(1.46)*	*(1.81)*
Risk Class 6	*-0.351*	*-0.34*	*-0.371*	*-0.362*	*-0.352*	*-0.347*	*-0.35*	*-0.346*	*-0.346*
	*(3.68)***	*(3.57)****	*(3.78)****	*(3.75)****	*(3.68)****	*(3.60)****	*(3.58)****	*(3.57)****	*(3.48)****
Optout	*1.369*	*1.433*	*1.323*	*1.25*	*1.476*	*1.437*	*1.468*	*1.389*	*1.287*
	*(4.96)***	*(5.39)****	*(5.10)****	*(4.51)****	*(4.79)****	*(5.30)****	*(4.67)***	*(5.18)****	*(3.53)****
Interaction 1									
Target progress × difficulty	*0.253*	*-*	*-*	*0.668*	*-*	*-*	*-*	*-*	*0.648*
	(0.44)	*-*	*-*	*(1.07)*	*-*	*-*	*-*	*-*	*(0.96)*
Target progress × External	*-*	*0.262*	*-*	*-0.347*	*-*	*-*	*-*	*-*	*-0.453*
approval by SBTi	*-*	*(1.27)*	*-*	*(1.56)*	*-*	*-*	*-*	*-*	*(1.81)**
Target progress × higher	*-*	*-*	*-0.264*	*-0.307*	*-*	*-*	*-*	*-*	*-0.363*
GHG emission	*-*	*-*	*(1.1)*	*(1.25)*	*-*	*-*	*-*	*-*	*(1.39)*
Interaction 2									
Higher GHG Emission	*-*	*-*	*-*	*-*	*0.234*	*-*	*0.156*	*-*	*-0.121*
× target difficulty	*-*	*-*	*-*	*-*	*(0.44)*	*-*	*(0.21)*	*-*	*(0.15)*
Higher GHG Emission	*-*	*-*	*-*	*-*	*-*	*0.091*	*0.045*	*-*	*0.297*
× SBTi approval	*-*	*-*	*-*	*-*	*-*	*(0.41)*	*(0.14)*	*-*	*(0.86)*
Interaction 3									
External target approval by	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*0.497*	*0.456*
SBTi × target difficulty	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*(0.26)*	*(0.21)*
Wald chi2:	*454.48*	*457.38*	*447.53*	*442.5*	*452.27*	*455.37*	*453.43*	*456.81*	*443.67*
Pseudo R2:	*0.224*	*0.2243*	*0.2241*	*0.2252*	*0.2237*	*0.2237*	*0.2237*	*0.2236*	*0.226*
Log Pseudo-likelihood:	*-968.896*	*-968.144*	*-1346*	*-966.92*	*-1859*	*-968.901*	*-968.88*	*-968.957*	*-966.201*
AIC:	*1957.791*	*1956.289*	*1956.757*	*1957.841*	*1957.782*	*1957.804*	*1959.761*	*1957.914*	*1962.401*
BIC:	*2019.13*	*2017.627*	*2018.096*	*2031.447*	*2019.121*	*2019.143*	*2027.234*	*2019.253*	*2054.41*

** p < .10; ** p < .05; *** p < .01; For all models - Number of Participants = 142, Number of observations = 3408, [95% Conf. Interval]; | z | - value in Parenthesis; Model 4 represents* ***Interaction-4*** *using all interactions variable from interactions 1,2 and 3.*

5. Discussions

This research study mainly contributes to carbon disclosure and impact investing literature. For instance, it aids the work of – Matsumura et al. (2014), Johnson et al. (2019), Clarkson et al. (2015), Griffin et. al. (2017), etc on general investment implication of carbon dislosure. Additionally, this study also contributes to fill the gap discussed in Agrawal and Hockert's (2021) about the underexplored state of the overall field of impact-investing. It provides insight into non-professional investors' preferences for carbon information attributes in the context of impact investing. The focus of this research study is not only the effect of past GHG emissions performance on investors' preferences but also the relevance of GHG targets *(i.e., companies' future expectations for emissions, and related target related attributes including, the level of target difficulty, status of target progress and validation of target as science-based targets)* for impact investment decisions. Moreover, the findings of this research study have wider implications and can be applied in the field of management accounting and sustainability reporting, corporate carbon management, fund management, etc., to name a few.

This section presents the key discussions based on the findings and analysis. Additionally, it discusses the wider potential implication of this research study, a few key limitations of the study, and recommendations for future research.

5.1 Discussion

Relevancy of carbon information attributes

The results of this research study suggest attributes of carbon information are of high relevance to non-professional impact investors. It affects their preferences thus affecting their priorities among available fund characteristics that they take into consideration while making impact investment choices. For instance, the findings of this research study reveal that Swedish non-professional investors, on average, do not prefer to invest in funds that include companies with GHG emissions higher than the industry average emission. This supports the findings of the existing study - for example, He et al. (2021), Haji et al. (2021), Johnson et al. (2019), Barber et. al. (2021), etc. about the negative impact of negative environmental performance.

It further strengthens the arguments that impact investors, on average, are averse to firms with higher emission intensity. In addition, willingness to pay estimates from the findings also contributes to this argument that the impact investors on average will expect more future return for investment portfolios including firms with lower emissions performance. This has implications for companies and GHG emissions performance becomes highly relevant for their carbon management strategies.

Furthermore, the findings also reveal, the target progress has the highest positive estimate among the carbon information attributes. It suggests that the Swedish non-professional on average has a high preference for investment choices showing that companies are on track to meet their GHG emissions reduction goal by 2030. Additionally, it also reveals they prioritize funds including companies that show higher levels of target difficulty and ambitious targets in their carbon disclosures. Additionally, WTP estimates for both attributes were negative suggesting that the Swedish retail investors were even willing to forgo part of their marginal return for targets with 'on track' progress status and more difficult targets. This suggests that trade-offs may exist between both conventional fund attributes and the carbon information attributes and could affect the willingness to pay as outlined by Barber et. al (2021). This further highlights the significance of relevance of both target progress and target difficulty, both, for the investors' decision-making in the context of impact investing and for the carbon disclosure, an aspect of wider carbon management strategies and carbon accounting.

Overall, the findings of this research study show that GHG emissions performance, GHG targets, and the related attributes are of high relevance to both the impact investment decisions and companies' carbon management. However, this does not cancel the significance of the relevancy of conventional fund attributes like risk and return in line with discussion of Barber et. al. (2021). The findings of the study suggest non-professional investors will still consider a return as one of the main criteria for their investment choices and expect some level of positive return even for the funds showing a higher level of GHG information attributes. And they do not prefer higher risk.

Legitimizing roles of the science-based label, target progress, and target difficulty

In this study, interactions models (Table 10) were primarily used to assess the role of these carbon information attributes and how their relationships and interactions explain the legitimizing role of these carbon information attributes, an aspect of broader corporate social responsibility disclosures. While the model was not able to provide any significant effects of interactions on the investors' preferences to make any conclusions, the main model does show the direct effects of the attributes that were used in the study.

