The Impact of ESG Ratings on Stock Preferences of Retail Investors

Abstract

This paper analyzes how retail investors incorporate ESG ratings in stock investing. It implements a survey experiment using Qualtrics and collects complete data from 277 participants. The main experiment consists of three rounds of stock investments where participants can freely allocate 10,000 US Dollars to two stocks, one with a high ESG rating and one with a low ESG rating. Participants are divided into a treatment and control group and the treatment is the allocation of binary ESG ratings. The outcome variable is the allocation to the stocks with the high ESG rating. The results show that ESG ratings belong to the most important quantifiable investment factors, along with return on investment. In contrast, the risk factor Beta and the familiarity with a company have no significant effect on the outcome variable. On average, the treatment group allocates 20 percent more money to the stocks with the high ESG rating. The statistical significance of this finding is confirmed with a Mann-Whitney U test. A multiple linear regression model finds that providing ESG ratings increases the allocation to the stocks with the high ESG rating by 980 US Dollars or 9.8 percentage points. This effect is also statistically significant. The findings of the post-experimental survey suggest the affect heuristic as driver of stock sustainability preferences of retail investors. These preferences are heterogenous across stock industries, sociodemographic variables, and individuals.

Keywords: Sustainable Finance, Behavioral Finance, Retail Investors, ESG Ratings

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Author: Philippe Phan (42396)

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MSc in Finance

Stockholm School of Economics

Supervisor: Anders Andersson

Master of Arts in Banking and Finance

University of St. Gallen

Supervisor: Julian Kölbel

Co-Supervisor: Anna Stünzi

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1 Introduction

Retail investors have increased their trading activity since the COVID-19 pandemic. This trend has steadily continued, with trading platforms such as Robinhood Markets reporting a significantly growing number of users (van der Beck & Jaunin, 2021). Simultaneously, sustainability has grown in importance both inside and outside of the investment world. In the financial context, sustainability is often synonymous with ESG (Environmental, Social, and Governance) criteria. These ESG topics have been researched and continuously implemented in context of new regulation and investment tools. For instance, financial services firms now provide ESG ratings for funds and stocks. These ESG ratings assess e.g. a company's sustainability performance based on multiple indicators. Thus, they provide additional information for investors and other stakeholders.

However, the exact significance of ESG ratings for retail investors remains unclear. Unlike institutional investors, retail investors may not be as rational and sophisticated in their investment processes. A recent example of such irrational behavior is the collapse of the Credit Suisse Bank, where some investors reportedly invested all their savings in the bank's stocks leading to substantial losses.

Biases, such as the home and familiarity bias, as seen in the Credit Suisse case, cause irrational investing behavior. In addition, the lack of awareness regarding these biases could impede investors from making decisions according to their preferences, for example by taking more risk than preferred. These biases and other investment drivers can also evolve over time. This particularly applies to sustainability preferences, which have been increasing. Non-pecuniary and sustainability factors have for instance gained relevance among institutional investors and in the context of investments in mutual funds (e.g. Hartzmark and Sussmann, 2019; Ammann et al., 2019). However, little research has discussed the role of sustainability preferences among retail investors and in stock investments. The Credit Suisse example suggests that stock investments might be influenced by factors like the familiarity bias, which could be even more pronounced among retail investors.

Despite the increased sustainability preference, Moss et al. (2020) found that retail investors trading on Robinhood Markets did not respond to ESG-related announcements. This could indicate two findings: first, that other investment factors and biases impede retail investors from making decisions according to their sustainability preferences; and second, that retail investors

follow a passive buy-and-hold investment strategy without processing new information. Nevertheless, ESG ratings continue to increase their importance as practical sustainability indicators that are offered on most trading platforms. Therefore, this paper analyzes: **How do retail investors incorporate ESG ratings in stock investing?** This research question is divided into three sub-questions. First, do retail investors have sustainability preferences in stock investing? Second, how strong are these sustainability preferences compared to other investment factors such as expected return and risk? And third, what motivates the lack or existence of these sustainability preferences?

Data was collected through a survey experiment where participants made investment decisions and allocated money to two stocks according to their preferences. The treatment group received binary (high or low) ESG ratings, and the outcome variable was the allocated amount to the stock with a high ESG rating. The data was subsequently analyzed using a Mann-Whitney U test and a multiple linear regression model.

2 Overview of Related Literature

2.1 Sustainability Preferences, Stocks, and Funds

Recent studies have researched sustainability preferences and their rationales in different settings and for different asset classes. Despite this, few notable studies on sustainability preferences in stock investments exist. For instance, Avramov et al. (2022) found that institutional investors reduce demand for stocks under ESG uncertainty. This indicates that these investors integrate ESG information to a certain extent in their investment decisions.

Alternatively, more research on sustainability preferences in different asset classes exists. Bauer, Ruof, and Smeets (2021) conducted a study where participants showed strong social preferences and a willingness to pay for engagement of their pension fund investments. Similarly, Baker, Egan, and Sarkar (2022) found a higher willingness to pay of investors for mutual funds with ESG mandates than the same mutual funds without ESG mandates. In addition, their study found a 19 basis points increase of this willingness to pay (from nine basis points in 2019 compared to 28 basis points in 2022). This indicates that sustainability preferences have increased in recent years. This can have many reasons such as increased general awareness or the Covid pandemic. The authors of the study further found that reported concern for climate change is directly linked to ESG interest. Hence, this likely has the potential to influence the willingness to pay for ESG.

Many studies on sustainability preferences have focused on institutional investors, possibly due to data availability, or have not made a distinction between institutional and retail investors[1]. Ammann et al. (2019), however, compared the effect of the Morningstar sustainability ratings publication for mutual funds on institutional and retail investors. The authors found that retail investors reacted significantly more strongly to the publication of the ratings. This difference in reactions indicates that retail investors have stronger preferences for sustainability, or at least a stronger preference for higher ESG ratings, than institutional investors.

2.2 Sustainability Preferences, ESG Ratings, and Retail Investors

The higher preferences of retail investors for sustainability in general or high ESG ratings can be explained with two possible reasons. First, perceptions of ESG ratings and their implica-

[1] Also known as individual investors.

tions on risk and return of stocks could differ between retail investors and institutional investors. Many studies have shown that ESG ratings exhibit a lot of uncertainty depending on the methodology. For instance, Berg et al. (2022a) found that fundamental differences about the data and methodology of ESG ratings drives divergence between different ratings, depending on the rating provider. More precisely, Berg, Koelbel, and Rigobon (2022b) described how an ESG attribute (or factor) can have varying estimates, depending on the ESG rating provider. Such findings could be more present among institutional investors and result in lower trust in ESG Ratings. In other words, retail investors might trust ESG ratings more, thereby attributing greater importance in and showing higher preference for them.

The lack of understanding of ESG ratings, or more generally of sustainable finance literacy (e.g. Filippini, Leippold, & Wekhof, 2021), among retail investors could also imply that they assign other attributes to ESG ratings. For instance, the implications of high ESG ratings on risk and return of stocks and other asset classes has been researched in many studies, but with ambiguous findings. Some studies found both higher risk and return when including high ESG ratings (e.g. Nagy, Kassam, & Lee, 2016), while other studies found opposite returns (e.g. Prol & Kim, 2022). It remains one of the most important questions for researchers and practitioners without consent. Retail investors could, as with the divergence of ESG ratings, be less aware of this, and mistakenly attribute higher or lower return and risk expectations to higher ESG ratings. Hence, their expectations could be another driver of high ESG rating preferences among retail investors.

Nevertheless, the assumption that retail investors have lower sustainable finance literacy than institutional investors does not explain the difference in ESG rating and sustainability preference. Strauss, Krakow, and Chesney (2023) found that news attention about sustainable finance increases sustainable finance literacy and the likelihood of investing in sustainable finance of Swiss retail investors. This implies that sustainable finance literacy and sustainability preferences (in this case the likelihood of investing in sustainable finance represents a proxy) are positively correlated. Filippini et al. (2021) presented similar results for Swiss retail investors, albeit with insignificant effects. However, the authors of the study found a gender gap among sustainable finance literacy.

Hence, and second, the heterogeneity among retail investors might explain their higher preferences for sustainability in general or high ESG ratings compared to institutional investors. Retail investors are heterogenous and thus have heterogenous sustainability preferences.

These heterogenous sustainability preferences were e.g. reported by Goldstein et al. (2022) who found that two groups (traditional and green) retail investors trade in opposite directions based on the same sustainability information. D'hondt, Merli, and Roger (2022) support these findings with their study that mentioned sociodemographic factors such as age, education, and wealth as relevant factors for heterogenous retail investor sustainability preferences. Furthermore, a UBS study (2022) reported that gender is also a relevant factor and that women have higher sustainability preferences than men.

In addition, regions and/or countries matter for sustainability preferences too. Few comparative studies on regional and/or international sustainability preferences exist, but e.g. de Vincentiis (2023) observed opposite reactions from European and US-American investors to sustainability news. Moreover, Sticha and Sekita (2023) suggested that finance literacy is low, particularly among the young, the less educated, and women; and that this low financial literacy is correlated with sustainable financial literacy (and possibly sustainability preferences). Last, current regional developments such as the anti-ESG movement in the USA could also change regional retail investor sustainability preferences.

2.3 Sustainability Preferences and the Affect Heuristic

Heterogenous sustainability preferences occur not only due to sociodemographic factors but can also be explained by the affect heuristic. The affect heuristic emphasizes the importance of emotions in decision-making. For retail investors the affect heuristic indicates that emotions affect their investment decisions and sustainability preferences more strongly than information does. For instance, Bauer and Smeets (2015) conducted an experiment with Dutch retail investors that revealed how social identification with sustainable finance increased the investments in sustainable finance but also created higher expectations on return as discussed in section 1.2. In the study, social identification and thus the emotional value, were particularly high among higher educated, younger investors, which also represented the target group of this present study.

Similarly, Hafenstein and Bassen (2016) e.g. observed how the personal sustainability orientation and a good feeling (of the investment) influenced the investments in sustainable companies. Heeb et al. (2022) support these findings, arguing for emotional drivers for higher willingness to pay for sustainable finance. The authors further found that these emotions de-

creased marginally and that willingness to pay for sustainable finance was limited, characterized by the warm glow effect, i.e. more impact does not increase willingness to pay at the same scale. Furthermore, Humphrey et al. (2020) illustrated with an experiment how positive and negative sustainable finance externalities were heterogenous. Concretely, negative externalities affected investment decisions more strongly, thus showing the asymmetry of sustainability preferences. This asymmetry and stronger effect of negative externalities could be categorized as a negativity bias. In combination with the findings from Heeb et al. (2022) a possible implication is that sustainability preferences in finance are characterized by significant but limited positive sustainability externalities and stronger negative sustainability externalities.

On the one hand, the so far mentioned literature has discussed why retail investors allocate more money towards sustainable finance and thus have higher sustainability preferences. On the other hand, other biases might explain why retail investors have high sustainability preferences but do not invest accordingly, as observed by Moss et al. (2020). Four biases are particularly relevant in stock investing.

First, salience could imply that specific information is more relevant (or salient) for retail investors. In other words, they could for example focus on expected or past return numbers which then divert their attention from sustainability information on stocks, despite them having preferences for high sustainability and ESG ratings. Salience might particularly be relevant in the context of ESG ratings where Hartzmark and Sussman (2019) found that the Morningstar Globe Ratings were salient and the main source of sustainability information for investors, whereas they ignored more detailed information.

Second, information overload can also be explained by these findings from Hartmark and Sussman (2019) on the salience of ESG ratings. Information overload in the context of retail investors and sustainability preferences implies that the investors receive too much (or an overload of) information overall, which includes financial and sustainability information. This suggests that retail investors do not include sustainability information in a manner they would if information overload was not present. Hafenstein and Bassen (2016) e.g. argued that information overload does affect investment decisions in sustainable finance and that retail investors do not between distinguish sustainability information in depth.

Third and fourth, two similar concepts, the familiarity bias and home bias both affect investment decisions too. The familiarity bias describes how retail investors would make decisions based on information they are already familiar with. In the context of retail investors and sustainability preferences, this would imply that retail investors choose stocks of firms they already know when choosing between different stocks. The existence of this bias among retail investors has e.g. been suggested by de Vries, Erasmus, and Gerber (2017). Similarly, the home bias indicates that retail investors would mainly select stocks from their country or home region. Groen-Xu and Zeume (2021) argued that the home bias itself characterizes sustainability preferences, and that sustainability preferences for foreign stock investments are low in comparison.

3 Data and Methodology

3.1 Experimental Design

The methodology of this paper was a survey experiment programmed and implemented with Qualtrics. The survey experiment consisted of four parts: the introduction (3.2.1), questions on demographics and risk and return preferences (3.2.2), the main experiment (3.2.3), and qualitative questions (3.2.4). Figure 1 presents an overview of the experimental design.

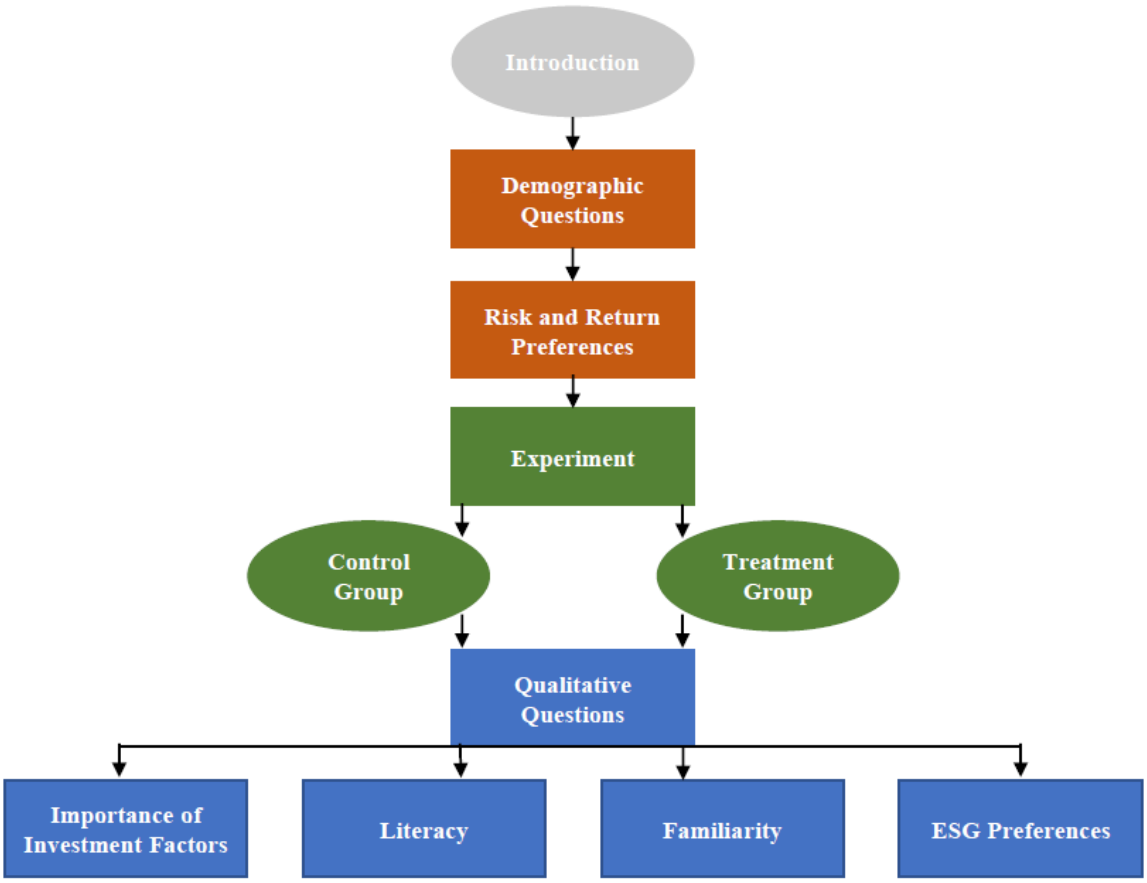


Figure 1: Experiment Overview

The experiment survey followed a hybrid approach that measured revealed and stated sustainability preferences. First, the survey experiment simulated stock investment decisions to analyze how retail investors incorporated ESG ratings, thus measuring revealed sustainability preferences. The reason for this revealed preferences approach is that it allowed for a quantitative measure of the preferences (using a proxy). Second, the qualitative questions collected information of stated sustainability preferences, investment factor preferences (e.g. risk and return), and other variables (e.g. financial literacy, familiarity with the companies). These

qualitative questions aimed to explore the motivation behind or lack of ESG incorporation in the stock investment experiment.

