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The steering effect of the EU taxonomy: Evidence from German institutional and retail investors

Sandra Chrzan | **Christiane Pott**

Faculty of Business and Economics, Department of International Accounting and Auditing, TU Dortmund University, Dortmund, Germany

Correspondence
Sandra Chrzan, Faculty of Business and Economics, Department of International Accounting and Auditing, TU Dortmund University, Dortmund 44221, Germany.
Email: sandra.chrzan@tu-dortmund.de

Abstract

The EU taxonomy, introduced in 2022, is a comprehensive classification system categorizing environmentally sustainable economic activities. This study examines the impact of incorporating EU taxonomy data into corporate environmental disclosure on investor judgments. Through five experimental cases involving standard environmental disclosure and additional moderate/positive/negative taxonomy-aligned information, we assessed institutional and retail investor evaluations. Results reveal that taxonomy inclusion significantly influences investor judgments, particularly among institutional investors who are more adept at recognizing and penalizing negative information. Clear taxonomy-aligned data in combination with standard environmental information shows no steering effect among retail investors. Despite underperforming taxonomy indicators, environmental information generally conveys positive signals to retail investors.

KEYWORDS

CSR reporting, EU taxonomy, investment decision, socially responsible investment

1 | INTRODUCTION

Sustainability has been one of the most important developments in the investment community in recent years (Iazzolino et al., 2023; Rau & Yu, 2023), and information on corporate environmental, social, and governance (ESG) issues has become increasingly important for capital market participants in making investment decisions. Institutional and other investors are displaying an increasing interest in ESG factors, leading to stricter disclosure regulations and more frequent voluntary disclosures. In recent years, companies have shifted their focus toward ESG engagement and corresponding corporate social responsibility (CSR) disclosures. More than 80% of companies (mid- and large cap) globally report on sustainability in some way (see KPMG, 2020). Selected companies in many countries in Europe,[1] Australia, and New Zealand must submit a non-financial statement as part of their corporate reporting. Even in the United States, where no such requirement exists, more firms are producing sustainability reports for investors, as highlighted by Myers (2020). These developments underscore the significance of ESG criteria for both companies and investors.

The role of sustainability information in investment decision-making has recently attracted substantial attention in the literature. Previous studies have revealed that available information on sustainable or "green" investments used to be insufficient to establish a common understanding among stakeholders (Büyükőzkan & Karabulut, 2018; Norang et al., 2023;

Siew, 2015). The environmental performance of companies and accompanying disclosure practices have been identified as factors contributing to the rise in asymmetric information in recent years (Hahn & Lülfs, 2014). Furthermore, Yu et al. (2020) emphasized the challenge investors face in accessing credible sustainability information, which presents a significant barrier during the asset selection process. Diverse interpretations of reported information, a lack of comparability, and inconsistent data have further eroded investor trust, thereby introducing risks into the decision-making process. Nevertheless, recent research suggests that market participants are influenced by a variety of non-financial factors that introduce new factors and risks, such as competitive advantage, external expectations, and reputational effects (Amel-Zadeh & Serafeim, 2018; Dangelico & Pujari, 2010; Esch et al., 2019). However, an important barrier to the efficient use of ESG information is the lack of reporting standards (Amel-Zadeh & Serafeim, 2018). Despite this, many investors, analysts, and rating agencies still consider sustainability information a crucial component in their company assessments (Morningstar Inc, 2021). Thus, there is a theoretical gap in our understanding of the steering effect of ESG information due to unstandardized disclosure versions.

To address this gap, we investigate whether more standardization of ESG information sends effective signals, providing transparency on sustainability performance that should typically be considered by investors. In response to the demand for clear ESG information, the EU Commission adopted a delegated act[2] in July 2021 that included the new Corporate Sustainability Reporting Directive (CSRD) and adopted the EU taxonomy as a clear classification system for environmentally friendly economic activities. The act requires companies to disclose their taxonomy-aligned information, leading to a uniform and comparable information base. This new form of information aims to improve investors' ability to effectively interpret ESG information in corporate reports, quantify investment risks, and make informed investment decisions.