The findings suggest the presence of a moderate positive effect of science-based level on investment preferences. It shows that the target being externally approved – for example, the target approved as a science-based target by the SBTi, has a moderate positive effect suggesting that the investors have a moderate level of positive perceptions perception for SBTs. Reflecting on the discussion in Chapter 2.13 by He et al. (2021), Milne and Patten (2002), and Dahlmann et al. (2019) *(about the reputational benefits of having a sustainable label signaling the public positive image of the company)* and discussion about symbolic legitimacy by Schuman, (1995), Mayer and Rowan (1977), and Dahlmann et al. (2019) *(about companies using symbolic actions and gestures for managing the perceptions of investors)*, it can be argued having a target approved as the science-based target has some reputational benefit showing firms' commitment to sustainability. It suggests science-based labels as a symbolic gesture show the existence of symbolic legitimacy and affects the investors' perception of the investment fund including companies with a target that are validated as SBTs by the SBTi positively.

While the findings show no statistically significant evidence for the positive effects of the lower emissions therefore no logical claim about substantive action related to actual emissions can be made. However, the results show the highest positive effect of target progress and additionally, a higher effect of target difficulty than for science-based labels, therefore, some inference is possible. Based on the premise that was set on Chapter 2.1.3 *(perspectives related to symbolic and substantive legitimacy and discussion about effects of targets-related attributes)* it can be argued that target progress *(which shows the target being on track to attain the company's GHG emission reduction goals)* and higher target difficulty shows substantive actions of the companies to attain the companies' emissions reduction objective and credibility in their claims about the information that is disclosed in the carbon disclosures. And the results also show the estimated positive effects are higher for these two attributes than science-based labels suggesting that Swedish non-professionals prioritize more substantive actions though symbolic gestures can have some reputational benefit. These are arguments are in line with Milne and Patten (2002) and Dahlmann et al. (20219). Additionally, these findings has greater implications on the role of target progress and target difficulty on the topic of relevancy among the carbon information attributes indicating more priority should be given to substantive action for having a greater positive impact on retail investors.

Preference heterogeneity.

Findings of this research study, while accounting for heterogeneity in individual-specific preferences suggest that socio-economic characteristics of the non-professional investors – for example, having a negative scale for *elementary level of education* were associated with lower scale thus indicating larger error variance.

One possible reason may be related to the limitation of statistical power associated with a smaller sample size. And the limitations are discussed in Chapter 5.3. Nevertheless, having a higher *household income above 60,000 SEK* shows it contributes to a moderate level of heterogeneity suggesting support for the existing findings of Cheah et al. (2011) and Nilsson (2009). Additionally, for variables related to behavioral aspects, the perceived importance of sustainable fund labels for own's impact investment decisions shows a moderate level of heterogeneity. But it is only significant at a 10% significance level. However, the findings for other behavioral factors expect the *perceived importance of sustainable fund labels on owns' impact investment decisions* and *social norms* other factors were not statistically significant, for which, methodological limitations are discussed in the latter part of this chapter.

5.2 Implications

The results of this research study can be a point of inference to corporate management, fund managers, and policymakers as the target attributes are of high relevance not only for investors but also has wider applications. The findings have shown that non-professional investors, in general, prioritize targets that are difficult with higher emissions reduction levels. In addition, the investors have the highest preference for target showing progress toward meeting emission reduction goals among all four attributes that belonged to the carbon information. This suggests that substantive claims about showing on-track progress and setting difficult targets showing a greater level of commitment have significant implications for investment preferences. Therefore, this finding can provide insights to corporate management in their carbon management practices with information about what attributes of GHG emissions information. It helps them to rethink and prioritize what attributes related to carbon information are to be considered in their carbon management strategies and action plans. It helps in improving not only the companies' reputation but also the credibility of their claims on carbon disclosures and has a greater impact on the investors' preferences. Additionally, these results also discourage them from setting less ambitious targets and focusing on progress, thus, avoiding misalignments of targets and reducing the instances of greenwashing practices.

Additionally, the results can be equally important for fund managers. The results from the studies can be used as a reference for designing a portfolio of impact investment funds prioritizing stocks of companies disclosing higher target difficulty that are aligned with the IPPC climate goals, companies with lower emissions or targets showing substantive progress that is on track to meet the company's carbon reduction goals. It can thus promote both responsible investments and overall sustainability in the longer time frame by encouraging investment into companies with higher positive impacts. Moreover, it can also be used by lobbyist or the policy maker as evidence showing that investors in general prefers to see substantive action to push agendas and policy related to GHG emissions to businesses and companies.

5.3 Limitations and future research

This research study has some limitations. The first limitation can be derived from the nature of choice experiments. As DCEs are based on hypothetical settings, DCEs as a method has limitations and are not able to fully capture the effects in some absolute term. It suggests choice experiments may not be able to capture the absoluteness of the effect in the totality of how individuals behave in real-life situations. For instance, DCE may sometimes result in overstated effects and may lead the participants to overstate their WTP (Hensher et al., 2015). However, in this study, a cheap talk script was used to reduce the hypothetical bias (Chapter 3.3.3).

Additionally, though the sample size of 142 participants was relatively fair for conducting DCE (Louviere and Islam, 2008) and even yielded some significant effects of the attributes in the standard CLM model with direct effects, the researchers faced some challenges during the analysis. The coefficient for most of the variables in the MNL with heterogeneity and interactions variables were insignificant suggesting that limited statistical power associated with smaller samples hindered the detection of significant effects in the MNL model. Furthermore, latent constructs that were derived were mainly derived using one-layer structural equation modeling as it was better suited for the corresponding sample size of 142 respondents. But it should be noted that it does not account for higher order relationships, or the indirect effects thus cannot account for nested relationships and capture the complete effects of latent variables.

Overall, the methods applied in this study are impartial given the size of the sample that was used to investigate the effect of carbon information. The analysis produced a fair result that shows the relevance of the carbon information attributes and their direct implications for investors' preferences. Though the results from the analysis using the complex model are not conclusive, the results thus yielded from the main

model are useful to further motivate the research in a topic related to – for example, the relevancy of carbon information attributes for carbon disclosure and impact investing. Moreover, future research on these topics could utilize the standard model used in this study to derive a more complex model that is flexible to analyze research including data with a larger sample size and more complex relationship. For instance, a hybrid model of multivariate analysis, e.g., multi-layer SEM could be used to handle covariates to capture high-order relationships including feedback loops. Additionally, as this study specifically focuses on individual-specific preference heterogeneity using a set of socio-economic and behavioral variables, the literature review used in this study, particularly for this case can be used as a point of reference in future studies to motivate studies.