The experimental design faced three potential issues. The first potential issue was that the choices made by the participants during the investment simulation are hypothetical. To minimize the potential effects of the hypothetical setting, participants received only information they would also have received on most trading platforms or could easily have found on the internet. This made the experiment feel less theoretical and more realistic to participants. Section 3.1.3 further illustrates how the experiment was designed to make it appear as realistic as possible in this setting.

The second potential issue was that the survey participants might have been influenced by an experimenter-demand bias. To mitigate this, the request for the experiment participation and the experiment introduction did not mention ESG. However, there is a potential for participants to have been familiar with the topic of this study. In other words, the answers of the participants might reveal high sustainability preferences because they believed it was most desirable for the study, and not because their answers represented their true preferences. This experimenter-demand bias could thus result in unprecise measurements or noise in the data.

The third potential issue was the fatigue or inattention of the experiment participants, despite the experiment being short. This potential issue was mitigated using an attention question, which filtered out inattentive participants and invalidated their answers. Nevertheless, the potential still existed for the experiment to seem complicated for some participants who subsequently filled out the survey hastily. This could also have increased noise in the collected data.

3.1.1 Experiment Introduction

The introduction to the experiment was short and concise. It mentioned the aim of the survey which was to “analyze the decision-making of stock investors”. It omitted ESG and sustainability since they were part of the treatment. It further emphasized the estimated duration of the experiment to set expectations, thereby reducing potential investment fatigue. In addition, mentioning the gratitude towards participants and the indication of a potential fun experience aimed to increase the motivation and attention of the participants. The text also gave the academic background of the study and reminded of the anonymity and confidentiality of the experiment.

3.1.2 Demographics and Risk and Return Preferences

After the introduction, a part with questions on demographics, as well as risk and return preferences of the participants followed. The demographic questions asked for the following: Nationality, Residence, Age, Gender, Political Views, Academic Degree, Employment Status, Income. The purpose of these demographic questions was to analyze whether the preferences of high ESG ratings would be heterogenous across sociodemographic factors as discussed in section 2.2.

Subsequently, the experiment asked the participants to answer with their own risk and return preferences. The participants could choose between three different risk/return profiles: cautious (low risk and return), balanced (moderate risk and return), and opportunistic (high risk and return). The wordings for the risk/return profiles aimed to be as neutral as possible. Any positive or negative attribution in a wording could have caused a nudge towards or from a profile and thus would not have measured risk/return preferences accurately. A negative example, for instance, would have been “aggressive” instead of “opportunistic”.

3.1.3 Main Experiment

In the beginning of the main experiment participants were instructed to assume they had inherited very a large sum from a distant relative, similar to Elliott et al. (2014). The text also mentioned that most of the inheritance was invested in their current portfolio set up by their fund manager. To give participants more interaction and reduce the hypothetical survey feeling, the text also mentioned that the inheritance allocation is based on the previous (demographic) answers of the participants. This followed a similar approach to new investment platforms such as Inyova where customers provide their preferences before receiving stock suggestions from the investment universe.

The participants further received the option to personalize their portfolio and make three subsequent investment decisions where they were instructed to allocate 10,000 US Dollars to two stocks according to their preferences. They could allocate the 10,000 US Dollars freely to one or both presented stocks but had to invest the full 10,000 US Dollars. These three investment decisions represented the main experiment. The text further revealed that all stocks had favorable recommendations which is also a feature of real trading platforms, e.g. Degiro provides a chart with analyst recommendations whether to buy, hold, or sell. The purpose of this recommendation was to ensure that participants choose according to their own preferences instead of trying to guess which stock is ‘better’.

The participants were then evenly and randomly allocated into a control group and treatment group. The treatment in the experiment is the distribution of ESG ratings. The treatment group received binary (high/low) ESG ratings. To avoid the occurrence of information overload, a simplified, binary ESG rating was presented. The survey used ESG ratings from the trading platform Degiro that are publicly available and originally provided from Refinitiv. A total ESG rating from A+ to B- was converted to 'high' and a rating from C+ to D- was converted to 'low'. As discussed in section 2.3, retail investors are unlikely to process additional ESG information because of the salience of ESG ratings. Thus, only providing a simplified binary ESG rating should not falsify any implications from the survey experiment.

The stocks in which the participants could allocate the 10,000 US Dollars into were the following: first, they allocated money to Amgen and/or GSK; second, to Mondelez and/or Barry Callebaut; and third, to Geely and/or Tesla. These are real stocks and allowed testing for a familiarity bias. The participants were expected to know some stocks more (e.g. Tesla) and some less (e.g. Geely). Furthermore, each allocation decision consisted of a high ESG rating stock (GSK) and a low ESG rating stock (Amgen), but the ESG ratings were only provided to the treatment group. The two companies from each round operate in the same industry (pharmaceuticals, food and beverages, automotives) and generally had comparable main products. Additional information included country, stock price, market capitalization as proxy for company size, ROI, and Beta as risk indicator. Table 1 provides an overview of one pair (GSK and Amgen) for the treatment group to which the participants allocated their money to. The control group received the same table excluding the ESG rating row. Appendix 1 presents all stock pairs and the full experiment survey.

A proxy for ESG incorporation was then used as an outcome variable to measure the extent of the ESG incorporation. The outcome variable was the allocation to the stock with the high ESG rating. In other words, the experiment measured whether the provision of ESG rating changed how much retail investors invest in the stock with the high ESG rating. This allowed measuring the sustainability preferences of participants absolutely but also relative to other factors.

Table 1: Example of Stock Pair for Treatment Group

	Amgen Inc.	GSK (GlaxoSmithKline)	ℹ
Industry	Pharmaceuticals	Pharmaceuticals	
Main Products	Treatments against e.g. rheumatoid arthritis, osteoporosis, and anemia	Respiratory medicine, vaccines, HIV treatments, and other biopharmaceuticals	
Country	USA	United Kingdom	
Stock Price	$310	$20	
Market Capitalization	$162,159 Billion	$80,874 Billion	Total **market value** of the company. Calculated by multiplying the number of outstanding shares and the single stock price.
ROI	13.81%	10.42%	Average amount **earned** by an investment in a stock each year (5 year average)
Beta	0.61	0.58	Measures **systematic risk** (volatility) of the stock in relation to the market. Beta of 1 is as volatile as the market, < 1: less volatile; > 1: more volatile
ESG Rating	Low	High	Indicates the performance of **environmental, social, and governance factors**, thus, assesses the **sustainability**. The rating is either **high (positive)** or **low (negative)**.

Data retrieved from Degiro, January 2024

3.1.4 Qualitative Questions

After the main experiment, a survey with qualitative questions followed. The participants were asked to indicate how important each factor (main products, country, stock price, market capitalization, return on investment, beta, and ESG rating for the treatment group) was for their investment decisions on a Likert scale from 1–10. In addition, the survey included Likert scale (1–5) questions on financial literacy, investing experience, and familiarity with the companies.

A short information text on ESG ratings (that the treatment group already received prior) followed for all participants. Subsequent questions on ESG ratings aimed to capture potential heterogenous sustainability preferences, biases, and other reasons why ESG ratings affected the stock preferences or not. This part had nine statement questions in total to which participants could agree on a Likert scale from 1–10. First, the survey asked whether participants were familiar with ESG as a proxy for sustainable finance literacy. Second, participants were asked how important ESG was for their investment decisions. which the treatment group had already received in a very similar way prior (how important was ESG as investment factor). Third, fourth, and fifth, the survey asked whether a high ESG rating implied high sustainability, high

positive impact, and low financial return, to measure expectations of the participants. Sixth, the participants were asked to indicate whether ESG was more important than return for their investment decisions. Seventh, a question on the perception of reliability of ESG ratings followed. Eighth, potential asymmetry of sustainability preferences was measured with a question where participants had to agree whether they would not invest in stocks with a negative ESG rating. Ninth and last, the survey participants were asked whether they wished for more sustainability information in their investment decisions.

3.2 Data

The sample of this study consisted of students who were directly contacted to participate in the survey experiment. In total, 366 responses were collected and 277 of these responses were completed and represent the analyzed data of this study. This sample of students provides two advantages. First, students are more likely to have little investment experience and fit the description of retail investors. Second, students belong to a younger generation that has been exposed more to sustainability-related topics, particularly climate change. The affect heuristic and sensitivity to ESG ratings could thus have been stronger for this specific sample than they had been for other investor groups as discussed in section 2.3. This stronger sensitivity could potentially have resulted in a clearer significance of the treatment of the experiment.

The specific target group of university students also implies limitations. One the one hand, they are more educated than the average retail investor and thus invest more rationally. Nevertheless, the lack of statistical variance in of the sample might have implications for the representativeness of the findings. The findings from the study might for example not be representative for older retail investors.

Table 2 provides an overview of the summary statistics of the sample of the participants of this study. The sociodemographic factors further analyzed in this study were gender, nationality, the risk/return profile, and the political orientation. Residence was excluded due to the high correlation with nationality. Furthermore, income, employment status, and education were also not further analyzed because of little variation within the data given the sample consisting of students.

Table 2: Summary Statistics of Sociodemographic Variables

	N	%	Pearson's X^2 test*
Gender			$p = 0.51$
Male	169	61%	
Female	103	37%	
Prefer not to say	3	1%	
Other	2	1%	
Nationality			$p = 0.45$
Swiss	115	42%	
Japanese	47	17%	
German	41	15%	
Swedish	17	6%	
Other	57	21%	
Risk/Return			$p = 0.49$
Balanced	174	63%	
Cautious	63	23%	
Opportunistic	40	14%	
Political Orientation			$p = 0.88$
Centre	78	28%	
Centre-left	77	28%	
Centre-right	52	19%	
Left	52	19%	
Right	12	4%	
Far-left	5	2%	
Far-right	1	0%	

*H_0: Variable is independent of Treatment

The mean of the age of the participants was 25 years. 264 out of 277 or 95 percent of the participants were between 20–30 years old at the time of the study. Roughly two third (61 percent) of participants identified themselves as male and one third (37 percent) as female. Most of the participants were students from Switzerland (42 percent), with the two other largest group being from Japan (17 percent) and Germany (15 percent). Most of the participants (63 percent) self-categorized their risk/return preferences as balanced, while cautious (23 percent) and opportunistic (14 percent) profiles established the minorities. The political orientation of the participants was broadly distributed three quarters answering their views as centre (28 percent), centre-left (28 percent), or centre-right (19 percent). A further 19 percent of the political orientation of participants is left, while right, far-left, and far-right represent clear minorities in the sample with four, two, and zero percent each.

Moreover, the Pearson's X^2 test checks the null hypothesis that the sociodemographic variables are independent from the treatment. In other words, it checks whether the sociodemographic variables are significantly different between the treatment group and the control group. None of the ρ values are significant and thus the null hypothesis cannot be rejected for any sociodemographic variable. This implies that the sociodemographic variables are not significantly different for the treatment and control group.

3.3 Methodology

The results from this pre-registered (see Appendix 2) study were analyzed in three steps. First, a Mann-Whitney U test checked for statistical significance in the difference of the outcome variable between the control group and the treatment group. Second, a multiple linear regression model analyzed the data in more depth. Third, an analysis of the results from the post-experiment qualitative questions explored the reasons for the (lack of) existence of preferences for high ESG ratings and whether they were heterogeneous.

The survey participants made three investment allocations between a stock with a high ESG rating and a stock with a low ESG rating. The outcome variable was the investment in or allocation to the stock with the high ESG rating. This allowed for a data mutation, so the number of observations for the outcome variable $Allocation\ High\ ESG\ Stock$ was tripled (N = 831) from the actual number of survey participants. In addition, dummy variables for treatment and the industries of the stocks (pharma, chocolate, and electric vehicles) were assigned to the observations. Furthermore, vectors with the values for market capitalization, return on investment, beta, and stock price were added. One vector with the values for the high ESG rating stock and one vector for the low ESG rating stock were added each (e.g. ROI and ROI_other).

A Mann-Whitney U test subsequently checked whether the means of the outcome variable, as well as other variables, were significantly different. The test was also applied in the study of Heeb et al. (2022). The Mann-Whitney U test was particularly advantageous in this study because it is a non-parametric test and does not require a normal distribution of the outcome variable. Figure 2 illustrates the distribution of the outcome variable $Allocation\ High\ ESG\ Stock$ and indicates a non-normal distribution.