While the literature highlights the importance of ESG information for investors, there remains a gap in empirical evidence regarding the steering effect of sustainability-related information itself rather than its interpretation in corporate reporting. This gap pertains to the extent to which ESG reporting effectively communicates positive or negative signals that would then shape investor decisions. Perceived challenges associated with interpreting and utilizing the information contribute to this research gap. It remains uncertain whether investors are primarily guided by the ESG information itself or by the diverse interpretations of it caused by the lack of regulation in reporting information. To the best of our knowledge, this study represents the first attempt to investigate the impact of environmental and EU taxonomy-aligned information in corporate reporting on investors' perceptions of information. Our contribution lies in examining taxonomy-aligned information for investment-related decisions, providing insights before the effects of the EU regulations can be observed in secondary data. In addition, we explore the potential steering effect of the newly standardized environmental information to fill the gap on the extent to which ESG information itself has a steering effect on investment decisions as opposed to its interpretation in corporate reporting.

Thus, this paper makes two primary contributions to the literature. First, it expands the literature on sustainability reporting. Previous investigations have shown that sustainability reports can provide investors with information that is useful for valuing firms (Tsang et al., 2022). However, such studies also indicate that a lack of comparability due to the absence of reporting standards is the main barrier to the use of ESG information (Amel-Zadeh & Serafeim, 2018; Yu et al., 2020). Second, this paper contributes to the literature on investors' consideration of ESG information. Despite decision risks due to poor ESG information (Büyükőzkan & Karabulut, 2018; Siew, 2015), investors nonetheless consider such information (Park & Oh, 2022), suggesting that it is a relevant component in the investment process. In this context, this study aims to fill the gap regarding the extent to which ESG information effectively guides investor decisions when there is a consistent and clear information base achieved through the integration of EU taxonomy-aligned information in corporate disclosure. Since the EU taxonomy has, to date, focused on the environmental component of ESG, we investigate whether a clear interpretation of environmental information is useful for decision-makers.

Furthermore, due to the increasing importance of individual investors in financial markets,[3] we examine the expected steering effect on both institutional and retail investors. If the taxonomy-aligned information (in the form of taxonomy turnover shares and taxonomy investment shares) creates a consistent understanding for investors, and investors have the ability or motivation to use the information, then investment judgments should match the direction (moderate/positive/negative) indicated by the integrated, taxonomy-aligned environmental information.

By conducting two online experiments with institutional and retail investors, our study examines the extent to which taxonomy-aligned disclosure gives clear signals and influences investor judgments, thereby exploring its steering effect. The experimental framework we use allows us to investigate the effect of new regulations even before secondary data become available. By varying the disclosure of moderate/positive/negative taxonomy-aligned information in addition to

commonly disclosed environmental information, we investigate whether various disclosure elements and different levels of the new form of information guide investors in their decisions.

To test our hypotheses about the steering effect of taxonomy-aligned information in environmental reporting, we constructed an experimental study including a reference group and experimental treatment groups. We then introduced moderate/positive/negative taxonomy-aligned information and compared the investment judgments of the reference group with those of the treatment groups. We use a 4×1 between-subjects experimental design in our main analysis of variance (ANOVA) to test our hypotheses about the steering effect of taxonomy disclosure. We show that institutional investors are significantly affected by negative taxonomy information in particular, which allows them to identify potential red flags. Conversely, retail investors respond positively to any taxonomy-aligned information (moderate, positive, or negative), particularly when it is combined with commonly disclosed environmental information in its unregulated form. While the isolated effect of clear taxonomy-aligned information aligns with the predicted direction of investors' reactions, the results indicate that unregulated information diminishes the steering effect on retail investors.

By experimentally accounting for cognitive and behavioral aspects in the analysis of transparency-enhancing policies, we make an important theoretical contribution to the relationship between environmental information disclosure and investment-related decisions across various investor types. Consequently, with a better understanding of how investors perceive taxonomy information, and with the determination that unregulated disclosure seems to diminish the steering effect on retail investors, we provide practical and investor-oriented insights for standard setting and the regulation of various disclosure elements. Such insights are a fundamental contribution to achieving the EU Commission's goals of steering capital investments in a sustainable direction.