6. Conclusions

To this end, a review of literature on carbon disclosures and impact investing was presented including some elements related to broader management accounting and sustainability reporting literature. In addition, perspectives of legitimacy and behavioral finance related to carbon reporting and impact investing were referred to and explained. It helped to motivate the hypothesis with an aim to gain a deeper understanding of the effects of interaction on investment preferences. The results of a DCE were then analyzed using conditional logistic regressions to get understating of Swedish non-professional investors' preferences. This gives us insights into main findings of this research study which is summarized in this chapter.

The findings of this study contribute to the existing knowledge about the negative effect of negative environmental performance on investment funds by confirming that non-professional investors do not prefer investment alternatives with higher GHG emissions than the industry average. Results from WTP estimates also support indicating the investor will expect more return for investing in the stock of companies with higher past GHG emissions. Moreover, the findings of this study show that the investors have *highest preferences for companies with 'on track' status of target progress* indicating that companies are on track to achieve their 2030 GHG emissions targets. Additionally, this was higher than for the preferences for targets with science-based labels which showed significant positive and moderate effects on the investors' preferences. This confirms the existing studies assessing the effects of carbon disclosure information from legitimacy perspectives that – even though symbolic actions and gestures like having a science-based label have some legitimacy effect, the legitimacy effect of substantive actions indicating higher commitment and credibility of having a GHG target have higher effects on the investors' preferences. The findings showing the higher positive effect of target difficulty than the moderate positive effect of having a science-based label further strengthen this argument and firmly established the relevancy of GHG targets and target-related attributes. Nevertheless, risk and return are still the key criteria related to conventional fund that the investors take into consideration while making trade-offs between their investment priorities suggesting they expect positive return and investors are in general risk averse. *It implies funds with better level of target attributes with positive returns are preferred.*

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Popular science summary

In 2015, the landmark Paris Climate Accord was signed, as of February 2023, 196 nations across the globe, the members of the United Nations Framework Conventions on Climate Change are subject to the Paris Climate Accord also referred to as the Paris Agreement. The goal of the agreement is to limit the rise in global temperature to below pre-industrial levels of 2 °C toward net-zero emission in the longer term. In this context, the companies have long been publishing their sustainability reports for a long time, with the emergence of new frameworks and standards to account for and report companies' impacts on the environment and society. In the process, the significance of appropriate GHG emissions targets was realized. Consequently, as part of the initiative the Science Based Targets initiative in collaboration with several other organisations has come up with frameworks and tools for companies to help them in setting their GHG emission targets (also referred to as emission reduction goals) in line with the latest science. Since then, more companies have shown the use of some kind of targets in their carbon disclosures. Additionally, the global trend in investment activities has also shifted toward impact investing as more investors are becoming aware of the climate risk. Share of investment in impact investment assets has quadrupled – a report by the Global Impact Investing Network shows, the estimated share of the global impact investment market to be about 46 billion US dollars in 2014, this rose to about 715 billion US dollars at the end of 2021. On this premise, investors increasingly rely on components disclosed in the corporate sustainability reports and GHG targets, and an aspect of corporate carbon disclosure is one of them.

Realizing the increasing relevance of GHG targets, this study conducted stated choice experiments with a panel of Swedish retail investors to examine if any of this information related to carbon, including – past GHG emissions intensity, emissions reduction target, target difficulty, and status of target progress, plays any significant role in influencing the investors' preferences for impact investment choices. The results of the study concluded that non-professional investors value target progress very highly among these four attributes of carbon information. Additionally, though they want to see more of the GHG targets being approved as science-based targets, they also want the target to be more difficult and ambitious

showing companies' commitment to attaining adequate impact on overall climate objectives. Furthermore, on average, the study also shows that the investors are even willing to sacrifice part of their return for better targets indicating their support for substantive action on behalf of companies to curb the emissions. And they do prefer to invest in funds including the companies with higher emissions than the average industry emissions. Overall, this study concludes that GHG targets are of high relevance for impact investors in making trade-offs between available investment choices.

Acknowledgements

I would like to express my sincere gratitude to all participants who dedicated their time to participate in the survey conducted for this thesis. A special thanks to my supervisor Uliana Gottlieb for her kindness, sincere guidance, and valuable feedback.

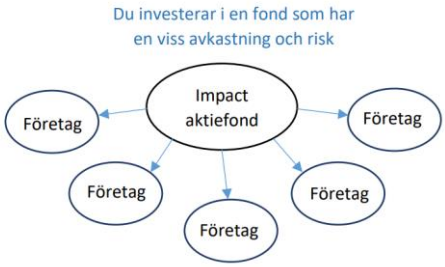
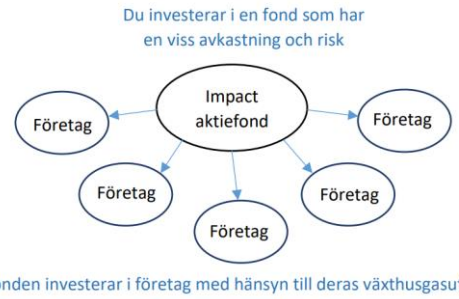
Finally, I would like to thank all individuals who were directly or indirectly part of my thesis journey.

Appendix 1

Appendix1. Survey Questionnaire

ENGLISH (ENGELSKA)	**SVENSKA (SWEDISH)**
Block 1 information	Block 1 information
Consent	**Samtycke**
Welcome to our research study!	**Välkommen till vår forskningsstudie!**
This study aims to investigate what information may be needed to enable investments in Sweden. All data collected in this survey will be anonymous, and the data will be used for scientific purposes only. Researchers in the study will not be able to identify people who participate in the survey. The results will be presented in a publicly available research paper.	Denna studie syftar till att undersöka vilken information kan behövas för att möjligöra investeringar i Sverige. All data som samlas in i denna undersökning kommer att vara anonym, och uppgifterna kommer endast att användas för vetenskapliga ändamål. Forskare i studien kommer inte kunna identifiera personer som deltar i undersökningen. Resultaten kommer att presenteras i en allmänt tillgänglig forskningsartikel.
The survey takes approx. 15 minutes to complete. Remember that once you have answered the question you cannot go back, so choose your answer carefully. You can only participate once. This study is carried out by researchers at the Swedish University of Agriculture. If you have any questions about the study, please contact uliana.gottlieb@slu.se.	Enkäten tar ca. 15 minuter att fylla i. Kom ihåg att när du väl har svarat på frågan kan du inte gå tillbaka, välj därför svaret noggrant. Du kan bara delta en gång. Denna studie utförs av förskare vid Sveriges Lantbruksuniversitet Om du har några frågor om studien, vänligen kontakta uliana.gottlieb@slu.se.
By clicking on the box below, you confirm that your participation in the study is voluntary,	*Genom att klicka på boxen nedan bekräftar du att ditt deltagande i studien är frivillig.*
Q1.	**Q1.**