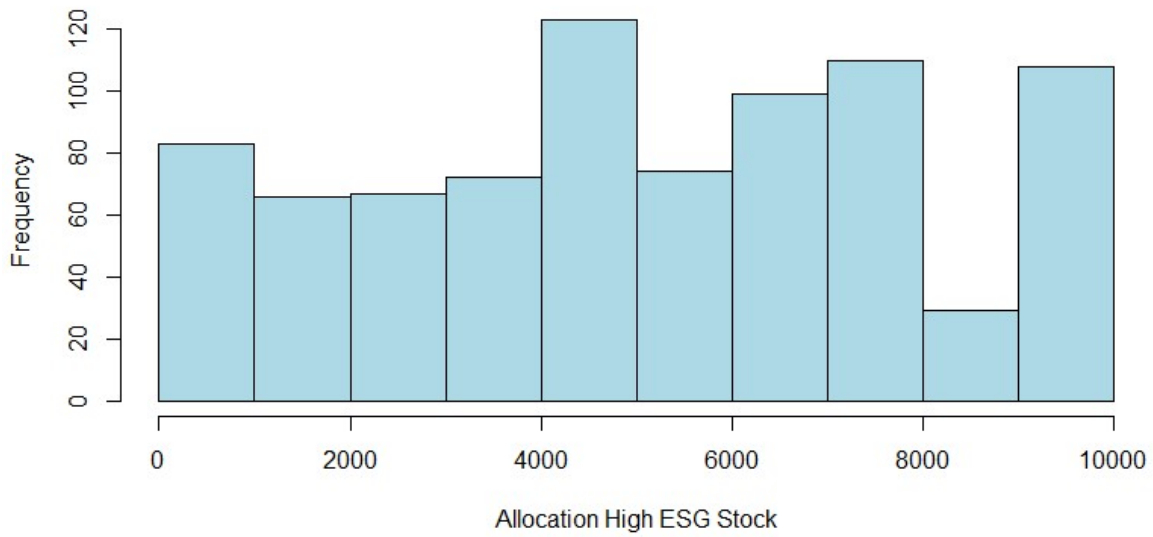


Figure 2: Histogram of Outcome Variable (N = 831)

Second, following the Mann-Whitney U test, a multiple linear regression was conducted to test for the magnitude of the effects of $Treatment$ and other investment factors on the outcome variable. Prior to that, a baseline model checked for the effect of the treatment dummy variable on the outcome variable $Allocation\ High\ ESG\ Stock$. The baseline model is:

$$Allocation\ High\ ESG\ Stock = \beta + \gamma * Treatment + \varepsilon \quad (1)$$

where β is the constant,

$Allocation\ High\ ESG\ Stock$ is the outcome variable in US Dollar,

$Treatment$ is whether the survey experiment participant received ESG ratings, the independent variable of main interest,

and ε is the error term.

An expanded multiple linear regression built on the baseline model and included the other numeric investment factors the participants received as information, as well as their stated familiarity with the stocks. To reduce the number of independent variables in the regressions, the difference between the factors for the stock with the high ESG rating and the stock with the low ESG rating were used (e.g. the difference between the Beta of the high ESG rating

stock and the Beta of the low ESG rating stock). This should have captured the effects equally and improved fit of this regression model by reducing the number of independent variables. The expanded model is:

$$Allocation\ High\ ESG\ Stock = \beta + \gamma * Treatment + \delta * ROIDiff_i + \theta * BetaDiff_i + \mu * MCapDiff_i + \xi * SPDiff + \nu * FamDiff_i + \varepsilon \quad (2)$$

where β is the constant,

$Allocation\ High\ ESG\ Stock$ is the outcome variable in US Dollar,

$Treatment$ is whether the survey experiment participant received ESG ratings, the independent variable of main interest,

$ROIDiff$ is the difference of return on investment of the high and low ESG rating stock,

$BetaDiff$ is the difference of the risk factor Beta,

$MCapDiff$ is the difference of the market capitalization,

$SPDiff$ is the difference of the stock price,

$FamDiff$ is the difference of the familiarity with the stock,

and ε is the error term.

This extended model, however, violated the no multicollinearity assumption of the multiple linear regression because of the high correlation between $ROIDiff$ (0.82) and $SPDiff$, as well as between $BetaDiff$ and $MCAPDiff$ (0.99). Therefore, simplified models with $Treatment$ and one other factor as an independent variable in each model were run in section 4.2 to show the significance of each factor. Economic and statistical significance considerations then resulted in the following model:

$$Allocation\ High\ ESG\ Stock = \beta + \gamma * Treatment + \delta * ROIDiff_i + \theta * BetaDiff_i + \varepsilon \quad (3)$$

where β is the constant,

$Allocation\ High\ ESG\ Stock$ is the outcome variable in US Dollar,

$Treatment$ is whether the survey experiment participant received ESG ratings, the independent variable of main interest,

$ROIDiff$ is the difference of return on investment of the high and low ESG rating stock,

$BetaDiff$ is the difference of the risk factor Beta,

and ε is the error term.

The regression model (3) was also executed with different subsets of the data to check for robustness and potential heterogeneity of preferences. Subsets were created for the three industries pharma, chocolate, and electric vehicles, as well as the sociodemographic variables gender, nationality, risk/return profile, and political orientation. Furthermore, the model did not violate the no multicollinearity assumption, and likely did not violate the other assumptions of the multiple linear regression either. On the one hand, the outcome variable is non-normally distributed as indicated earlier in this section. On the other hand, the residuals of the regression model are normally distributed as the histogram in Figure 3 illustrates. Thus, the model did not violate the normality assumption. Furthermore, the study assumed that the regression model does not violate linearity, independence of observations, or homoscedasticity. Figure 4 plots the residuals against the fitted models where no clear pattern can be observed. This supports the assumptions of no violation of independence of observations and homoscedasticity.

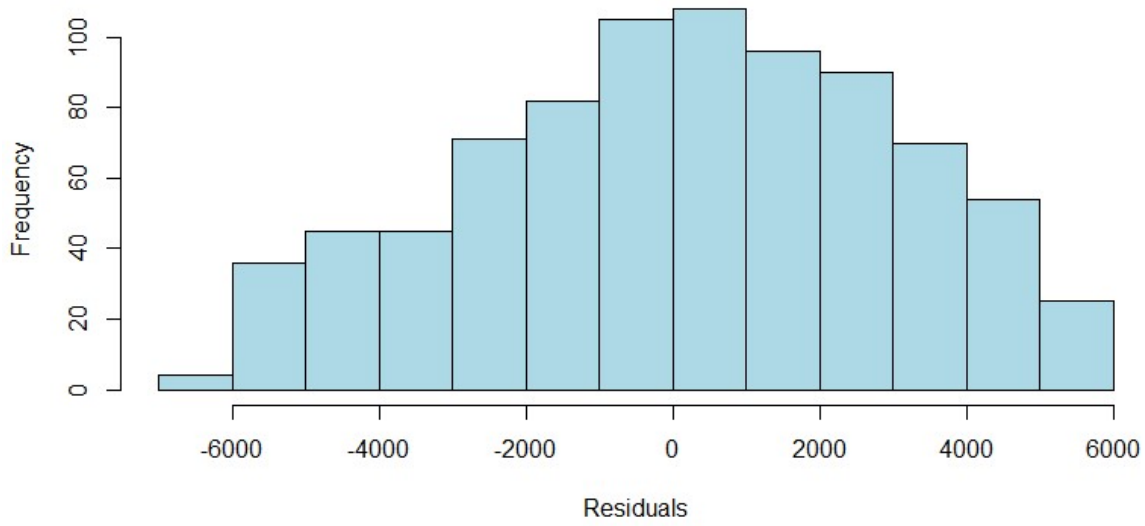


Figure 3: Histogram of Residuals (N = 831)

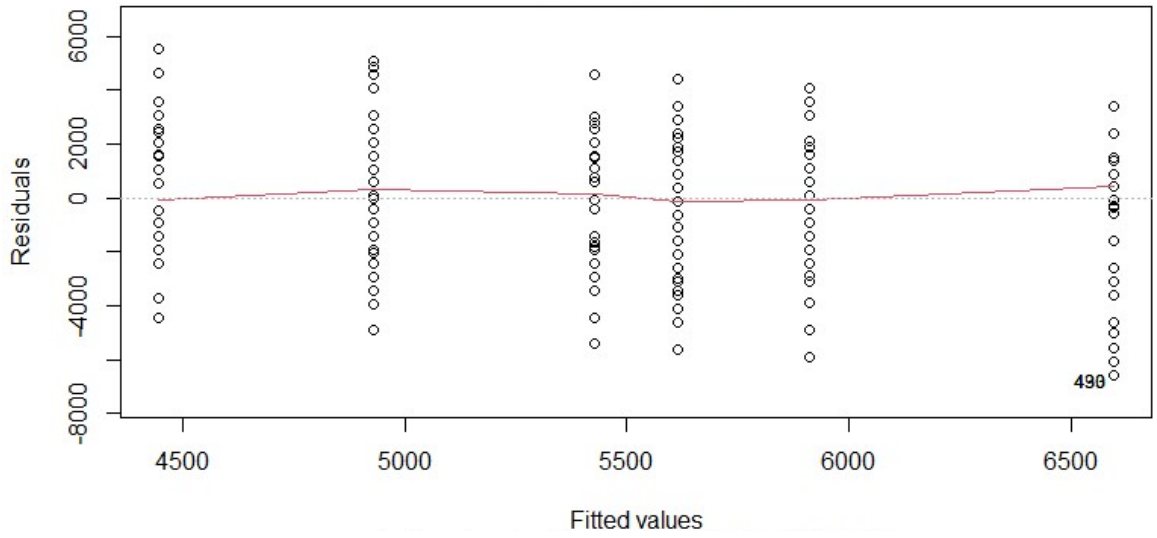


Figure 4: Fitted Values vs. Residuals

Third and last, an analysis of the Likert scale post-experiment qualitative questions followed. The analysis was based on the results from the Mann-Whitney U test and of the multiple linear regression. For instance, if there were significant effects on certain subsets such as nationality, the summary statistics to the post-experiment qualitative questions were examined by nationality.

4 Results

This chapter illustrates and discussed the results from the Mann-Whitney U Test, the regressions described in the previous chapter, and the post-experiment qualitative questions. Particularly the outcome variable, the allocation to the stock with the high ESG rating, was analyzed in depth. Table 3 gives an overview of the allocation to and the familiarity with the stocks of the experiment. Given the nature of the experiment, many rounded amounts (e.g. 4000. 5000, or 6000) were allocated to the stocks. The mean for the allocation to the stocks with the high ESG rating GSK, Barry Callebaut, and Geely was 4928, 6097, and 4590 US Dollars respectively. The standard deviation for the outcome variable was similar among all three allocations (between 2710−3208) and for the range of the outcome variable was 0−10,000 for all stocks.

The stated familiarity with the stocks was generally low. Tesla represents the exception where the mean familiarity was 3.71 on a Likert scale from 1−5. Furthermore, self-reported familiarity with Mondelez had a mean of 2.09 and a median of 2. The other stocks exhibited very low familiarity, where the mean ranged from 1.46−1.68 and the median was the lowest possible value 1. Standard deviation was also low and ranged between 0.81−1.17. These low levels and standard deviations of self-reported familiarity might limit a capture of a potential familiarity bias in the study.

Table 3: Allocation to and Familiarity with Stocks (N = 277)

	Mean	Median	Standard Deviation	Min	Max
Investment to					
Amgen	5072	5000	2710	0	10,000
GSK	4928	5000	2710	0	10,000
Mondelez	3903	4000	2802	0	10,000
Barry Callebaut	6097	6000	2802	0	10,000
Geely	4590	5000	3208	0	10,000
Tesla	5410	5000	3208	0	10,000
Familiarity with					
Amgen	1.46	1	0.85	1	5
GSK	1.68	1	1.02	1	5
Mondelez	2.09	2	1.17	1	5
Barry Callebaut	1.58	1	0.85	1	4
Geely	1.62	1	1.01	1	5
Tesla	3.71	4	0.81	1	5

4.1 Mann-Whitney U Test

This section summarizes and discusses the results from the non-parametric Mann-Whitney U test described in section 3.3. Initially, the survey participants seemed to include ESG ratings which is the main research question of this survey. They allocated more money towards the stock with the high ESG rating when ESG ratings were provided. This is consistent with expectations and existing literature that suggest high sustainability preferences for young, high-educated retail investors. Figure 5 presents the outcome variable results in a grouped boxplot for all high ESG rating stocks in total and for each stock individually. The medians and distributions of the outcome variable show that the treatment increased the money allocation to the stock with the high ESG rating. This applies to the total outcome variable and to that of GSK and Barry Callebaut. For Barry Callebaut, the allocation median of the control group was 5000 US Dollar, whereas the treatment group exhibited a median of 7000 US Dollar. GSK showed a similarly large difference between the median of the control group (4000 US Dollar) and treatment group (6000 US Dollar). Geely represents the exception where the median and distribution were identical between the control group and treatment group. This initially suggests that the treatment did not affect the allocation or in other words that the ESG ratings of Geely and Tesla were not incorporated into the decision-making of the survey participants.

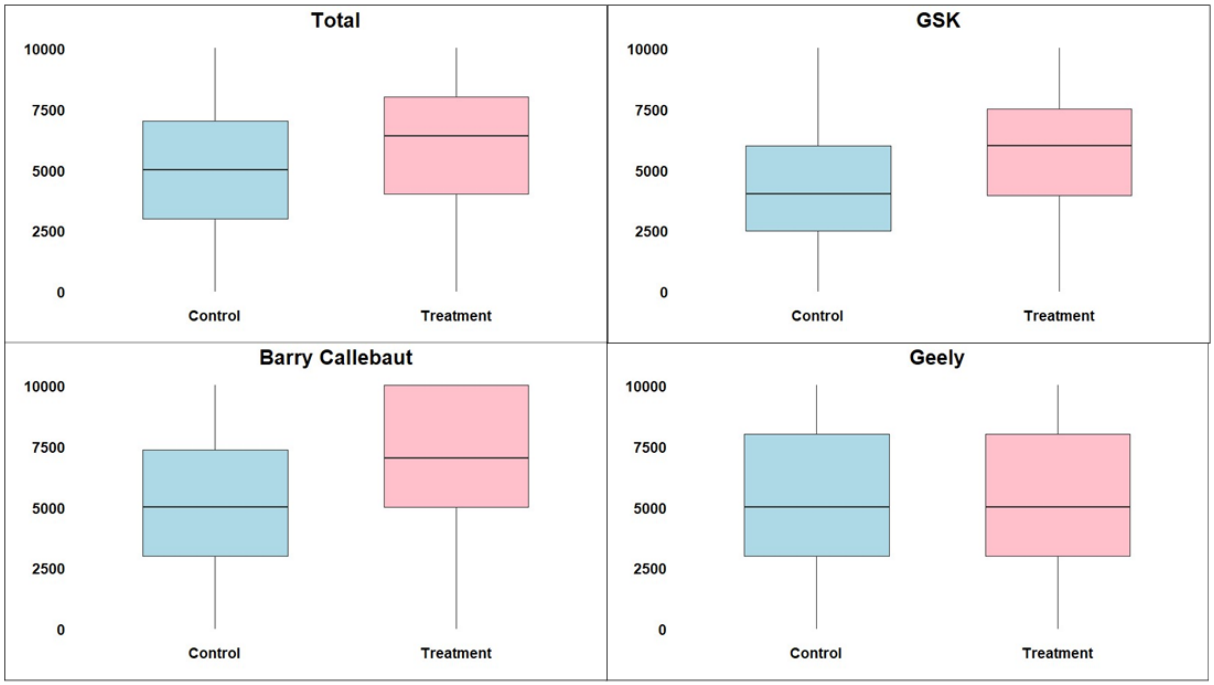


Figure 5: Grouped Boxplot: Outcome Variable by Treatment

Table 4 (based on Heeb et al., 2022) presents the means and the corresponding Mann-Whitney U test of the main experiment. In line with the previous paragraph, Table 4 indicates that the treatment affected the outcome variable positively. This applies to the mean of the outcome variable in total (mean of treatment group is 19.7 percent higher), of GSK (treatment group mean + 27.8 percent), and of Barry Callebaut (+ 32.6 percent). The ρ values of the Mann-Whitney U test were also significant at the 99 percent confidence level. Thus, the null hypothesis that there are no differences in central tendency of the control group and treatment group can be rejected.