The structure of the paper is as follows: Section 2 explains the theoretical foundations of the EU taxonomy. In Section 3, we review relevant literature, formulating hypotheses on investors' information evaluation within the context of signaling theory. Section 4 outlines our research methodology, while Section 5 presents the obtained results. Moving to Section 6, we provide a comprehensive discussion of our findings, ultimately concluding the study.

2 | BACKGROUND: SUSTAINABILITY REPORTING AND THE EU TAXONOMY

Sustainability reporting has become an increasingly important topic for practitioners and researchers in the last decade. Given the lack of consensus in the research on the exact definition of *sustainability reporting*, most studies have been concerned with developing standards for defining and reporting on sustainability (Christensen et al., 2021). Sustainability reporting is based on the idea of providing the public with information about a company that goes beyond financial aspects. This non-financial information, which could include details on how a company handles environmental and climate-related risks or its compliance with relevant laws, is valuable to investors in helping them assess the performance and long-term viability of the company, as these non-financial items are seen as leading indicators of a company's future financial performance (Eccles & Serafeim, 2011).

Many studies have suggested that the market reacts positively to sustainability reporting by corporations. Some scholars have found evidence that sustainability reporting is negatively associated with the cost of capital and forecast errors by analysts (Dhaliwal et al., 2011, 2012; Plumlee et al., 2010) and positively associated with stock prices (Clarkson et al., 2011; Serafeim & Yoon, 2022a). However, there is currently no required standard framework for the publication of sustainability reports, and each EU member state is responsible for verifying and auditing the reports provided by local companies. One of the most relevant sustainability reporting frameworks is the Sustainability Reporting Guideline established by the Global Reporting Initiative (GRI). This reporting framework, based on a multistakeholder approach, is voluntary and includes a variety of reporting items. In recent years, a major debate has arisen over whether flexibility or standardization should be emphasized in this unregulated information disclosure practice (Mittelbach-Hoermanseder et al., 2021). Researchers and practitioners have considered both the format (Eccles & Serafeim, 2011; Esch et al., 2019) and the quality of sustainability reporting.

However, the importance of ESG investments is reflected in the European Green Deal Action Plan for Sustainable Finance. With the EU taxonomy, the EU Commission first addressed the environmental perspective with a regulation designed to strengthen transparency regarding environmentally friendly activities in capital markets and create a common understanding of green economic activities. This standardized classification system was accompanied by a thorough revision of the Non-Financial Reporting Directive (NFRD), which has been mandatory for large public interest entities[4] since January 2017 [Directive 2014/95/EU Article 1, 19a (1)]. According to the NFRD, companies are

required to publish a non-financial report on activities relating to "environmental, social and employee matters, respect for human rights, anti-corruption, and bribery matters" as part of their annual reports.[5] With the new classification system, firms already providing non-financial reports have been required to provide additional taxonomy-aligned disclosure since January 1, 2022.[6]

Under a second stage beginning on January 1, 2023, expanded taxonomy-aligned information is required. This information is primarily ecological and understood to refer to companies' taxonomy-aligned environmentally friendly activities.[7] According to a report by the Technical Expert Group (TEG), information must be provided on economic activities classified as environmentally sustainable based on the performance thresholds and screening criteria defined in the taxonomy. Activities in different economic sectors are designated as "aligned with the EU taxonomy" if they meet the following conditions: first, they must contribute significantly to one of the six predefined environmental objectives; second, they must not violate the "do no significant harm" principle while achieving an environmental objective; and third, they must meet minimum social requirements.

The TEG report contains an industry-specific[8] catalog of criteria that can be used to classify environmentally friendly activities. These criteria enable companies to specify the percentages of turnover, capital expenditure, or operational expenditure they consider taxonomy-aligned. The TEG explains that these criteria are intended to create a consistent understanding of environmentally friendly activities and thus enable financial intermediaries to define the actual share of their portfolios that is currently taxonomy-aligned.