• I have read and understood the above information. I am over 18 years old and agree to participate in the study by answering the survey.	• Jag har läst och förstått ovanstående information. Jag är över 18 år och samtycker till att delta i studien genom att svara på enkäten.
Block 2 - screening **Q2.** How would you describe yourself? • Male • Female • Non-binary • Prefer not to say **Q3.** Age? (year, numbers only) _____ **Q4.** Have you ever personally invested in stocks, funds, or other investment products? (excluding general pension contributions) • Yes • No but planning to • No **Q4.1** IF YES or NO BUT PLANNING TO How important is it to you that *your investments* in companies contribute to the following? (from 1 = not important at all to 5 = very important) • Good working conditions (including the supply chain) • Protection and restoration of biodiversity and ecosystems	Block 2 - screening **Q2.** Hur skulle du beskriva dig? • Man • Kvinna • Icke-binär • Föredrar att inte säga **Q3**. Ålder? (år, endast siffror) _____ **Q4.** Har du någonsin gjort privata investeringar i aktier, fonder eller andra investeringsprodukter? (exklusive allmänna pensionsvalet) • Ja • Nej men planerar att göra det • Nej **Q4.1** Om JA eller NEJ MEN PLANERAR ATT GÖRA DET Hur viktigt är det för dig att *dina investeringar* i företag bidrar till följande? (från 1 = inte alls viktigt till 5 = mycket viktigt) • Bra arbetsvillkor (inklusive i leverantörskedjan) • Skydd och återställande av biologisk mångfald och ekosystem

• Climate change mitigation and adaptation • The sustainable use and protection of water and marine resources • The transition to a circular economy	• Begränsning av och anpassning till klimatförändringar • Hållbar användning och skydd av vatten och marina resurser • Övergången till en cirkulär ekonomi
Block 3 - attributes and choice cards Impact investments are investments that are made with the intention of generating positive, measurable social and environmental impact (impact) alongside financial returns. An example of a positive, intentional environmental purpose is to reduce climate change. One way to make impact investments is to invest in an investment fund that buys shares of other companies whose emissions you want to influence. A fund's impact objectives are added in addition to its financial goals. It can look like this:  You will now be shown information about the company and fund that you will decide on when choosing afterward. **Q5** **Q5.1**	Block 3 - attributer och valkort Impact-investeringar är investeringar som görs med avsikt att generera positiv, mätbar social och miljömässig påverkan (impact) vid sidan av ekonomisk avkastning. Ett exempel av positiva, avsiktliga miljömässiga syften är att minska klimatförändring. Ett sätt att göra impact-investeringar är att investera i en investeringsfond som köper aktier av andra företag vars utsläpp man vill påverka. En fonds impact-syften tillkommer utöver dess finansiella mål. Det kan se ut så här:  Du kommer nu att visas information om företag och fond som du ska ta ställning till vid val efteråt. **Q5** **Q5.1** Information om företag: Utsläpp av växthusgaser

Information about companies: Emissions of greenhouse gases A typical indicator is the number of *tonnes of greenhouse gases the company emits* per million euros of turnover. This enables comparisons with other companies. The company's greenhouse gas emissions can be: • Much higher than the industry average • About the same as the industry average • Much lower than the industry average Based on this information, which indicator of the company's greenhouse gas emissions means less emissions? • Much higher than industry average • About the industry average • Much lower than industry average	En typisk indikator är antal *ton växthusgaser företaget släpper ut* per miljon euro omsättning. Detta möjligör jämförelser med andra företag. Företagets växthusgasutsläpp kan vara: • Mycket högre än branschsnittet • Ungefär som branschsnittet • Mycket lägre än branschsnittet Utifrån denna information, vilken indikator av företagets växtgusgasutsläpp innebär mindre utsläpp? • Mycket högre än branschsnittet • Ungefär som branschsnittet • Mycket lägre än branschsnittet
Q5.2 Company information: **Emission reduction target level** This describes *how much the company plans to reduce all of its greenhouse gas emissions* by a certain year, e.g. 2030 from a certain reference year, e.g. 2019. All greenhouse gas emissions include the company's own emissions, emissions from purchased energy, and emissions from the entire supply chain. Target levels can look like this:	**Q5.2** Information om företag: **Målnivå för reducering av utsläpp** Detta beskriver *hur mycket företaget planerar att minska alla sina växthusgasutsläpp* innan ett visst år, t.ex. 2030 från ett visst referensår, t.ex. 2019. Alla växthusgasutsläpp inkluderar företagets egna utsläpp, utsläpp från köpt energi samt utsläpp från hela försörjningskedjan. Målnivåer kan se ut så här: • mål att minska växthusgasutsläppen med 15 %

• target to reduce GHG emissions by 15% • target to reduce GHG emissions by 30% • target to reduce GHG emissions by 45% • target to reduce GHG emissions by 60% CORRECT Based on this information, which goal until 2030 from the year 2019 is most ambitious? • target to reduce GHG emissions by 15% • target to reduce GHG emissions by 30% • target to reduce GHG emissions by 45% • target to reduce GHG emissions by 60% CORRECT **Q5.3** Company information: **External target approval** This means that the company's targets for reducing greenhouse gas emissions are set according to the rules of the Science-Based Target initiative. These rules *ensure that the target is in line with the latest science* on how much emissions need to be reduced to keep global warming below 2 degrees Celsius compared to pre-industrial temperatures.	• mål att minska växthusgasutsläppen med 30 % • mål att minska växthusgasutsläppen med 45 % • mål att minska växthusgasutsläppen med 60 % Utifrån denna information, vilket mål fram till 2030 från år 2019 är mest ambitiös? • mål att minska växthusgasutsläppen med 15 % • mål att minska växthusgasutsläppen med 30 % • mål att minska växthusgasutsläppen med 45 % • mål att minska växthusgasutsläppen med 60 % **Q5.3** Information om företag: **Externt målgodkännande** Detta innebär att företagets mål för minskning av utsläppen av växthusgaser sätts enligt reglerna för Science-Based Target initiative. Dessa *regler säkerställer att målet är i linje med den senaste vetenskapen* om hur mycket utsläppen behöver minskas för att hålla den globala uppvärmningen under 2 grader Celsius jämfört med förindustriella temperaturer.

A company can demonstrate that its targets are approved by the Science-Based Target initiative or not: • 'science-based' target • no approval available Based on this information, what does a 'science-based' target mean? • The company uses the latest science on how to reduce greenhouse gas emissions. • The company uses the latest science about how to reduce emissions. **Q5.4** Company information: **Target achievement** This shows *if the company has been reducing GHG emissions at a pace needed to meet its target* since the adoption of the target Based on this information, a company's target progress can be summarized as • Not on track to meet its 2030 GHG target • On track to meet its 2030 GHG target Based on this information, which option means that the company is making sufficient progress in reducing emissions to meet its 2030 target? • On track to reach its 2030 emissions target	Ett företag kan visa att dess mål är godkända av Science-Based Target initiative eller inte: • orskningsbaserade mål (science-based target). • inget godkännande finns Utifrån denna information, vad betyder ett forskningsbaserat mål? • Företaget använder den senaste vetenskapen om vilket mål att sätta för att begränsa den globala uppvärmningen till under 2 grader Celsius. • Företaget använder den senaste vetenskapen om hur man ska minska växthusgasutsläpp. **Q5.4** Information om företag: **Måluppnåelse** Detta visar *om företaget sedan målet antogs har minskat utsläppen av växthusgaser i den takt som krävs för att nå sitt mål*. Ett företags måluppnåelse kan sammanfattas som: • Inte på väg att nå sitt 2030 utsläppsmål • På väg att nå sitt 2030 utsläppsmål Utifrån denna information, betyder att vara 'på väg att nå sitt 2030 utsläppsmål' att företaget gör tillräckliga framsteg med utsläppsminskning för att nå sitt 2030-mål?