Table 4: Means and Mann-Whitney U Test of Main Experiment

	Mean Values				**Mann-Whitney *U* Test**
	Treatment	N	Control	N	Treatment = Control
Allocation High ESG Stock					
Total	5978	408	4996	423	$p < 0.01$
GSK	5540	136	4336	141	$p < 0.01$
Barry Callebaut	6970	136	5255	141	$p < 0.01$
Geely	5423	136	5397	141	$p = 0.94$
Allocation High ESG Stock by Gender					
Male	5835	84	4841	85	$p < 0.01$
Female	6248	50	5226	53	$p < 0.01$
Nationality					
Swiss	6702	56	5250	59	$p < 0.01$
Japanese	4935	22	4532	25	$p = 0.29$
German	5675	22	4185	19	$p < 0.01$
Swedish	5667	5	5611	12	$p = 0.98$
Other	5676	31	5175	26	$p = 0.2$
Risk/Return					
Balanced	5831	84	4981	90	$p < 0.01$
Cautious	6438	29	5336	34	$p = 0.01$
Opportunistic	5935	23	4396	17	$p < 0.01$
Political Orientation					
Centre	5570	40	4756	38	$p = 0.01$
Centre-left	5938	35	5083	42	$p = 0.02$
Centre-right	5348	24	4746	28	$p = 0.22$
Left	7388	26	5532	26	$p < 0.01$
Right	5524	7	4600	5	$p = 0.4$

This does not apply for the outcome variable of Geely, where the means were almost identical between the control group and treatment group. Thus, the null hypothesis of the Mann-Whitney U Test cannot be rejected. Furthermore, Table 4 presents the results from the main experiment grouped by the sociodemographic variables gender, nationality, risk/return profile, and political orientation. First, the means of the treatment group subsets for male (+ 20.5 percent) and female (+ 19.6 percent) participants were higher than the control group means, and the difference is statistically significant.

For subsets by nationality, these statistically significant results were only present within the Swiss and German participants where the treatment groups mean was 27.7 and 35.6 percent respectively higher than the control group mean. An effect can also be observed for participants from Japan (treatment group mean: + 8.9 percent) and other countries (+ 9.7 percent). In contrast, the Swedish subset showed almost identical means between the treatment and control group, albeit a small sample size. Hence, the results from the main experiment vary by nationality. This suggests that sustainability preferences of retail investors and their ESG incorporation in stock investing vary by nationality.

All three risk/return profile subsets indicated similar statistically significant treatment effects in size. The Balanced profile participants showed the smallest relative mean difference of the outcome variable (+ 17.1 percent) and the Opportunistic profile participants showed the largest (+ 35 percent) relative mean difference of the outcome variable. The reason for this could be that the balanced profile had a much larger sample than the other two profiles. Thus, clear interpretations of these results require further analysis.

Results by political orientation suggest that the more left in the political spectrum retail investors are, the more they will incorporate ESG ratings. In this study, participants who assigned themselves with a left political orientation showed the highest treatment effect where the mean of the treatment group was a third higher than that of the control group. The other subsets with significant differences were the central and central-left subsets where treatment resulted in an outcome variable of a sixth. The centre-right and right subset results also exhibited positive effects of treatment on the allocation towards the stock with the high ESG rating, albeit smaller in size and statistically insignificant.

Table 5 (based on Heeb et al., 2022) presents the mean and Mann-Whitney U test results from the post-experiment qualitative questions. The null hypothesis of the Mann-Whitney U

Test cannot be rejected for any variable. This suggests that the treatment had no significant effect on the post-experiment qualitative answers. The analysis of the means of the post-experiment qualitative questions is discussed in section 4.3.

Table 5: Means and Mann-Whitney U Test of Post-Experiment Questions

	Mean Values		**Mann-Whitney *U* Test**
	Treatment (N = 136)	Control (N = 141)	Treatment = Control
Familiarity with			
Amgen	1.43	1.49	$p = 0.31$
GSK	1.68	1.67	$p = 0.78$
Mondelez	2.13	2.05	$p = 0.56$
Barry Callebaut	1.6	1.56	$p = 0.46$
Geely	1.55	1.7	$p = 0.15$
Tesla	3.71	3.7	$p = 0.98$
Financial Literacy	2.79	2.73	$p = 0.66$
Investment Experience	2.37	2.28	$p = 0.58$
Importance of			
Products	5.42	5.96	$p = 0.06$
Country	5.59	5.63	$p = 0.91$
Stock Price	3.31	3.47	$p = 0.3$
MCAP	4.46	5.03	$p = 0.07$
ROI	7.01	7.17	$p = 0.83$
Beta	6.53	6.69	$p = 0.39$
ESG			
Familiarity	6.02	5.67	$p = 0.41$
Importance	5.49	5.45	$p = 0.79$
= Sustainability	5.42	5.18	$p = 0.43$
= Impact	4.98	4.61	$p = 0.26$
= Lower Return	2.6	2.45	$p = 0.64$
Importance over Return	3.34	3.26	$p = 0.96$
Reliability	3.65	3.39	$p = 0.47$
Negative ESG Avoidance	5.45	5.5	$p = 0.84$
Wish for more Information	6.99	6.73	$p = 0.42$

4.2 Regression Results

The previous section described the results from the Mann-Whitney U test. These results were significant and indicate an overall impact of ESG ratings on stock preferences but also depending on subsets by stocks and sociodemographic variables. This section discusses the results from the regression models introduced in section 3.3. Table 6 presents the overview of the

regression model (1) with $Treatment$ as the single independent variable. Moreover, one of the variables $ROIDiff$, $BetaDiff$, $MCapDiff$, $SPDiff$, and $FamDiff$ were added as independent variables in each of the other five regression. Because the regression model (2) violates the no multicollinearity assumption of the multiple linear regression, these simplified regressions provided an overview on which investment factors were relevant and significant for the dependent variable $Allocation\ High\ ESG\ Stock$.

The coefficient of $Treatment$ was around 980 and significant at the 99 percent confidence level in all six regressions. This implies that the survey participants increased their allocation to the stock with the high ESG rating by 980 US Dollar when receiving ESG ratings. The 980 US Dollars represents 9.8 percent of the total money (10.000 US Dollars) they had to allocate to the two stocks. The regression (1)[2] coefficient of $ROIDiff$ indicates that for each 1 percent difference in ROI, the participants allocated 180 US Dollars more to the stock with the high ESG rating. The coefficient is also statistically significant at the 99 percent confidence level. Regressions (2) and (3) show smaller coefficients for $BetaDiff$ (2.6 US Dollar increase if Beta is one percent higher) and $MCapDiff$ (coefficient = 0.0001). The coefficients are also statistically insignificant. Nevertheless, the coefficient of $BetaDiff$ might suggest that the participants preferred higher risk or that they did not fully grasp the Beta variable in the experiment. The coefficient of $SPDiff$ is statistically significant at the 99 percent confidence level and indicates that if the stock price was one US Dollar higher, allocation increased by 0.5 US Dollars. This number is very low and indicates an insignificant economic significance. Given the low economic significance and the high correlation of the variables with $ROIDiff$ (0.82) and $BetaDiff$ (0.99) respectively, $SPDiff$ and $MCapDiff$ were not included as independent variables in the further regression models. The same applies for $FamDiff$ where the coefficient is statistically insignificant and shows a large standard error. The low variable variation in the sample might be the reason for this.

The adjusted R^2 values are generally low, which indicates that the regressions in Table 6 do not explain much of the variation in the dependent variable. However, by adding $ROIDiff$ as an independent variable to the regression, the adjusted R^2 almost doubled from 0.027 to 0.051.

[2] Not to be confused with the regression models of section 3.3

Table 6: Regression Table: Simplified Regressions

	Dependent variable:					
	Allocation to High ESG Stock					
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	981.776***	981.776***	981.776***	981.776***	981.776***	979.947***
	(201.993)	(199.463)	(201.973)	(202.093)	(199.759)	(202.096)
ROIDiff		17,973.910***				
		(3,817.838)				
BetaDiff			261.460			
			(242.787)			
MCAPDiff				0.0001		
				(0.0003)		
SPDiff					0.534***	
					(0.121)	
FAMDiff						-42.494
						(72.338)
Constant	4,996.239***	4,998.036***	5,063.347***	5,037.849***	4,824.180***	4,963.489***
	(141.535)	(139.763)	(154.634)	(173.031)	(145.254)	(152.172)
Observations	831	831	831	831	831	831
Adjusted R^2	0.027	0.051	0.027	0.026	0.048	0.026
Residual Std. Error	2,910.954	2,874.493	2,910.673	2,912.403	2,878.764	2,912.104
F-Statistic	23.624***	23.196***	12.394***	11.888***	21.899***	11.975***
Note:						*p<0.1; **p<0.05; ***p<0.01

The remainder of this section presents the results for the regression model (3) with the full sample, as well with sample subsets by gender, nationality, risk/return profile, and political orientation. Table 7 presents the results from regression model (3) for the full sample and for gender subsets. The coefficient of $Treatment$ remains 981.78 in regression (1) which is the same value as in the regression model with only $Treatment$ as independent variable. $ROIDiff$ has a coefficient of 17,899.69 which is consistent with the result from Table 6. Both coefficients are statistically significant at the 99 percent confidence level. In contrast, the coefficient of $BetaDiff$ remains positive, small, and statistically insignificant.

Table 7: Regression Table: Full Sample and Gender Subsets

	Dependent variable:		
	Allocation to High ESG Stock	by Gender	
	(1)	(2) *Male*	(3) *Female*
Treatment	981.776***	994.002***	1,022.592***
	(199.463)	(257.969)	(319.894)
ROIDiff	17,899.690***	22,958.500***	11,651.400*
	(3,818.566)	(4,939.336)	(6,122.523)
BetaDiff	239.589	410.779	71.096
	(239.815)	(310.202)	(384.509)
Constant	5,059.523***	4,948.894***	5,245.275***
	(152.714)	(198.532)	(243.749)
Observations	831	507	309
Adjusted R^2	0.051	0.065	0.034
Residual Std. Error	2,874.496	2,904.246	2,810.416
F-Statistic	15.796***	12.818***	4.630***
Note:			*p<0.1; **p<0.05; ***p<0.01

Regression (2) examines the male subset and finds a similar coefficient of $Treatment$ but a larger coefficient of $ROIDiff$. The latter coefficient is twice as high (22,958) as the coefficient of the female subset (11,651). In contrast, the treatment effect was slightly higher for the female subset. These results indicate that female retail investors marginally incorporated ESG ratings more in their stock investments while male retail investors put a stronger focus on return on investment. The coefficient of $Treatment$ is statistically significant at the 99 percent confidence level for both gender subsets. The same applies for the coefficient of $ROIDiff$ for the male subset, whereas the one in the female subset is statistically significant at the 90 percent confidence level. The coefficient of $BetaDiff$ is statistically insignificant for either of the subsets. Moreover, the regression model shows a larger adjusted R^2 for the male (0.065) than the female (0.034) subset but remains relatively low.

Table 8: Regression Table: Full Sample and Nationality Subsets

	Dependent variable:					
	Allocation to High ESG Stock	by Nationality				
	(1)	(2) *Swiss*	(3) *Japanese*	(4) *German*	(5) *Swedish*	(6) *Other*
Treatment	981.776***	1,451.471***	402.788	1,490.409***	55.556	500.771
	(199.463)	(298.019)	(452.731)	(484.160)	(965.721)	(470.70)
ROIDiff	17,899.690***	16,020.600***	7,033.202	32,261.730***	36,562.740**	14,754.1
	(3,818.566)	(5,704.337)	(8,650.925)	(9,245.546)	(16,850.690)	(8,978.04)
BetaDiff	239.589	510.054	942.611*	-88.310	-1,598.024	-101.85
	(239.815)	(358.246)	(543.298)	(580.642)	(1,058.263)	(563.84)
Constant	5,059.523***	5,382.640***	4,774.973***	4,165.560***	5,204.608***	5,150.550
	(152.714)	(227.381)	(339.680)	(384.691)	(589.968)	(376.08)
Observations	831	345	141	123	51	171
Adjusted R^2	0.051	0.082	0.011	0.133	0.072	0.005
Residual Std. Error	2,874.496	2,766.786	2,682.459	2,677.602	3,142.415	3,065.777
F-Statistic	15.796***	11.265***	1.506	7.220***	2.289*	1.285
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 8 presents the results from regression model (3) for the full sample and for nationality subsets. The coefficient of $Treatment$ is statistically significant at the 99 percent confidence level in the Swiss and German subsets. The ESG rating provision increased the allocation to the high ESG stock by almost 1500 US Dollars in both subsets. In contrast, the $Treatment$ coefficient is smaller and statistically insignificant in the Japanese (403), "Other" (501), and Swedish (56) subsets. This is consistent with the findings from the Mann-Whitney U test presented in section 4.1 and suggests that the treatment had a significant, but large, effect only on Swiss and German participants. Furthermore, the coefficient of $ROIDiff$ shows that return on investment had the largest impact on Swedish (95 percent significance) and German participants (99 percent significance), which were approximate twice as high compared to the Swiss (99 percent significance) and "Other" subsets (statistically insignificant) and five times as high as the Japanese subset (statistically insignificant). The coefficient of $BetaDiff$ is statistically significant at the 90 percent confidence level only in the Japanese subset and suggests preferences for higher risk. Only the Swedish subset has a clear negative (statistically insignificant) coefficient where a difference in ten percent of the Beta would reduce the allocation to the stock

with the high ESG rating by 160 US Dollars. In addition the adjusted R^2 increased in the Swiss (0.082), German (0.133), and Swedish (0.072) subsets, but are lower in the Japanese (0.011) and "Other" (0.005) subsets.