According to the results of a survey by the IFRS Foundation, as well as prior research, investors have requested standardized environmental disclosure. Multiple stakeholder groups, including investors, media, and society in general, are increasingly demanding that companies transparently disclose information about their sustainability performance (Beerbaum, 2021; Cohen et al., 2011, 2012).

3 | LITERATURE ON INVESTOR PERCEPTIONS OF SUSTAINABLE INFORMATION

The literature on socially responsible investments (for an overview, see Renneboog et al., 2008; Widyawati, 2020) offers evidence about market reactions to ESG information. From the perspective of an investor, this information has the potential to improve strategic decision-making and enhance a company's ability to create long-term stakeholder value (Adams & Simnett, 2011; Ballou et al., 2012; Rounok et al., 2023). To that end, studies have shown that stock price changes occur in response to news about environmental performance (Hassel et al., 2005; Jacobs et al., 2010).

According to Beerbaum (2021), investors are the driving force behind the increasing calls for clear, consistent, and comparable sustainability information to enable individual investors to make the right investment decisions efficiently and at the appropriate time (Pradhan & Kasilingam, 2015). Asset managers and institutional investors are currently facing rising expectations from their customers, clients, and beneficiaries while contending with underdeveloped data and analytics on investable assets as well as significant cost pressures. Decision usefulness theory (Staubus, 1999) indicates that decision-makers respond to provided information once it is perceived to be useful for decision-making. At the same time, unstandardized information is a major reason for reporting recipients' skepticism about ESG information (Lasarov et al., 2021; Sullivan, 2014). While Young-Ferris and Roberts (2023) elucidate the value relevance of ESG data for decision-making, the ambiguity inherent in ESG issues, such as the quantification and aggregation of ESG data, can readily obscure this value relevance. In addition, Hahn and Lülfs (2014) demonstrated that environmental performance can be seen as a driver for increasing asymmetric information. Obtaining credible information on sustainability aspects can be a barrier for external stakeholders and make the asset selection process more difficult for investors (Yu et al., 2020).

The literature refers to the lack of investor trust in the disclosure practices of companies (Holder-Webb et al., 2009; Kothari, 2019; Masini & Menichetti, 2012). This reflects the existing uncertainty of those who receive the information due to a lack of transparency and a common understanding of investment products. According to Jin et al. (2024), there is a negative correlation of perceived ESG ambiguity and decision-making. Against this background, the EU Commission assumes that taxonomy-aligned information can facilitate investors' decisions; thus, this information should send clear signals and lead to the intended steering effect. According to the EU Commission, the obligation to align reporting with the taxonomy should encourage companies to improve their environmental performance to attract investors and improve their financing conditions (e.g., Dhaliwal et al., 2011).

According to Danarti et al. (2020), investment decision-making requires a constant effort to reduce the level of uncertainty and risk. This risk is decreased by obtaining good information and analyzing it appropriately. Furthermore,

demand for sustainability information exists despite the identified uncertainty in information disclosure. Thus, a theoretical gap exists regarding the steering effect of sustainable information itself as opposed to its interpretation due to unstandardized corporate reporting.

Two reasons for considering ESG information can be found in the literature: first, ethical motives, and second, improving the financial performance of managed portfolios, that is, the possibility to increase returns and reduce portfolio risk (Broadstock et al., 2021). While Døskeland and Pedersen (2021) found that financial information is more effective than ethical information, Glac (2009) suggested the opposite. Studies on ethical concerns have suggested that, in addition to the external factors that concern investors, norms of responsible investing influence investor behavior (Bollen, 2007; Hong & Kostovetsky, 2012). However, the extend of ethically motivated sustainable investments is difficult to measure, as such sustainable investments can also generate financial benefits and add value. Thus, it is not clear whether choosing a green investment results from intrinsic ethical motivation or financial motivation.