• Not on track to meet its 2030 emissions target	• På väg att nå sitt 2030 utsläppsmål • Inte väg att nå sitt 2030 utsläppsmål
Q5.5 Company information: **Expected Annual return** This means *how much you can get in return annually from your investments* in the fund. Expected annual return is estimated based on the fund's past performance and does not guarantee future returns. The expected annual return could look like this: • 6% • 10% • 14% • 18% Based on this information, what expected return potentially means the highest profit per year on your investments in the fund? • 6% • 10% • 14% • 18%	**Q5.5** Information om fonden: **Förväntad avkastning** Det betyder *hur mycket du kan tjäna årligen från dina investeringar* i impact-fonden. Förväntad avkastning beräknas utifrån fondens tidigare resultat och garanterar inte framtida avkastningar. Den förväntade årliga avkastningen kan se ut så här: • 6 % • 10 % • 14 % • 18 % Utifrån denna information, vilken förväntad avkastning innebär potentiellt högst vinst per år på dina investeringar i fonden? • 6 % • 10 % • 14 % • 18%
Q5.6 Information about the fund: **Risk indicator** Risk indicator provides guidance on the level of risk for ups and downs in the value of a fund share. It shows *how much the return*	Q5.6 Information om fonden: **Riskindikator** Riskindikator ger en vägledning om risknivån för upp- och nedgångar i värdet av en fondandel. Den visar *hur mycket avkastningen från fonden varierade*

from the fund has varied historically, with a higher number indicating higher risk. A risk indicator might look like this: • Risk category 4, with a historical spread in return of 12%–20% per year. • Risk category 5, with a historical spread in return of 20%–30% per year. • Risk category 6, with a historical spread in return of 30%-80% per year. Based on this information, which risk class means that the return has varied most historically? • Risk category 4 • Risk category 5 • Risk category 6	*historiskt, där en högre siffra indikerar högre risk.* En riskindikator kan se ut så här: • Riskklass 4, medelnivå, med en historisk spridning i avkastning på 12%–20% per år. • Riskklass 5, medelhög nivå, med en historisk spridning i avkastning på 20%–30% per år. • Riskklass 6, hög nivå, med en historisk spridning i avkastning på 30%-80% per år. Utifrån denna information, vilken riskklass innebär att avkastningen har varierat mest historiskt? • Riskklass 4 • Riskklass 5 • Riskklass 6
Q6. **Read the following text carefully** Imagine that you are considering investing in an equity fund that, in addition to financial returns, also aims to have a positive impact on climate change by reducing greenhouse gas emissions from the portfolio companies. Your preferences are important to the fund manager's investment decisions. Assume specifically that you are about to invest SEK 1,000 per month and you expect	**Q6.** **Läs följande text noggrant** FFöreställ dig att du funderar på att investera i en aktiefond som utöver finansiell avkastning också syftar till att ha en positiv inverkan på klimatförändringarna genom att minska utsläppen av växthusgaser från portföljbolagen. Dina preferenser är viktiga för fondförvaltarens investeringsbeslut. Antag specifikt att du är på väg att investera 1000 kr per månad och du räknar med att

to use this money only in 7 years. You will now be presented with eight different choices for this impact investment. Therefore, do your best to make your choice reflect what you think is important in this type of investment. Try to think about each question regardless of your previous choices.

Block 4 - Choice cards

Q7.1 Choice cards (8 out of 16)

Think carefully and choose which impact investment option you would choose to invest SEK 1,000 per month for 7 years. There are no right or wrong answers. We are only interested in your opinions.

	Option A	Option B
Greenhouse gas emissions	Much higher than the industry average	Much lower than the industry average
Target level for reducing emissions	Target to reduce greenhouse gas emissions by 45%	Target to reduce greenhouse gas emissions by 60%
External target approval	Research-based goals	-
Goal achievement	Not on track to meet its 2030 emissions target	On track to reach its 2030 emissions target
Expected return	18%	6%
Risk indicator	Risk class 5, ± spread of 20%-30%	Risk class 5, ± spread of 20%-30%

- I chose option A
- I chose option B
- If these are the only option to choose from, I refrain

Q8. IF you refrained from choosing one of options A and B in several cases, please indicate the main reason for this:

använda dessa pengar först om 7 år. Du kommer nu presenteras med åtta olika val för denna impact-investering. Gör därför ditt yttersta för att ditt val ska återspegla vad du tycker är viktigt i den här typen av investering. Försök att fundera kring varje fråga oberoende av dina tidigare val.

Block 4 - valkort

Q7.1

Fundera noga och välj vilket alternativ för impact-investering du skulle välja för att investera 1000 kr per månad under 7 år. Det finns inga rätt eller fel svar. Vi är endast intresserade av dina åsikter.

	Alternativ A	Alternativ B
Utsläpp av växthusgaser	Mycket högre än branschsnittet	Mycket lägre än branschsnittet
Målnivå för reducering av utsläpp	Mål att minska växthusgasutsläppen med 45%	Mål att minska växthusgasutsläppen med 60%
Externt målgodkännande	Forskningsbaserade mål	-
Måluppnåelse	Inte på väg att nå sitt 2030 utsläppsmål	På väg att nå sitt 2030 utsläppsmål
Förväntad avkastning	18%	6%
Riskindikator	Riskklass 5, ± spridning på 20%-30%	Riskklass 5, ± spridning på 20%-30%

- Jag väljer alternativ A
- Jag väljer alternativ B
- Om dessa är de enda alternativen att välja mellan avstår jag

Q8. OM du avstod från att välja något av alternativen A och B i flera fall, vänligen ange den viktigaste anledningen till detta:

● it was too difficult to choose between the options ● neither option was worth investing in ● it was difficult to understand the questions ● I am not interested in investing in sustainable funds ● it was too exhausting to familiarize myself with the different options entail ● important information was missing _____ ● other reason. Please specify: _____	● det var för svårt att välja mellan alternativen ● inget av alternativen var värda att investera i ● det var svårt att förstå frågorna ● jag är inte intresserad av att investera i hållbara fonder ● det var för ansträngande att sätta mig in i vad de olika alternativen innebär ● det saknades viktig information. Vänligen ange: _____ ● annan anledning. Vänligen ange: _____
<u>Block 5 - current practices and attitudes</u> **Q9**. How have you made investments in the financial market so far? ● Monthly savings investments ● Invested on individual occasions ● Made own choices in the public pension ● Have invested in other ways ● Have not made investments in the financial markets **Q10**. Which of the following investments have you ever made? (excluding public pension investments) ● Equity funds (investments in shares) ● Bond funds (investments in interest-bearing securities, e.g. bonds)	<u>Block 5 - nuvarande praxis och attityder</u> **Q9**. Hur har du gjort investeringar i finansmarknaden hittils? ● Månadssparande investeringar ● Investerat vid enskilda tillfällen ● Gjorde egna val i den allmänna pensionen ● Har investerat på annat sätt ● Har inte gjort investeringar i finansmarknaden **Q10.** Vilka av följande investeringar har du någonsin gjort? (exklusive allmänna pensionsplaceringar) ● Aktiefonder (investeringar i aktier) ● Räntefonder (investeringar i räntebärande värdepapper, t.ex.