Table 9: Regression Table: Full Sample and Risk/Return Profile Subsets

	Dependent variable:			
	Allocation to High ESG Stock	by Risk/Return Profile		
	(1)	(2) *Balanced*	(3) *Cautious*	(4) *Opportunistic*
Treatment	981.776***	849.809***	1,101.748**	1,538.965***
	(199.463)	(242.310)	(452.989)	(535.929)
ROIDiff	17,899.690***	18,949.230***	4,726.010	34,082.750***
	(3,818.566)	(4,636.838)	(8,646.188)	(10,145.530)
BetaDiff	239.589	89.888	242.103	886.825
	(239.815)	(291.204)	(543.001)	(637.163)
Constant	5,059.523***	5,006.288***	5,398.416***	4,627.105***
	(152.714)	(184.201)	(337.456)	(438.054)
Observations	831	522	189	120
Adjusted R^2	0.051	0.048	0.018	0.136
Residual Std. Error	2,874.496	2,766.420	3,103.963	2,902.193
F-Statistic	15.796***	9.717***	2.141*	7.219***
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 9 presents the results from regression model (3) for the full sample and for risk/return profile subsets. The balanced profile, which was the largest subset, exhibits similar coefficients and an adjusted R^2 value as the full sample in regression (2). The coefficients of $Treatment$ and $ROIDiff$ in the subset are statistically significant at the 99 percent level. The cautious profile subset in regression (3) shows a much lower adjusted R^2 and the coefficient of $Treatment$ is higher and statistically significant at the 95 percent confidence level. The coefficient for $ROIDiff$ is statistically insignificant, but it is also much lower than that of the balanced profile subset which is consistent with the profile preferences. The same does not apply for the $BetaDiff$, however without any statistical or economic significance. In contrast to the cautious

profile subset, regression (4) presents a high adjusted R^2. The coefficients of $Treatment$, $ROIDiff$, and $BetaDiff$ are also high, with the first two coefficients being statistically significant at the 99 percent confidence level. This suggests that the opportunistic survey participants had higher preferences for high risk and return which is consistent with their profile. However, it also suggests that they incorporated ESG ratings more into stock investing. One possible explanation thereof is that retail investors expected a correlation of ESG ratings with high return and risk, as discussed in section 2.2.

Table 10 presents the results from regression model (3) for the full sample and for political orientation subsets. The coefficient of $Treatment$ increases the further left[3] the political orientation subset is, with the biggest increase from centre-left (855) to left (1855). This is consistent with the Mann-Whitney U test results discussed in section 4.1. The coefficient is statistically significant at the 99 percent confidence level in the left subset and at the 95 percent level in the centre and centre-left subset. Return on investment is more significant for the centre-right subset, with the coefficient of $ROIDiff$ being more than 10,000 higher than in the other subsets[3]. The coefficient is respectively statistically significant at the 99 percent (center-right), at the 95 percent (centre, centre-left), and at the 90 percent (left) confidence level. In contrast, the coefficient for $BetaDiff$ is insignificant in all subsets without any clear pattern. The adjusted R^2 increased for the centre-right (0.07) and particularly the left subset (0.12) compared to the full sample but remains low.

Overall, the results show that the survey participants incorporated ESG ratings in the allocation to the stocks and increased the allocation to the stock with the high ESG rating. Deeper analyses by sociodemographic subsets reveal four main findings. First, there is a treatment effect for both male and female participants but a higher for female participants. Second, the treatment effect is high and statistically significant for Swiss and German participants but not for the other nationalities. Third, all risk/return profiles show a significant treatment effect, and the effect is highest for the opportunistic profile. Fourth, the treatment effect is higher, the further left the political orientation of the participants is and is by far highest for participants with a left political orientation. In addition, there is a clear positive effect of return on investment, whereas the difference of the risk factor Beta has no statistically significant effect on the outcome variable.

[3] Excluding the right subset because of the small sample

Table 10: Regression Table: Full Sample and Political Orientation Subsets

	Dependent variable:					
	Allocation to High ESG Stock	by Political Orientation				
	(1)	(2) *Centre*	(3) *Centre-left*	(4) *Centre-right*	(5) *Left*	(6) *Right*
Treatment	981.776***	813.856**	854.603**	601.881	1,855.449***	923.810
	(199.463)	(349.456)	(378.204)	(470.015)	(466.061)	(1,055.864)
ROIDiff	17,899.690***	14,818.730**	16,288.700**	27,684.100***	17,206.180*	20,770.570
	(3,818.566)	(6,688.966)	(7,211.633)	(8,972.894)	(8,923.844)	(19,934.240)
BetaDiff	239.589	-288.437	720.377	304.460	228.952	94.808
	(239.815)	(420.083)	(452.907)	(563.519)	(560.438)	(1,251.917)
Constant	5,059.523***	4,683.327***	5,270.018***	4,826.949***	5,593.203***	4,626.411***
	(152.714)	(272.486)	(280.228)	(350.537)	(359.575)	(868.077)
Observations	831	234	231	156	156	36
Adjusted R^2	0.051	0.045	0.054	0.070	0.115	0.055
Residual Std. Error	2,874.496	2,671.947	2,862.204	2,926.549	2,910.551	3,123.287
F-Statistic	15.796***	3.582**	4.293***	3.840**	6.589***	0.620
Note:						*p<0.1; **p<0.05; ***p<0.01

4.3 Qualitative Analysis

The previous two sections presented the results from the main experiment and indicated that (1) the survey participants do incorporate ESG ratings in stock investing, (2) they have sustainability preferences and (3) the treatment has a significant and sizeable effect on the allocation to stock. This section presents the results from the post-experiment qualitative survey and analyzes possible factors that explain the treatment effect and the revealed sustainability preferences.

Table 11 presents the summary statistics of the post-experiment qualitative survey. Self-reported financial literacy and investment experience show moderate values with means of 2.76 and 2.32 on a Likert scale from 1–5. This is consistent with expectations as many participants are university students from business school and thus are closer to the topic than others. Despite this, the values are still low enough to classify them as retail investors overall.

The survey participants also answered how important each factor was for their investment decision. The variables with the two highest means are return on investment (7.09) and the risk factor Beta (6.61). In addition, return on investment was the variable with the lowest standard deviation. This further supports the decision to include the two factors in the regression model (3) described in section 3.3. The ESG rating (5.91, only answered by the treatment group because the control group did not receive ESG ratings), products (5.7), and country (5.61) of the company also have high means. In contrast, the market capitalization (4.75) and the stock price (3.39) have low means. Overall, these stated preferences align with the results from the previous sections on the importance of return on investment and ESG ratings. However, the stated preferences for Beta are higher than what the regression results suggest.

Table 11: Summary Statistics of Post-Experiment Questions (N = 277)

	Mean	Standard Deviation	Min	Max	Correlation with Outcome Variable (Treatment Group, N = 136)
Financial Literacy	2.76	0.98	1	5	-0.10
Investment Experience	2.32	1.02	1	5	-0.14
Importance of					
Products	5.7	2.48	0	10	-0.08
Country	5.61	2.63	0	10	-0.13
Stock Price	3.39	2.64	0	10	-0.03
MCAP	4.75	2.4	0	10	-0.17
ROI	7.09	2.19	0	10	-0.02
Beta	6.61	2.49	0	10	-0.06
ESG Rating (n = 136)	5.91	2.68	0	10	0.23
ESG					
Familiarity	5.84	3.26	0	10	-0.04
Importance	5.47	2.73	0	10	0.16
= Sustainability	5.3	2.61	0	10	0.13
= Impact	4.79	2.66	0	10	0.04
= Lower Return	2.52	2.18	0	9	-0.10
Importance over Return	3.3	2.62	0	10	0.20
Reliability	3.52	2.1	0	10	-0.03
Negative ESG Avoidance	5.47	2.98	0	10	0.18
Wish for more Information	6.86	2.91	0	10	0.16

The results from the last question survey on ESG ratings suggest that participants were to a certain extent familiar with ESG and find ESG important. They agreed with the statement that a high ESG rating means a company is sustainable and to a lower extent that the company has a positive impact. They did not believe that ESG ratings are negatively correlated with return, but also stated that return was more important than high ESG ratings. The participants did not want to invest in stocks with a negative ESG rating as much as they found ESG important. As both questions have a similar mean value, this suggests that sustainability preferences are symmetric in this sample based on stated preferences. Moreover, the participants clearly indicated that they do not find ESG ratings reliable and that they wished for more sustainability information on top of the ESG ratings. These answers were consistent across the treatment group and control group, as Table 5 in section 4.1 presented. Appendix 3 further visualizes grouped boxplots for the post-experiment survey by treatment group and control group.

The last column of Table 11 presents the correlation of each question in the table with the outcome variable for the treatment group. The results explore potential reasons for the treatment effect. The correlations are overall low but give some indications. The correlations are positive and above 0.15 for: 1) “ESG importance”, 2) “ESG importance over return”, 3) “negative ESG avoidance”, and 4) “wish for more information”. This suggests that allocation to the stock with the high ESG rating is higher if participants found ESG important in general. In contrast, there is no correlation between whether participants find ESG ratings reliable and the outcome variable. The correlations for ESG familiarity, financial literacy, and investment experience are negative and low, which potentially suggests that increased financial literacy and sustainable finance literacy reduced the treatment effect. However, these results are based on (low) correlations and on stated preferences, and thus, should be interpreted cautiously.

The current section has analyzed the post-experiment qualitative survey for the full sample so far. The results in the previous sections, however, found significant treatment effects depending on the sociodemographic variables gender, nationality, risk/return profile, and political orientation. The treatment effect was positive and significant for both the male and female subset which is consistent with the literature discussed in section 2.2. That particularly participants with a left political orientation incorporated ESG ratings into their stock allocations also is consistent with the existing literature (e.g. affect heuristic discussed in section 2.3). Thus, the remainder of this section analyzes the results from the risk/return profile and nationality subsets.

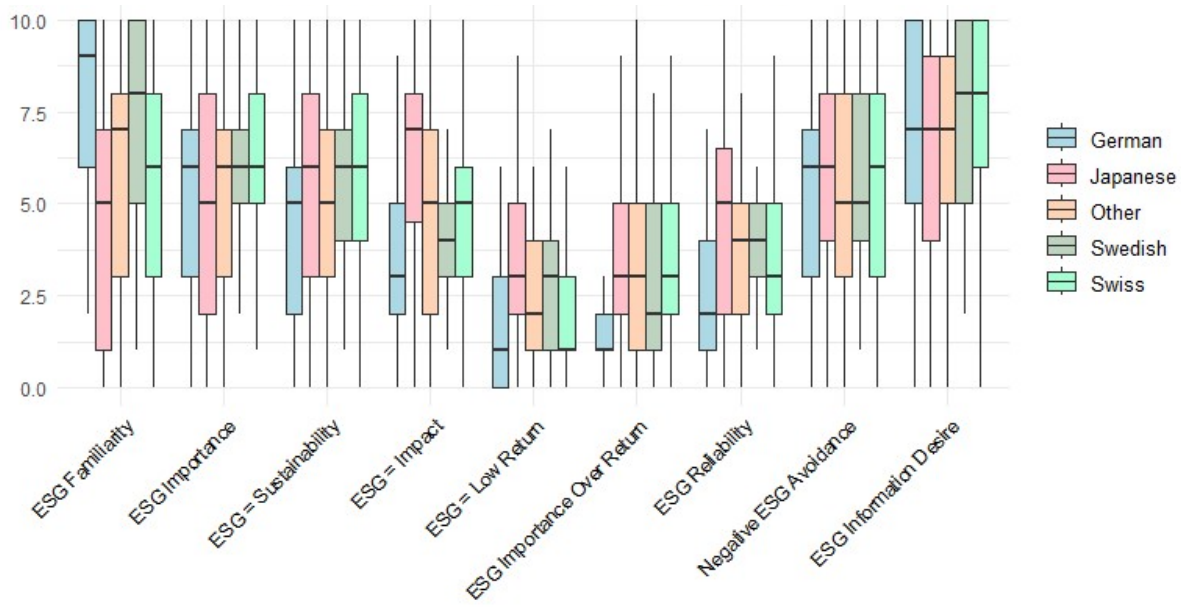


Figure 6: Grouped Boxplot: Post-Experiment ESG Questions by Nationality

Figure 6 presents the results from the post-experiment qualitative survey with the ESG questions by nationality. The analysis of these ESG questions by nationality provides four main findings. First, familiarity with ESG was highest for German and Swiss participants and lowest for Japanese participants. Second, the Japanese believed the most that ESG ratings are reliable and that high ESG ratings imply that a company has a positive impact. They agreed to this question more than to that which asks whether high ESG ratings imply that a company is sustainable. Despite these answers, ESG was less important for the Japanese in this sample. Third, all participants disagreed with the statement that high ESG ratings correlate with low returns and the Swiss and German disagreed the most. Fourth and last, all participants wished for more ESG information independent of nationality.

Besides these four main findings, answers by nationality were similar. This either indicates that the four main findings capture the differences in ESG rating incorporation between the nationality subsets or that the stated preferences questions did not capture the explanatory factors for the treatment effect. The results from the previous sections found that Swiss and German participants showed a high and significant treatment effect, whereas it was low and insignificant for the Japanese and Swedish participants. However, this seems to be consistent with the correlation question of high ESG ratings and low returns. Thus, it could suggest that participants incorporated ESG ratings more, the more they were convinced about no negative correlation between ESG ratings and return on investment (or other return metrics).

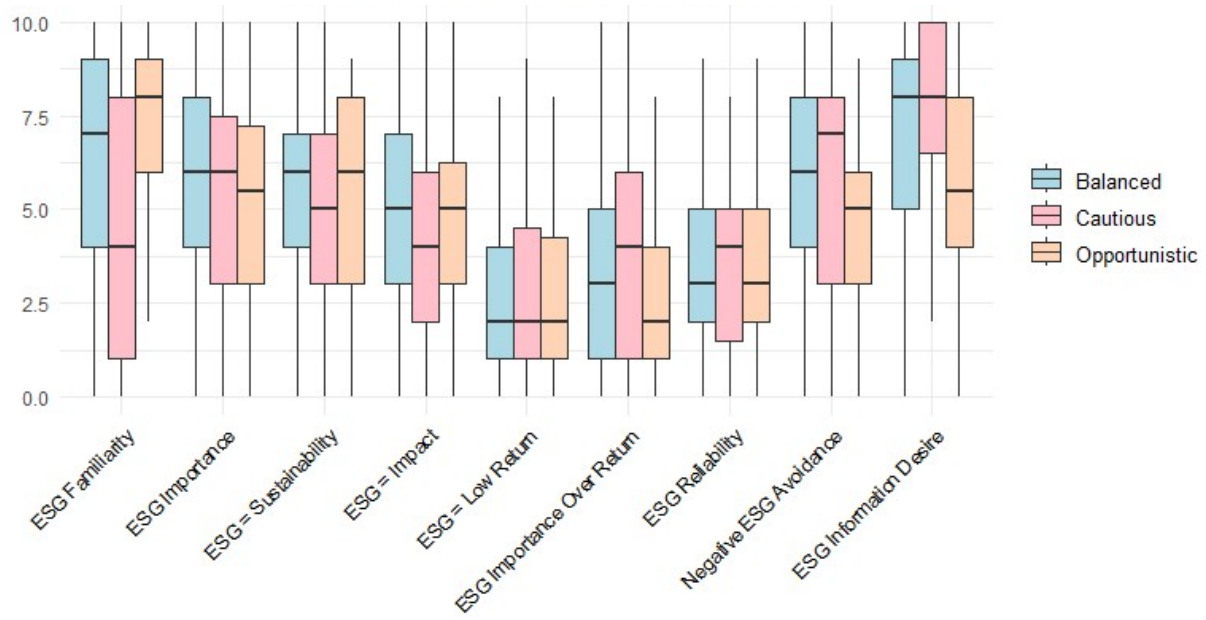


Figure 7: Grouped Boxplot: Post-Experiment ESG Questions by Risk/Return Profile

Figure 7 presents the results from the post-experiment qualitative survey with the ESG questions by risk/return profile. The analysis of these ESG questions by risk/return profile provides three main findings. First, familiarity with ESG was high for the balanced and opportunistic profile subsets and low for the cautious profile subset. Second, balanced and cautious retail investors found it more important to avoid investments in stocks with negative ESG ratings. Third and last, opportunistic retail investors wished less for additional ESG information than balanced and cautious retail investors.