According to Park and Oh (2022), investors consider sustainability information in their investment decisions because they believe ESG integration helps mitigate risks and thereby increases investment performance. Market studies show that factors such as competitive advantage, external expectations, and associated reputational effects contribute to utility maximization and are positively related to the financial performance of an investment (Dangelico & Pujari, 2010; Esch et al., 2019). This finding highlights new risks and drivers that affect investment decisions based on non-financial information (Amel-Zadeh & Serafeim, 2018; Bollen, 2007; Capelle-Blancard & Petit, 2019; Statman, 2004). However, poor reporting standards can be seen as a barrier to efficiently classifying and interpreting this information. Hence, the question arises of whether the findings in the literature are attributable to the intrinsic content of CSR reports (i.e., actual CSR information and performance) or the variations and diverse interpretations resulting from the lack of standardization. Examining the steering effect in relation to various levels of sustainability performance allows us to gain insights into the impact of standardized information.

3.1 | Steering effects of ESG information on Investors' reactions

Empirical evidence raises the question of whether market participants always rationally process the ESG information included in sustainability reports. Early research in cognitive psychology demonstrated that information processing and judgments can be strongly affected by information organization and presentation (Kahneman et al., 1982; Slovic, 1972). Subsequent research also dealt with how social influence on investors and limited rationality are related to the integration of ESG information (Capelle-Blancard & Petit, 2019). Social influence is defined as the degree to which individuals perceive how others think they should use ESG information (Venkatesh et al., 2003), which aligns with findings indicating that investors exhibit herd behavior (Spyrou, 2013). Ammann and Schaub (2021) showed that comments in online communities significantly influence the decision-making of individual investors, especially those who invest smaller amounts and are less financially literate. These findings indicate that investors are influenced not only by the sustainability information itself but also by accompanying factors.

In addition, previous event studies have shown that capital markets respond to signals about corporate ESG performance. Therefore, the value of the information (positive vs. negative) and content affect the extent of market reactions. Multiple studies have indicated that financial markets reward favorable ESG performance, while a low ESG score can lead to a decrease in stock prices, particularly in response to negative corporate news (Bauer & Hann, 2010). Nevertheless, Serafeim and Yoon (2022b) found evidence suggesting that the market only responds to financially significant and unexpected ESG news. Further research showed that negative events cause a decrease in companies' market value, while positive events bring no financial benefits (Capelle-Blancard & Petit, 2019; Ender & Brinckmann, 2019). This asymmetric information processing in the market is also evident in the findings of Cornell and Damodaran (2020), who noted results regarding market reactions to ESG events except for companies classified as bad firms. In this context, determining the correlations and direction (positive, negative, or neutral) of decision effects regarding ESG aspects is not straightforward (Eccles & Serafeim, 2013).

3.2 | Hypotheses development

Our study aims to address the existing research gap on the extent to which more standardized ESG information has a steering effect on investors' decision-making processes. We do so by investigating the effectiveness of ESG information

in communicating signals to investors in the context of consistent and transparent information delivery. Specifically, we examine the integration of EU taxonomy-aligned information into corporate disclosure as a means of achieving a standardized and clear information base. By doing so, we contribute to understanding the extent to which ESG information can effectively guide investors' decision-making processes in this enhanced informational framework. This study aligns with the EU Commission's perspective that the inclusion of taxonomy indicators enables investors to more effectively understand and interpret information. Through our experimental study, we aim to gain insights into investors' perceptions of information and examine whether this uniform classification of ESG performance, aside from unregulated disclosure and other accompanying influencing factors, effectively communicates signals to investors and leads to the intended steering effect.

Drawing on the literature (e.g., Mahoney et al., 2013; Zerbini, 2017), we employ signaling theory (Connelly et al., 2011) as the theoretical foundation to develop testable hypotheses (see Figure 1).