● Mixed funds (investments in shares and fixed income securities) ● Shares ● Derivatives (e.g. futures, options) ● Other _____ ● No previous investments	obligationer) ● Blandfonder (investeringar i aktier och räntebärande värdepapper) ● Aktier ● Derivat (t.ex. terminer, optioner) ● Övrigt _____ ● Inga tidigare investeringar
Q11. How much do you invest on average per month? (excluding general pension contributions) ● 0 SEK ● 1 - 500 SEK ● 500 – 1,000 SEK ● 1,001 – 2,000 SEK ● 2,001 – 5,000 SEK ● More than 5,000 SEK	**Q11**. Hur mycket investerar du i genomsnitt per månad? (exklusive allmänna pensionsavgifter) ● 0 kr ● 1 - 500 kr ● 500 – 1 000 kr ● 1 001 – 2 000 kr ● 2 001 – 5 000 kr ● Mer än 5 000 kr
Q12. Please answer the following questions: (1 = not at all, 4 = very much). ● How worried are you about global warming? ● How much do you think global warming will negatively affect you? ● How much do you think global warming will negatively affect future generations?	**Q12**. Vänligen svara på följande frågor: (1 = inte alls, 4 = väldigt mycket). ● Hur orolig är du för den globala uppvärmningen? ● Hur mycket tror du att den globala uppvärmningen kommer att påverka negativt dig? ● Hur mycket tror du att den globala uppvärmningen kommer att påverka negativt framtida generationer?
Q13. To what extent do you agree with the following statements? (1 = strongly disagree, 7 = strongly agree)	**Q13**. I vilken utsträckning håller du med om följande påståenden? (1 = håller inte med, 7 = håller helt med)

• Mitigation of climate change plays an important role in my social contacts. • My social connections expect me to buy products with lower GHG emissions. • I am happy to do something good for the environment. • I feel responsible for sustainable development and want to contribute by making sustainable investments **Q14**. How much would you say you know in general about the following? (1 = nothing at all, 7 = very much). • The companies' sustainability reporting • Science-based targets • GHG emission accounting **Q15.** There are different labels of sustainable funds. Do you know them? Swan-labelled Funds • Do not know of • know Morningstar • Do not know of • know European Union fund classification • Do not know of • know **Q16**. Please select the respective description for Nordic Ecolabelled Funds.	• Begränsning av klimatförändringar spelar en viktig roll för mina sociala kontakter • Mina sociala kontakter förväntar sig att jag köper produkter med lägre växthusgasutsläpp • Jag blir glad av att göra någonting som är bra för miljön • Jag känner ansvar för hållbar utveckling och vill bidra genom att göra hållbara investeringar **Q14.** Hur mycket skulle du säga att du vet generellt om följande? (1 = ingenting alls, 7 = väldigt mycket). • Företagens hållbarhetsrapportering • Vetenskapsbaserade mål • Redovisning av växthusgasutsläpp **Q15**. Det finns olika märkningar av hållbara fonder. Känner du till de? Svanenmärkta Fonder • Känner inte till • Känner till Morningstar • Känner inte till • Känner till Europeiska Unionens fond Klassificering • Känner inte till • Känner till **Q16**. Välj vänligen respektive beskrivningen för Svanenmärkta Fonder.

• Low CO2 risk • Light green/ dark green • REfrain from certain industries • Do not know	• Låg CO2-risk • Ljusgrön/ mörkgrön • Avstå från vissa branscher • Vet ej
Q17. Please select the respective description for Morningstar • Low CO2 risk • Light green/ dark green • REfrain from certain industries • Do not know	**Q17**. Välj vänligen respektive beskrivningen för Morningstar. • Låg CO2-risk • Ljusgrön/ mörkgrön • Avstå från vissa branscher • Vet ej
Q18. Please select the respective description for EU Funds classifications. • Low CO2 risk • Light green/ dark green • REfrain from certain industries • Do not know	**Q18**. Välj vänligen respektive beskrivningen för Eurpeiska Unisonens fond klassificering. • Låg CO2-risk • Ljusgrön/ mörkgrön • Avstå från vissa branscher • Vet ej
Q19. Would any of these labels be critical to your investments towards reduced greenhouse gas emissions? Which? • European Union fund classification • Swan label • Morningstar • None of these	**Q19**. Skulle någon/några av dessa märkningar vara avgörande för dina investeringar mot minskade växthusgasutsläpp? Vilka? • Europeiska unionen fond klassificering • Svanenmärkta Fonder • Morningstar • Ingen av dessa
Q20. To what extent do you agree or disagree with the following statements (1 Completely disagree to 7 completely agree) • I like to have the responsibility of handling a situation that requires a lot of thinking. • I prefer complex to simple tasks. • I prefer tasks that require less	**Q20**. I vilken utsträckning håller du med om följande påståenden? (1 Motsätter mig helt och hållet till 7 Håller med helt och hållet) • Jag gillar att ansvara för situationer som kräver mycket tankemässig ansträngning • Jag föredrar komplexa framför enkla

thought to those that require a lot of thinking.	uppgifter ● Jag föredrar uppgifter som kräver mindre tankemässig ansträngning framför de som kräver mer
Block 6 - Demographics **Q21**. Enter the number of people in your household including yourself: ● 1 person ● 2 persons ● 3 persons ● 4 persons ● 5 persons or more **Q22**. How many inhabitants does the area you libe in have? ● More than 150,000 inhabitants ● 50,000 – 150,000 inhabitants ● 10,000 – 50,000 ● Less than 10,000 ● Don't know **Q23**. Please enter your highest completed education: ● Elementary/ primary school, unfinished primary school or similar ● Secondary school, high school or similar ● College/ university up to three years ● college/ university more than three years ● other	Block 6 - Demografi **Q21**. Antal personer i ditt hushåll inklusive dig själv: ● 1 person ● 2 personer ● 3 personer ● 4 personer ● 5 personer eller fler **Q22**. Hur många invånare har din stad? ● Mer än 150 000 invånare ● 50 000 – 150 000 invånare ● 10 000 – 50 000 invånare ● Mindre än 10 000 invånare ● Vet inte **Q23.** Vänligen ange din högsta avslutade utbildning: ● Grundskola, folkskola, ej avslutad grundskola eller liknande ● Realskola, folkhögskola, gynasium eller likanande ● Högskola/ universitet upp till tre år ● Högskola/ universitet mer än tre år ● Annat