Besides these three main findings, answers by risk/return profile were similar. For nationality subsets and risk/return profile subsets, a pattern exists where the subset with the lowest familiarity with ESG (Japanese, cautious) indicates a smaller treatment effect, and thus lower incorporation of ESG ratings. Similarly, the German and opportunistic profile subsets clearly stated that ESG was not more important than return for them. Nevertheless, the treatment effect was particularly high and significant for these subsets. A possible reason thereof is the high familiarity with ESG across both subsets.

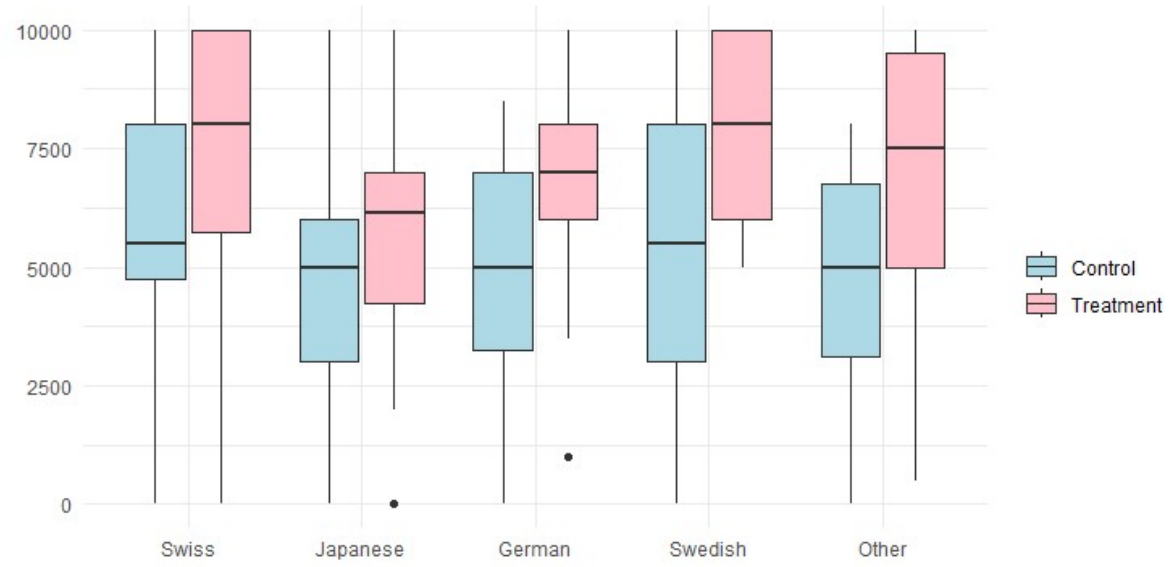


Figure 8: Grouped Boxplot: Allocation to Barry Callebaut by Nationality

Another variable that has not been analyzed in this study is the stated importance of country for the stock allocation. Table 11 illustrated that participants reported the (base) country of a company as almost as important as ESG ratings with means of 5.61 and 5.91 (only treatment group) respectively on a Likert scale of 1–10. The country of a listed company can be important in general but also be defined by a home bias particularly, as discussed in section 2.3. Figure 8 plots the allocation to Barry Callebaut (part of the outcome variable as a stock with high ESG rating) by nationality. Barry Callebaut is the only company from a country which also represents the nationality of a large sample of participants of the study, in this case Switzerland. In Figure 8, the control group seems to be affected by a home bias, as both the first quartile and third quartile of the control group is higher for Swiss participants than all other nationalities. The difference between treatment group and contrast group, however, is consistent with the findings from the main experiment. This suggests that despite a potential home bias, it did not affect the treatment effect significantly.

4.4 Robustness Checks

This section focuses on the verification of the attention of the survey experiment participants. The previous sections have illustrated that the treatments effect is statistically and economically significant. The results are consistent across the Mann-Whitney U test and the different multiple linear regression models. The coefficient of treatment does not change significantly when changing the independent variables in the regression models. Moreover, the regression results by subsets reveal that the treatment only affects the outcome variable depending on the sociodemographic variables. These subset results are also consistent with the Mann-Whitney U test results and statistically significant. Therefore, the regression models and results are assumed to be robust.

However, additional checks for (in)attention of the survey participants can add certainty to the robustness of the results. All survey participants answered the attention question ("please mark 4") correctly. This suggests a minimal attention and/or that the question was too easy. Another possible indicator is the duration of the experiment. The median for the duration was 559 seconds or 9.3 minutes. The median is consistent with expectations but also indicates that half of the participants completed the survey in less than 9.3 minutes which is short. This could indicate some degree of inattention.

Another possibility to check for (in)attention and consistency of answers is to compare the answers to two similar questions. At the beginning of the post-experiment survey, the treatment group indicated how important the ESG ratings were for their investment allocations. In the end, all participants further agreed whether ESG was important for their investment decisions in general. Both questions are in essence the same and were answered on the same Likert scale from 1–10. The correlation of the two question results is 0.67, which is high. This suggests that the treatment group remained consistent during the survey experiment. Figure 9 presents the two variables in a scatterplot, with the general investment decision importance question in the x-axis and the importance of the ESG ratings for the experiment in the y-axis.

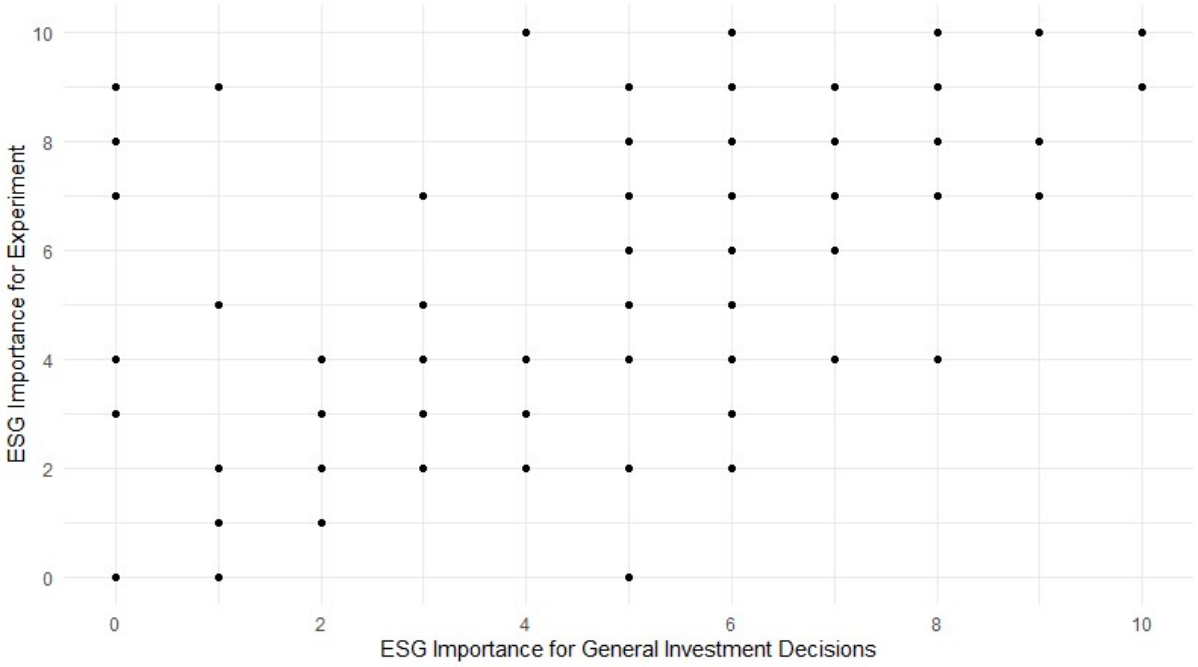


Figure 9: Scatterplot: Two Similar Questions on ESG Importance

4.5 Discussion of the Results and Limitations

This section summarizes and discusses the main results presented in the previous sections and suggests implications for managers and policymakers, as well as highlighting limitations of this study and potential further research areas.

4.5.1 Interpretation of Main Findings

The previous sections found that the addition of ESG ratings significantly increased the allocation to the stock with the high ESG rating overall. Thus, the main finding of these results is that retail investors in the study sample did incorporate ESG ratings in their stock allocation and that the degree of incorporation is persistent among various subsets. In these samples, ESG ratings belonged to the most important quantifiable investment factors, along with the return on investment indicator. The risk factor Beta, in contrast, had no significant effect on the outcome variable, as well as familiarity with a company.

A possible reason for the lack of Beta integration is that the sample did not understand the variable. It was explained as a systemic risk indicator, and results might have varied in case of absolute risk indicators. Furthermore, the information overload and salience of the affect heuristic discussed in section 2.3 might also be relevant factors for the lack of integration of

the Beta variable. One potential explanation is that the Beta as information is abstract and not salient. In combination with additional information overload, participants might have given the Beta less importance and thus not integrated it. This would then explain the discrepancy between high stated importance and low revealed preferences of risk. In addition, the lack of significance of the familiarity variable can be explained by the low variation of the factor within the sample.

Furthermore, the treatment effect was significant for male and female participants, but higher for the female subset. The same applies for the three risk/return profiles where the opportunistic profile showed the highest treatment effect. In contrast, a few subsets in nationality and political orientation did not have a significant treatment effect, e.g. the Japanese and Swedish, as well as the centre-right and right subsets. The findings for the gender and political subsets are consistent with the existing literature, as discussed in section 4.3. The answers to the post-experiment qualitative survey were similar across the three different risk/return profile subsets despite different magnitudes of the treatment effect. This has two possible explanations. First, that the risk/return profiles did not capture the true risk/return preferences of the sample. Second, that ESG rating incorporation is mainly driven by risk/return expectations, as the opportunistic profile sample revealed the highest treatment effect. In other words, opportunistic retail investors believe that high ESG ratings of stocks are correlated to high risk and return which is consistent with their preferences.

The nationality subsets showed clearer patterns than the risk/return profile subsets, particularly the Japanese subset. These Japanese participants agreed that ESG ratings are reliable and that high ESG ratings imply that a company has a positive impact, however, they did not incorporate ESG ratings as much as e.g. the Swiss or German participants. Underlying reasons for this contradiction could be effects that were not captured in the survey. For instance, they could have a different understanding of ESG ratings than other participants or generally have lower sustainability preferences despite the higher trust in ESG ratings. Further variables that potentially explain whether there is a treatment effect are familiarity with ESG and how important participants found ESG. The latter is self-explanatory and is one of the variables with the highest correlations with the outcome variable (albeit still low at 0.16, see Table 11). Low

familiarity with ESG persisted among subsets that had no significant treatment effect (Japanese, cautious profile). However, the ESG familiarity variable had no correlation with the outcome variable.

Differences in the treatment effect were not only observed across subsets by sociodemographic variables but also across the stock pairs. ESG ratings increased the allocation to the stock with the high ESG rating significantly for the pairs of the pharma and chocolate industry. The treatment, however, did not affect the allocation to the two stocks of the electric vehicles. This section presents three potential reasons for the lack of ESG incorporation for the Geely/Tesla pair.

First, a country bias might persist. Section 4.3 argued against the impact of a potential home bias on the treatment. Nevertheless, this referred to the Barry Callebaut example and Swiss participants. Geely is the only company from China and Asia in the experiment. This could thus indicate that country preferences are strong for/against Chinese companies and overweigh the treatment effect, and that this does not apply for European or US American companies.

Second, familiarity with a company does not affect sustainability preferences linearly but individually. Most participants were familiar with Tesla, or at least to a higher degree than with the other companies. Some, for instance, might have already formed positive opinion, and other negative opinions on the company. Thus, familiarity is very significant and potentially stronger as investment factor than ESG ratings are, but not linear.

Third and last, ESG ratings could be more relevant for industries with more sustainability uncertainty and controversies. The pharma industry and particularly the chocolate industry have faced significant backlash for ESG-related issues such as child labor in the labor supply of the chocolate production. Thus, ESG ratings become more important and significant for stock retail investors. In contrast, the electric vehicle industry is known for shaping the transformation away from fossil fuels to greener mobility. Hence, retail investors might perceive companies within the industry as sustainable in general and do subsequently not further incorporate ESG ratings.

Overall, the results from this study imply that retail investors do incorporate ESG ratings in their stock investments. These high sustainability preferences of retail investors in stocks are likely strongly driven by the affect heuristic. The preferences are, however, heterogenous

across sociodemographic variables, industries, and individuals. This study only presents some potential reasons for the heterogeneity in the underlying data which is consistent with the low adjusted R^2 values of the regression models. Nevertheless, retail investors seek more sustainability information, independent of the sociodemographic variables. This finding can be explained by a lack of understanding of and/or low trust in ESG ratings.

4.5.2 Implications for Managers and Policymakers

This study found that retail investors incorporate ESG ratings in stock investing but to a varying extent. For managers this means that they should start or continue to provide ESG ratings in their equity products. Given the heterogeneity of sustainability preferences of retail investors, financial institutions and particularly ESG rating providers are advised to consider potential product innovations. The challenge for them is to find a balance between providing enough sustainability information and avoiding the occurrence of information overload. Thus, a more direct approach such as a form of interactive advisory could be sensible.

However, greenwashing risks of ESG ratings need to be reviewed. The lack of standardization could further reduce trust in them. This is an issue that policymakers have discussed and where new regulations drafts are in process, e.g. the new ESG rating regulation of the EU. Nevertheless, too many regulations and too much standardization could also result in negative feedback effects. One possible result is that the number of ESG rating providers decreases and an overall change in the ESG rating landscape that decreases the quality of ESG ratings.

The challenge for managers and policymakers is not only to standardize ESG ratings, but also to ensure an offering that is suitable for the specific target group and industries. Particularly industries with higher sustainability uncertainty like the chocolate industry could require more extensive ESG ratings or information. Furthermore, regional preferences should be taken into consideration too. For instance, increase awareness of sustainability issues within finance and reducing negative stigmas of ESG rating in Japan would likely have a higher immediate impact than more ESG rating regulation.