Signaling theory, rooted in agency theory (Jensen & Meckling, 1976), explains how individuals or entities with asymmetric information can signal their true qualities, intentions, or attributes to others. This theory addresses the challenges posed by information asymmetry by scrutinizing how signals can effectively convey pertinent information to mitigate uncertainty. By exploring the dynamics of this signaling process, we examine how it influences decision-making and actions, thereby elucidating the informativeness of the provided information. In the context of CSR reporting, signaling theory posits that companies undertake CSR activities and report on them to signal their positive attributes and intentions to various stakeholders, including investors, customers, employees, and the general public. This strategic communication allows companies to convey their dedication to social and environmental responsibility and set themselves apart from competitors. Signaling theory offers valuable insights into how individuals strategically employ signals to mitigate information asymmetry and shape the perceptions, decisions, and behaviors of others.

Relating this theory to the present context, environmental information serves as a signal of future viability that investors consider alongside financial factors, and the nature of the signal influences their perception of the investment's potential. By publicly reporting on CSR activities, companies aim to create a positive perception among stakeholders, which can lead to various benefits, including enhanced reputation, increased customer loyalty, improved employee morale, access to capital, and competitive advantage.

However, signaling theory also recognizes that not all CSR reporting is genuine and that it may involve strategic or opportunistic behavior. Some companies may engage in "greenwashing" or "CSR-washing," where they present a more positive or socially responsible image through their reports than they actually practice (Marquis et al., 2016; Yu et al., 2020). In such cases, the signaling is more about creating a positive perception than indicating genuine commitment and action. Nevertheless, the EU taxonomy, as a standardized classification system for environmentally friendly activities, might reduce uncertainty in information processing and overcome mistrust in environmental disclosure by influencing signals between companies and stakeholders. Thus, through clear criteria and thresholds, taxonomy indicators should signal actual environmental performance and leave no room for interpretation.

The research question we aim to answer is whether standardized information can effectively signal the consideration of sustainability information itself and offer transparency on sustainability performance that is considered by investors. To examine whether environmental information itself, including the EU policy measure, sends clear signals to investors and thus leads to steering effects, we propose the following hypotheses:

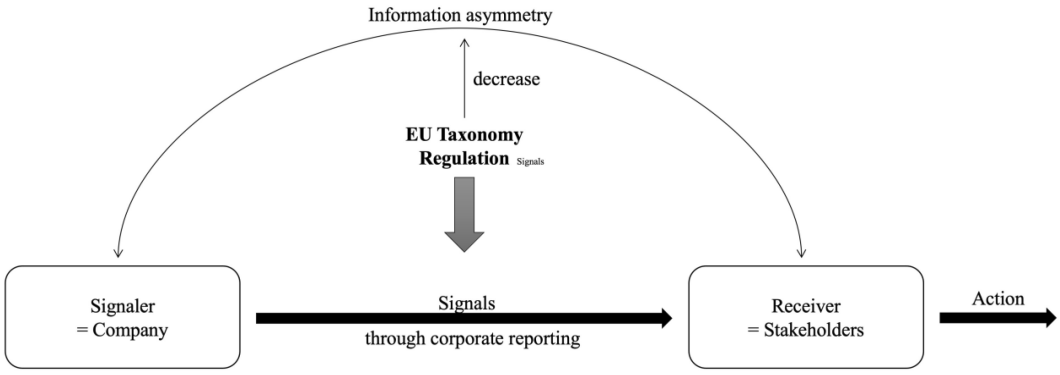

FIGURE 1 Theoretical concept.

Hypothesis 1. The addition of clear and standardized taxonomy-aligned environmental information signaling a positive environmental performance has a positive impact on investors' judgments.

Additionally, it is suggested that even if a company reports information that signals an average environmental performance, its use of the EU taxonomy to present clear and standardized environmental information can enhance investors' judgments of its potential for financial profitability. Signaling theory implies that providing any form of environmental information indicates a level of transparency and accountability, which may positively influence investors' perceptions of the overall quality of the company's management. Although its environmental performance may not be exceptional, the inclusion of this information can still convey a sense of responsible behavior, potentially increasing investors' confidence in the company's ability to generate financial returns. Thus, we propose:

Hypothesis 2. The addition of clear and standardized taxonomy-aligned environmental information signaling a moderate environmental performance (on average) improves investors' judgments.