Q24. What is your household's total monthly income? (e.g., income from employment, social security benefits, pension and/ other income before tax) ● Less than 10,000 ● 10,001-20,000 ● 20,001-30,000 ● 30,001-40,000 ● 40,001-50,000 ● 50,001-60,000 ● 60,001-70,000 ● more than 70,000 ● Do not want to specify **Q25**. You have now answered all the questions. Many thanks for your participation! Feel free to write here if you have other comments or if you think we missed something: _____ **End of Survey**	**Q24**. Vad är hushållets sammanlagda inkomst per månad? (dvs. inkomst av anställning, sjukpenning, pension och/ annan inkomst **före** skatt) ● Mindre än 10 000 kr ● 10 001 - 20 000 kr ● 20 001 - 30 000 kr ● 30 001 - 40 000 kr ● 40 001 - 50 000 kr ● 50 001 - 60 000 kr ● 60 001 - 70 000 kr ● mer än 70 000 kr ● Vill ej ange **Q25**. Du har nu svarat på alla frågor. Stort tack för ditt deltagande! Här får du gärna skriva om du har övriga kommentarer eller tycker att vi missat något: _____ **End of survey**

Appendix 2

Appendix2. Summary Statistics, Alpha reliability estimates and results from factor analysis for variable measure – Relevance of EU Green deal objectives

1. *Summary Statistics: number of responses to question – "how important is it for you that your investments in firms contribute to the following?"*

	Not important at all (1)	(2)	Neutral (3)	(4)	Very important (5)
Good working conditions (including for value-chain workers)	-	*3*	*56*	*62*	*21*
The protection and restoration of biodiversity and ecosystems	-	*1*	*45*	*65*	*32*
Climate change mitigation and adaptation	-	*0*	*48*	*64*	*30*
The sustainable use and protection of water and marine resources	-	*1*	*38*	*65*	*38*
The transition to a circular economy	-	*7*	*66*	*49*	*20*

Number of respondents = 142

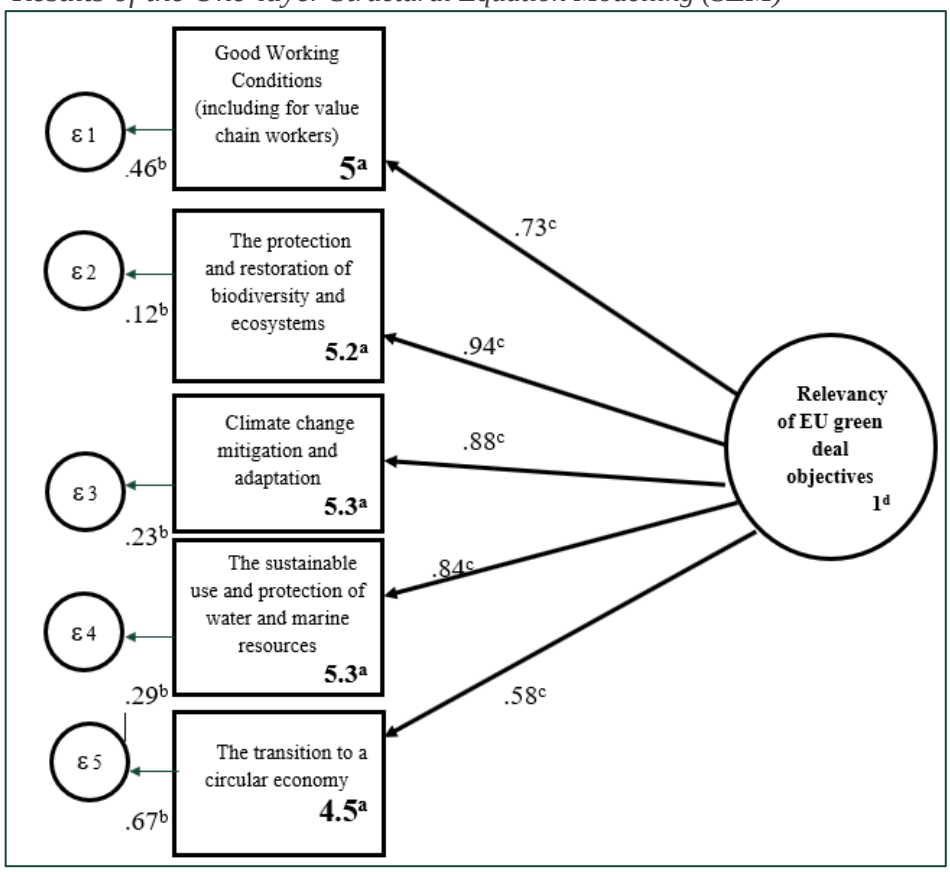
Note: Table above illustrates the number of responses for indicators for factor variable *'relevance of EU Green deal objectives' on a* 5-point Likert scale.

Note: The table below illustrates results of reliability analysis using alpha coefficient measuring the internal consistency showing the extent indicators that are used to derive factor variable measure same underlying construct. Alpha value greater than 0.7 is often recommended as minimum acceptable reliability threshold for internal consistency. The alpha coefficient for the overall test scale is 0.8918, which indicates a high level of internal consistency.

2. *Cronbach's alpha*

	Sign	Item-test correlation	Item-rest correlation	Average inter-item correlation	Alpha (α)
Good working conditions (including for value-chain workers)	+	*0.81*	*0.70*	*0.36*	*0.88*
The protection and restoration of biodiversity and ecosystems	+	*0.91*	*0.86*	*0.32*	*0.84*
Climate change mitigation and adaptation	+	*0.87*	*0.79*	*0.34*	*0.86*
The sustainable use and protection of water and marine resources	+	*0.86*	*0.77*	*0.34*	*0.86*
The transition to a circular economy	+	*0.72*	*0.56*	*0.39*	*0.91*
Test Scale				***0.35***	***0.89***

3. *Results of the One-layer Structural Equation Modelling (SEM)*



a – constant (intercepts); b – residual variances; c – factor loading; d – variance of latent var.

Note: All estimates are statistically significant at 1% level. Values are estimated using maximum likelihood estimation.

Appendix 3

Appendix 3. Summary Statistics, Alpha reliability estimates and results from factor analysis for variable measure – Attitude toward climate change.