Finally, the main question should be what the purpose of ESG ratings is. Depending on whether ESG ratings exist to attract more customers or to increase reallocation of financial flows towards more sustainable companies, other strategies should be followed. At the time of writing this study, ESG ratings can still be assumed to only be relevant for a specific target

group. Consequently, managers and policymakers should reflect on whether the status quo should remain, or if the goal is to expand ESG rating incorporation to a broader target group.

4.5.3 Limitations and Further Research

This study has conducted an experiment with retail investors that consisted of university students mainly from Switzerland, Japan, and Germany. This sample allowed checking for regional differences and analyzing a target group that likely shows higher preferences for sustainability. Hence, the findings from the study might not be representative for all retail investors depending on their age and other sociodemographic variables.

The main potential issue of this study is the persistence of an experimenter-demand bias. The treatment effect of this study is unusually high, which suggests that participants might have been aware of the treatment. This implies that the likelihood of an overestimation of the treatment effect is high, and an underestimation unlikely.

Further research could analyze the reasons for the incorporation of ESG ratings in stock investing, as this study only found some potential indicators. An extension of the sample size could test whether the findings from this study persist in general and across different sample groups. Moreover, open questions on the heterogeneity of sustainability preferences remain. Particularly regional differences could be explored. Finally, ESG ratings could persist or disappear over time, but sustainability questions will remain. Thus, further research should focus on sustainability preferences among retail investors, as well as how to present sustainability optimally.

5 Conclusion

This paper analyzed how retail investors incorporate ESG ratings in stock investing. It used a survey experiment conducted with Qualtrics to collect complete data from 277 participants. The first of three sub-questions explored whether retail investors have sustainability preferences in stock investing. Results from the Mann-Whitney U test suggest that overall, retail investors exhibit sustainability preferences. The mean of the outcome variable, the allocation to the stock with the high ESG rating, is 19.7 percent higher than that of the control group and the difference is statistically significant at the 99 percent confidence level. This difference increases for certain subsets by industry (pharma and chocolate) and sociodemographic variables (left political orientation, Swiss and German participants). Furthermore, all risk/return profile and gender subsets show a higher mean for the treatment group, also statistically significant. Among these subsets, particularly the opportunistic profile and female subsets incorporated ESG ratings. In contrast, the mean difference was small (Centre-right, Right, Japanese) or close to zero (electric vehicles, Swedish) in other subsets.

The second sub-question examined how strong sustainability preferences of retail investors are compared to other investment factors. Multiple linear regression models used a treatment dummy for ESG ratings and found a coefficient of 980 that was significant at the 99 percent confidence level for both a simplified and an extended model. This implies that the survey participants increased their allocation to the stock with the high ESG rating by 980 US Dollars when receiving ESG ratings, representing 9.8 percent of the total money they invested. The treatment coefficient varied depending on the subset, consistent with the findings from the Mann-Whitney U test. ESG ratings belonged to the most important quantifiable investment factors, along with return on investment. In contrast, the risk factor Beta and the familiarity with a company had no significant effect on the outcome variable.

The third and last sub-question researched the reasons for the existence of these sustainability preferences. Findings from the post-experimental survey reveal that high sustainability preferences of retail investors in stocks were strongly driven by the affect heuristic. The preferences were heterogenous across sociodemographic variables, industries, and individuals. This study only identified potential reasons for the heterogeneity in the underlying data, as supported by the low adjusted R^2 values of the regression models. Nevertheless it confirms high sustainability preferences of retail investors who seek more sustainability information.

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Appendix 1: Survey Experiment

Introduction

Welcome

Thank you very much for taking your time to fill out this survey. This survey analyzes the **decision-making of stock investors**. It is part of my master's thesis for the University of St. Gallen and the Stockholm School of Economics.

Your answers will be treated anonymously and confidentially. Filling out the survey takes around **5 – 8 minutes** and is voluntary.

I appreciate your contribution very much - thank you and have fun :)

Demographics

In the following you will face an investment decision. Before we start, I would like to ask some questions about you.

What is your nationality?

- ○ Swiss
- ○ German
- ○ Swedish
- ○ Japanese
- ○ Other

Where is your main residence (last 5 years)?

- ○ Switzerland
- ○ Germany
- ○ Sweden
- ○ Japan
- ○ Other

What is your age in years?

What is your identified gender?

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer not to say

How would you identify your political views?

- ○ Far-left
- ○ Left
- ○ Centre-left
- ○ Centre
- ○ Centre-right
- ○ Right
- ○ Far-right

What is your highest degree?

- ○ No degree
- ○ Secondary School diploma or equivalent
- ○ University Bachelor's Degree (e.g. Bachelor of Arts, Bachelor of Science)
- ○ University Master's Degree (e.g. Master of Arts, Master of Science)
- ○ Doctoral Degree or higher

What is your current employment status?

- ○ Employed full time
- ○ Employed part time
- ○ Retired
- ○ Self-employed
- ○ Unable to work
- ○ Homemaker
- ○ Other

What is your monthly net income in US Dollar?

- ○ < 1,000
- ○ 1,000 - 2,999
- ○ 3,000 - 4,999
- ○ 5,000 - 7,499
- ○ 7,500 - 9,999
- ○ 10,000 - 14,999
- ○ 15,000 - 24,999
- ○ > 25,000
- ○ Prefer not to say

Risk/Return Preferences

How would you define your preferred risk/return investment strategy?

- ○ Cautious - low risk, low return
- ○ Balanced - moderate risk, moderate return
- ○ Opportunistic - high risk, high return

Intro Experiment

In the following you will face an investment decision. **Please read carefully.**

Assume you have inherited a very large sum of money from a distant relative. Based on your answers so far, your fund manager strongly advises you to invest the majority of the inheritance in your current fund portfolio that was set up by your fund manager. They also give you the opportunity to personalize and expand your portfolio with new **stock investments** in three industries.

For each industry you will be presented two stocks with currently favorable recommendations. This means that your fund manager and a majority of professional analysts recommend to buy these stocks. You are advised to invest $10,000 in each of the industries.

Experiment_Treatment

Time to practice.
This is only an illustrative **example**. In the following, you will invest $10,000 three times. You can freely choose the amount you want to invest in one or both of the presented stocks. You do not have to buy full stocks (e.g. if the stock price is $1000, you may also invest $1,500 or $500).

Possible examples are:
Invest $10,000 only in X
Invest $10,000 only in Y
Invest $5,000 in X, and $5,000 in Y
Invest $3,600 in X, and $6,400 in Y
Invest $8,200 in X, and $1,800 in Y
etc.

	Stock X	Stock Y	
Industry	Entertainment Services	Entertainment Services	
Main Products	Internet streaming service	Television broadcasting, film production, streaming services, licensing, etc.	
Country	USA	USA	
Stock Price	$483	$100	
Market Capitalization	$207,486 Billion	$166,376 Billion	Total **market value** of the company. Calculated by multiplying the number of outstanding shares and the single stock price.
ROI	10.32%	2.39%	Average amount **earned** by an investment in a stock each year (5 year average)
Beta	1.22	1.38	Measures **systematic risk** (volatility) of the stock in relation to the market. Beta of 1 is as volatile as the market, < 1: less volatile; > 1: more volatile
ESG Rating	Low	Low	Indicates the performance of **environmental, social, and governance factors**, thus, assesses the **sustainability**. The rating is either **high (positive)** or **low (negative)**.

Data retrieved from Degiro, January 2024

	Amgen Inc.	GSK (GlaxoSmithKline)	
Industry	Pharmaceuticals	Pharmaceuticals	
Main Products	Treatments against e.g. rheumatoid arthritis, osteoporosis, and anemia	Respiratory medicine, vaccines, HIV treatments, and other biopharmaceuticals	
Country	USA	United Kingdom	
Stock Price	$310	$20	
Market Capitalization	$162,159 Billion	$80,874 Billion	Total **market value** of the company. Calculated by multiplying the number of outstanding shares and the single stock price.
ROI	13.81%	10.42%	Average amount **earned** by an investment in a stock each year (5 year average)
Beta	0.61	0.58	Measures **systematic risk** (volatility) of the stock in relation to the market. Beta of 1 is as volatile as the market, < 1: less volatile; > 1: more volatile
ESG Rating	Low	High	Indicates the performance of **environmental, social, and governance factors**, thus, assesses the **sustainability**. The rating is either **high (positive)** or **low (negative)**.

Data retrieved from Degiro, January 2024

v

Assign how much you want to invest in each stock. You can invest in one or both but must invest $10,000 in total.

0 Amgen Inc.

0 GSK

Take a look at the next two stocks. Read the information carefully and choose according to your preferences.

	Mondelez International Inc.	Barry Callebaut AG	
Industry	Food and Beverages	Food and Beverages	
Main Products	Chocolate, Confectionery, Snacks, Cheese, etc.	Chocolate and Confectionery	
Country	USA	Switzerland	
Stock Price	$74	$1567	
Market Capitalization	$99,468 Billion	$8,767 Billion	Total **market value** of the company. Calculated by multiplying the number of outstanding shares and the single stock price.
ROI	5.27%	8.24%	Average amount **earned** by an investment in a stock each year (5 year average)
Beta	0.59	0.69	Measures **systematic risk** (volatility) of the stock in relation to the market. Beta of 1 is as volatile as the market, < 1: less volatile; > 1: more volatile
ESG Rating	Low	High	Indicates the performance of **environmental, social, and governance factors**, thus, assesses the **sustainability**. The rating is either **high (positive)** or **low (negative)**.

Data retrieved from Degiro, January 2024

Assign how much you want to invest in each stock. You can invest in one or both but must invest $10,000 in total.

0 Mondelez International Inc.

0 Barry Callebaut AG

Take a look at the last two stocks. Read the information carefully and choose according to your preferences.

	Geely Automobile Holdings Ltd.	Tesla	
Industry	Automotives	Automotives	
Main Products	Passenger cars: electric vehicles, hybrid models, SUVs etc.	Electric Vehicles	
Country	China	USA	
Stock Price	$1	$238	
Market Capitalization	$10,850 Billion	$754,962 Billion	Total **market value** of the company. Calculated by multiplying the number of outstanding shares and the single stock price.
ROI	11.52%	11.13%	Average amount **earned** by an investment in a stock each year (5 year average)
Beta	1.60	2.44	Measures **systematic risk** (volatility) of the stock in relation to the market. Beta of 1 is as volatile as the market, < 1: less volatile; > 1: more volatile
ESG Rating	High	Low	Indicates the performance of **environmental, social, and governance factors**, thus, assesses the **sustainability**. The rating is either **high (positive)** or **low (negative)**.

Data retrieved from Degiro, January 2024

Assign how much you want to invest in each stock. You can invest in one or both but must invest $10,000 in total.

0 Geely Automobile Holdings Ltd.

0 Tesla

You have completed the investment task, thank you. Now I have some follow-up questions.

How important were these factors for your investment allocations?



How knowledgeable are you in finance?

- 1 - Not knowledgeable at all
- 2 - Not so knowledgeable
- 3 - Somewhat knowledgeable
- 4 - Very knowledgeable

How experienced are you in investing?

- 1 - Not experienced at all
- 2 - Not so experienced
- 3 - Somewhat experienced
- 4 - Very experienced
- 5 - Extremely experienced

How familiar are you with the company **Amgen Inc.**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **GSK (GlaxoSmithKline)**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

This is an attention question. Please mark "4"

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

How familiar are you with the company **Mondelez International Inc.**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **Barry Callebaut AG**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **Geely Automobile Holdings Ltd.**?

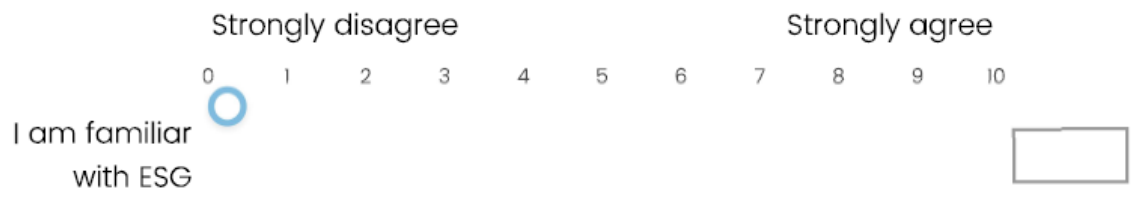
- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **Tesla**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

Some investors also include **ESG ratings** in their investment decisions. An ESG rating indicates the performance of **environmental**, **social**, and **governance** factors, thus, assesses the **sustainability**. A rating can be **high (positive)** or **low (negative)**.

Do you agree with these statements?



	Strongly disagree 0 1 2 3 4 5 6 7 8 9 10 Strongly agree
ESG is important for my investment decisions	
A high ESG rating means the company is sustainable	
A high ESG rating means the company has a positive impact	
A high ESG rating correlates with a low financial return	
ESG is more important than return for my investment decisions	
ESG ratings are reliable	
I do not want to invest in stocks with a negative ESG rating	
I wish to have more sustainability information for my investment decisions	

Experiment_Control

Time to practice.
This is only an illustrative **example**. In the following, you will invest $10,000 three times. You can freely choose the amount you want to invest in one or both of the presented stocks. You do not have to buy full stocks (e.g. if the stock price is $1000, you may also invest $1,500 or $500).

Possible examples are:
Invest $10,000 only in ...
Invest $5,000 in X, and $5,000 in Y
Invest $3,600 in X, and $6,400 in Y
Invest $8,200 in X, and $1,800 in Y
etc.

	Stock X	Stock Y	
Industry	Entertainment Services	Entertainment Services	
Main Products	Internet streaming service	Television broadcasting, film production, streaming services, licensing, etc.	
Country	USA	USA	
Stock Price	$483	$100	
Market Capitalization	$207,486 Billion	$166,376 Billion	Total **market value** of the company. Calculated by multiplying the number of outstanding shares and the single stock price.
ROI	10.32%	2.39%	Average amount **earned** by an investment in a stock each year (5 year average)
Beta	1.22	1.38	Measures **systematic risk** (volatility) of the stock in relation to the market. Beta of 1 is as volatile as the market, < 1: less volatile; > 1: more volatile

Data retrieved from Degiro, January 2024

Now take a look at the following two stocks. Read the information carefully and choose according to your preferences.

	Amgen Inc.	GSK (GlaxoSmithKline)	
Industry	Pharmaceuticals	Pharmaceuticals	
Main Products	Treatments against e.g. rheumatoid arthritis, osteoporosis, and anemia	Respiratory medicine, vaccines, HIV treatments, and other biopharmaceuticals	
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Data retrieved from Degiro, January 2024

Assign how much you want to invest in each stock. You can invest in one or both but must invest $10,000 in total.

0 Amgen Inc.

0 GSK

Take a look at the next two stocks. Read the information carefully and choose according to your preferences.

	Mondelez International Inc.	Barry Callebaut AG	
Industry	Food and Beverages	Food and Beverages	
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Data retrieved from Degiro, January 2024

Assign how much you want to invest in each stock. You can invest in one or both but must invest $10,000 in total.

0 Mondelez International Inc.

0 Barry Callebaut AG

Take a look at the last two stocks. Read the information carefully and choose according to your preferences.

	Geely Automobile Holdings Ltd.	Tesla	
Industry	Automotives	Automotives	
Main Products	Passenger cars: electric vehicles, hybrid models, SUVs etc.	Electric Vehicles	
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ROI	11.52%	11.13%	Average amount **earned** by an investment in a stock each year (5 year average)
Beta	1.60	2.44	Measures **systematic risk** (volatility) of the stock in relation to the market. Beta of 1 is as volatile as the market, < 1: less volatile; > 1: more volatile

Data retrieved from Degiro, January 2024

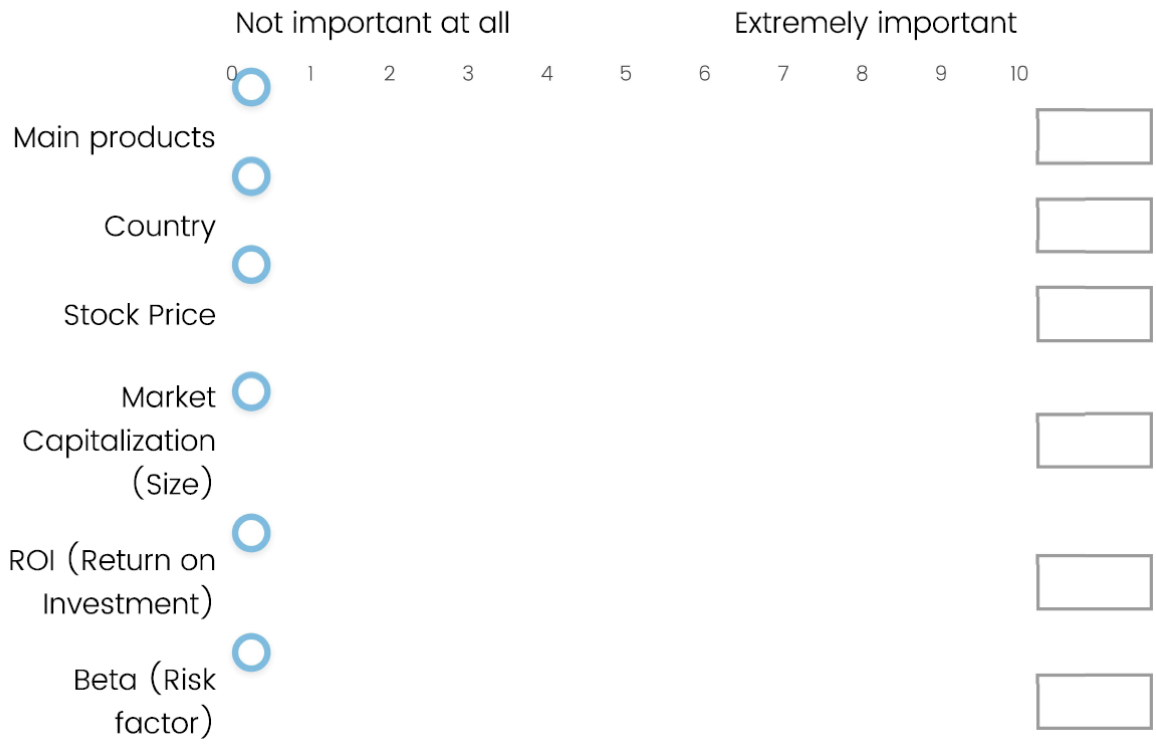
Assign how much you want to invest in each stock. You can invest in one or both but must invest $10,000 in total.

0 Geely Automobile Holdings Ltd.

0 Tesla

You have completed the investment task, thank you. Now I have some follow-up questions.

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How knowledgeable are you in finance?

- 1 - Not knowledgeable at all
- 2 - Not so knowledgeable
- 3 - Somewhat knowledgeable
- 4 - Very knowledgeable
- 5 - Extremely knowledgeable

How experienced are you in investing?

- 1 - Not experienced at all
- 2 - Not so experienced
- 3 - Somewhat experienced
- 4 - Very experienced
- 5 - Extremely experienced

How familiar are you with the company **Amgen Inc.**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **GSK (GlaxoSmithKline)**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

This is an attention question. Please mark "4"

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

How familiar are you with the company **Mondelez International Inc.**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **Barry Callebaut AG**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **Geely Automobile Holdings Ltd.**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

How familiar are you with the company **Tesla**?

- ○ 1 - Not familiar at all
- ○ 2 - Not so familiar
- ○ 3 - Somewhat familiar
- ○ 4 - Very familiar
- ○ 5 - Extremely familiar

Some investors also include **ESG ratings** in their investment decisions. An ESG rating indicates the performance of **environmental**, **social**, and **governance** factors, thus, assesses the **sustainability**. A rating can be **high (positive)** or **low (negative)**.

Do you agree with these statements?




Strongly disagree
Strongly agree
0 1 2 3 4 5 6 7 8 9 10
ESG is important for my investment decisions
A high ESG rating means the company is sustainable
A high ESG rating means the company has a positive impact
A high ESG rating correlates with a low financial return
ESG is more important than return for my investment decisions
ESG ratings are reliable
I do not want to invest in stocks with a negative ESG rating
I wish to have more sustainability information for my investment decisions

End

Do you have any further comments?

Powered by Qualtrics

Appendix 2: Pre-registration on AsPredicted

ASPREDICTED

Wharton CREDIBILITY LAB
UNIVERSITY of PENNSYLVANIA

Impact of ESG Ratings on Stock Preferences of Retail Investors (#158660)

Created: 01/19/2024 08:20 AM (PT)
Public: 01/19/2024 08:20 AM (PT)

Author(s)
Philippe Phan (University of St. Gallen) - philippe.phan@student.unisg.ch

1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
How do retail investors incorporate ESG ratings in stock investing?
This research question can be divided into three sub-questions. First, do retail investors have ESG preferences in stock investing? Second, how strong are these ESG preferences compared to other investment factors such as expected return and risk? And third, what motivates the lack or existence of these ESG preferences?

3) Describe the key dependent variable(s) specifying how they will be measured.
The dependent variable is the allocation towards a stock with a high ESG rating in per cent. Participants will be asked to allocate 10'000$ (hypothetically) to two stocks, one with a high and the other with a low ESG rating.

4) How many and which conditions will participants be assigned to?
The participants will be assigned to two groups: a treatment and a control group.

The treatment group receives ESG ratings (either "high" or "low") in addition to the same information the control group receives.
Both groups receive current data on the stocks they are asked to allocate the money to, based on the investment platform Degiro.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Linear regression predicting how much more (or less) the retail investors allocates the money to a stock with a high ESG rating when receiving ESG ratings compared to when not receiving any ESG ratings. Same analysis for other investment factors such as risk, return, and familiarity with a listed company.
Qualitative questions will analyse reasons for the lack or existence of these ESG preferences of retail investors.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
Any participants that finish the survey within 5 minutes or faster, or answer the attention question incorrectly will be excluded.

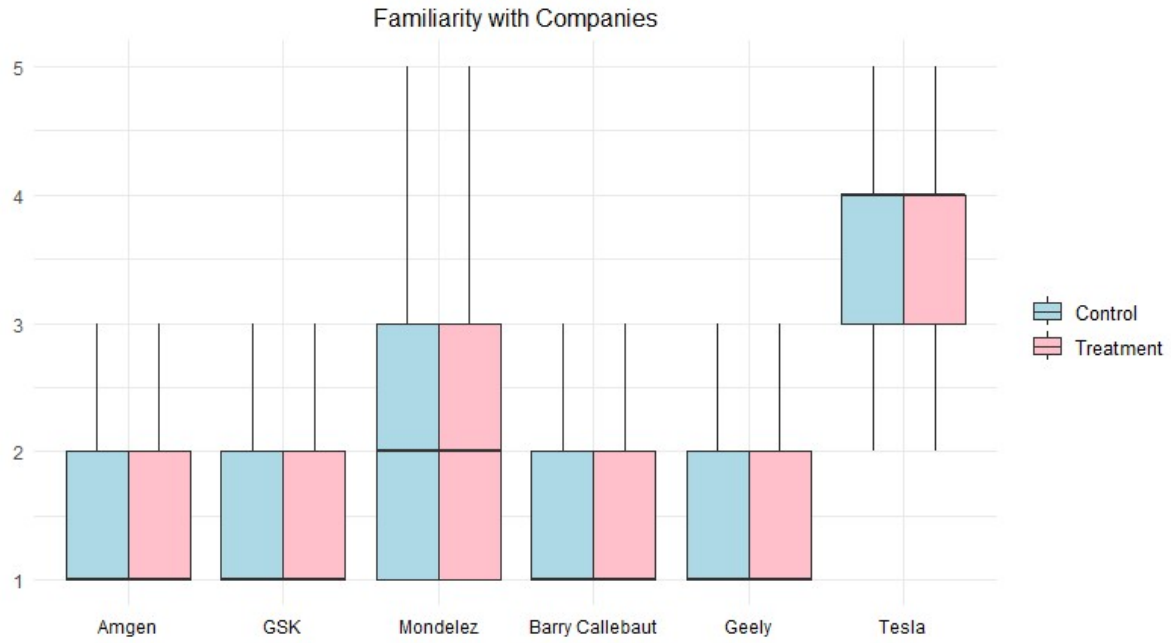
7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
The aim is to reach 200 participants by contacting them directly or through word-of-mouth.

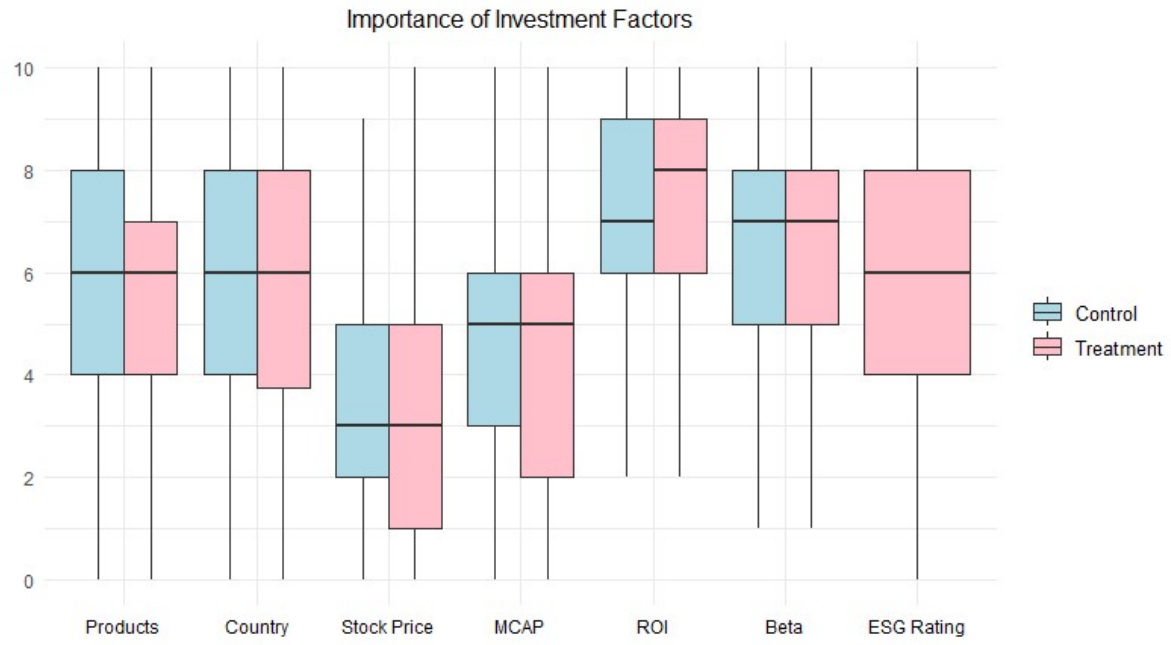
8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
Nothing else to pre-register.

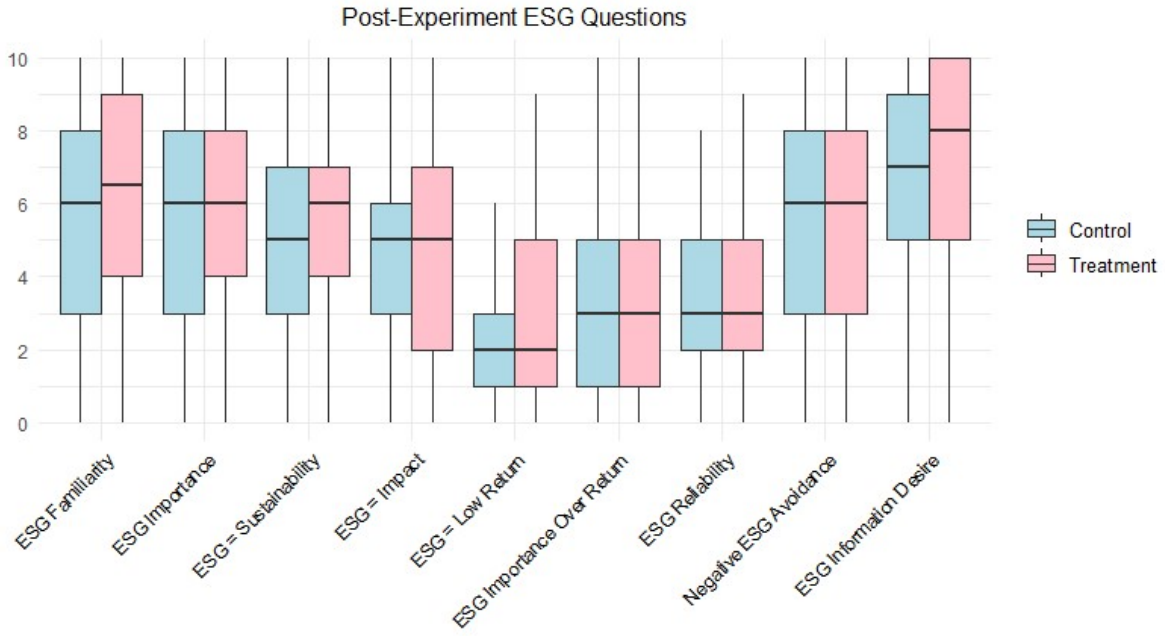
Version of AsPredicted Questions: 2.00

Available at https://aspredicted.org/xk2py.pdf
(Permanently archived at http://web.archive.org/web/*/https://aspredicted.org/xk2py.pdf)

Appendix 3: Grouped Boxplots of Post-Experiment Analysis by Treatment Group and Control Group







Appendix 4: Directory of aids

Auxiliary means	**Usage**	**Affected parts**
Private Proofreading	Spelling and Language Correction	Entire document
R	Data Programming	All quantitative analyses, plots, and tables
ChatGPT	Support for Language and Programming Code	Data code, plots, and tables