1. Summary Statistics: number of responses to questions –

	Not very much (1)	Neutral (2)	Somewhat (3)	Very much (4)
How important is the issue of global warming to you?	*1*	*26*	*65*	*50*
How worried are you about global warming?	-	*15*	*56*	*71*
How much do you think global warming will negatively affect you?	*4*	*43*	*52*	*43*
How much do you think global warming will negatively affect future generations?	*5*	*21*	*57*	*21*

Number of respondents = 142

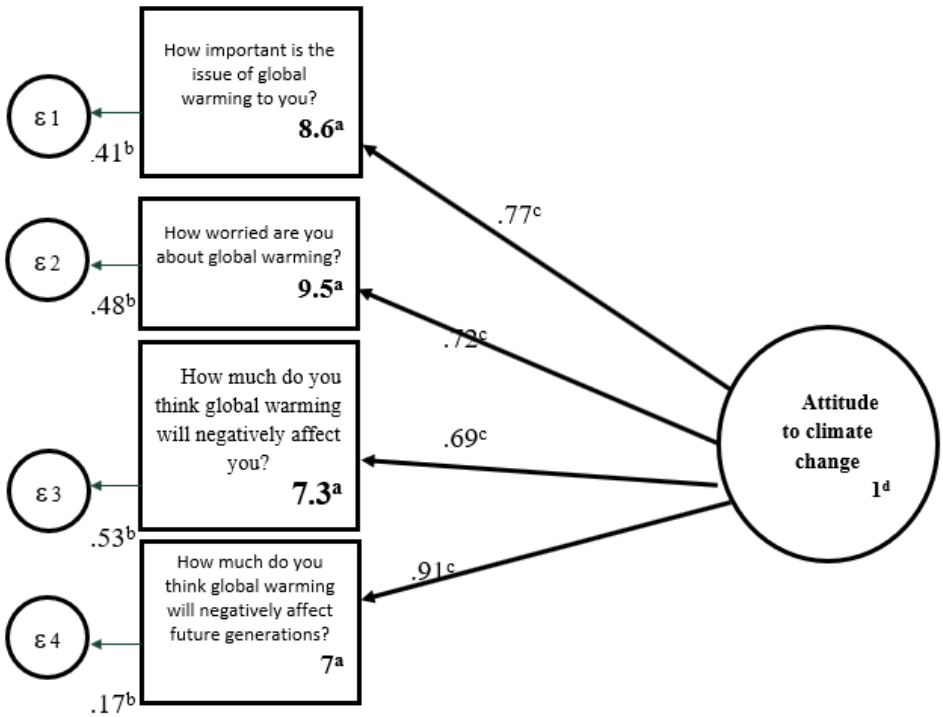
Note: Table above illustrates the number of responses for indicators for factor variable *'attitude toward climate change'* on a 4-rating scale.

Note: Table below shows *Cronbach's alpha for* indicators used to derive the variable measure *attitude toward climate change* indicating internal reliability of indicators used to derive underlying latent construct.

2. Cronbach's alpha

	Sign	Item-test correlation	Item-rest correlation	Average inter-item correlation	Alpha (α)
How important is the issue of global warming to you?	+	*0.83*	*0.71*	*0.34*	*0.80*
How worried are you about global warming?	+	*0.79*	*0.64*	*0.38*	*0.84*
How much do you think global warming will negatively affect you?	+	*0.90*	*0.79*	*0.27*	*0.77*
How much do you think global warming will negatively affect future generations?	+	*0.80*	*0.63*	*0.35*	*0.84*
Test Scale				***0.34***	***0.85***

3. Result of one-layer Structural Equation Modelling (SEM)



a – constant (intercepts); b – residual variances; c – factor loading; d – variance of latent var

Appendix 4

Appendix 4. Summary Statistics, Alpha reliability estimates and results from factor analysis for variable measure – Self-stated knowledge**.**

1. *Summary statistics: number of responses to question – "How much would you say you know in general about the following?"*

	Not at all (1)	(2)	(3)	(4)	(5)	(6)	Very much (7)
The companies' sustainable reporting	*18*	*28*	*28*	*35*	*21*	*4*	*8*
Science-based targets	*11*	*15*	*28*	*40*	*25*	*13*	*10*
Accounting for GHG emissions	*15*	*25*	*34*	*31*	*18*	*12*	*7*

Number of respondents = 142

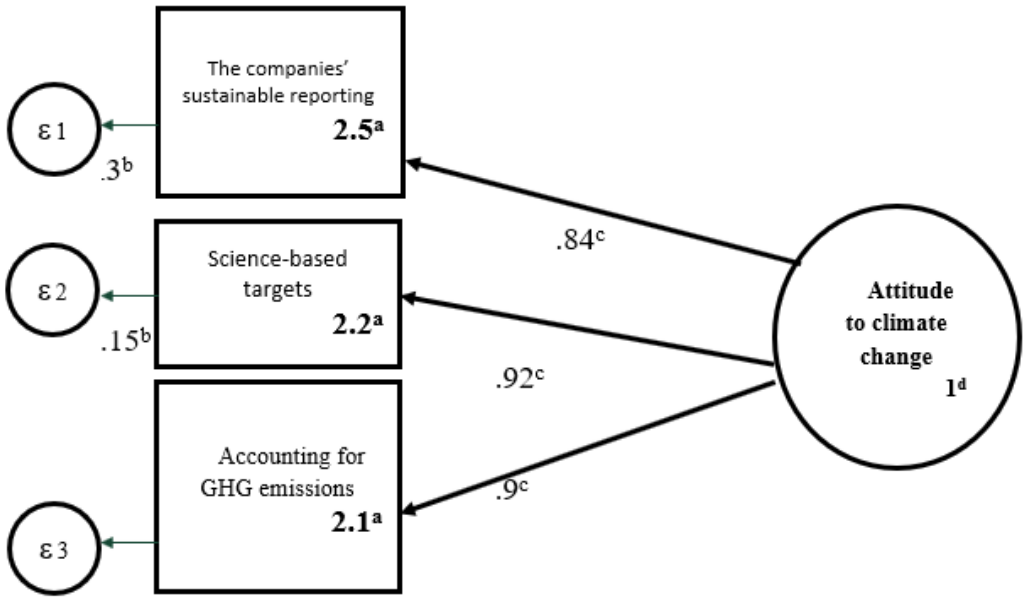
Note: Table above shows the responses for indicators for factor variable *'self-stated knowledge'* on a 7-point Likert scale.

Note: Table below presents *Cronbach's alpha for* the indicator variables used to construct the latent variable *self-stated knowledge*.

2. *Cronbach's alpha*

	Sign	Item-test correlation	Item-rest correlation	Average inter-item correlation	Alpha (α)
The companies' sustainable reporting	+	*0.92*	*0.82*	*3.40*	*0.85*
Science-based targets	+	*0.89*	*0.75*	*3.56*	*0.91*
Accounting for GHG emissions	+	*0.93*	*0.84*	*3.07*	*0.83*
Test Scale				***3.35***	***0.91***

3. Result of one-layer Structural Equation Modelling (SEM)



a – constant (intercepts); b – residual variances; c – factor loading; d – variance of latent var

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