On the other hand, if a company's clear and standardized environmental information indicates or signals poor environmental performance, it will negatively impact investors' judgments of the investment's financial profitability. Signaling theory suggests that investors interpret poor environmental performance as a sign of lower quality, potentially raising concerns about the company's long-term viability and risk-management practices. Even if the company appears financially profitable, some investors may assign more weight to the negative environmental signal, leading to a lower judgment of the investment. Thus, we propose:

Hypothesis 3. The addition of clear and standardized taxonomy-aligned environmental information signaling poor environmental performance leads to investors judging an investment more negatively even if it is financially profitable.

Moreover, we refer to the decision usefulness theory as a prerequisite for the anticipated judgment (Reimsbach & Hahn, 2015). According to this theory, investors are expected to respond in the predicted direction upon the reporting of either positive or negative information, provided that this information is deemed value-relevant (Holm & Rikhardsson, 2008; Staubus, 1999). There is increasing evidence that sustainability aspects indeed constitute value-relevant information for investors (Berthelot et al., 2012; Dhaliwal et al., 2012). Consequently, investors are anticipated to react in the predicted direction to the disclosure of taxonomy-aligned environmental information.

4 | RESEARCH DESIGN

The purpose of our study is to experimentally examine whether additional EU taxonomy-aligned information sends clear signals to investors and shows the expected steering effect. If the taxonomy-aligned information creates a consistent understanding and enables investors to perceive the necessary data and quantify the environmental performance, then investor judgments should match the (moderate/positive/negative) direction of the (moderate/positive/negative) taxonomy-aligned environmental information. Therefore, we use a between-subjects design with manipulating our main variable representing taxonomy-aligned environmental information.

We conducted two online experiments with institutional and retail investors using a 4×1 factorial design in which we manipulated taxonomy-aligned information on different levels. We constructed five experimental groups. The reference group received only financial company information (FIN). Below, we use delta (Δ) to indicate the addition of information. The second experimental group was a pre-analysis group (ECO), which was provided with financial and traditional environmental information, reflecting the common practice of environmental reporting (FIN + ΔECO) representing the unstandardized part of the disclosure. This group served as a tool to perform treatment checks in a pre-analysis step to ensure that our design and the construction of our three treatment groups ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) were appropriate. The three treatment groups additionally received moderate/positive/negative taxonomy information as the experimental manipulations ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg} = FIN + \Delta ECO + \Delta EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$). In the three treatment groups, we held constant the financial and traditional environmental information.

In the main analysis, we then compared the investor judgments of the treatment groups ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) with those of the reference group (FIN). Thus, we used a 4×1 between-subjects experimental design in our analysis of variance (ANOVA) to test the hypotheses of the positive impact of additional moderate and positive taxonomy-aligned information

(Hypotheses 1 and 2) and the negative impact of additional negative taxonomy-aligned information (Hypothesis 3). By conducting two investigations, one with institutional investors and one with retail investors, we aimed to observe the effects on different types of investors.

4.1 | Experimental cases and dependent variables

To determine the steering effects of taxonomy-aligned information, we constructed different cases wherein we manipulated the environmental taxonomy-aligned performance of a fictitious company for each of the three treatment groups. The experimental material on the fictive company was modeled following actual reports from a real-life company. To classify the direction of the judgments, we constructed a reference group (FIN) representing Case 1. FIN participants were provided with financial information before they were asked for their individual investment-related judgments.[9] According to the EU Commission, taxonomy-aligned environmental information in the form of shares of sales and investments must be integrated into non-financial statements. Thus, taxonomy-aligned information will be combined with commonly disclosed environmental information. This commonly disclosed environmental information was provided to Case 2 of our experimental groups (pre-analysis group ECO) for treatment checks.[10] Thus, the treatment groups ($EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}), representing Cases 3–5, were provided with the innovations introduced by the EU taxonomy in three different directions (moderate/positive/negative). Following Wason et al. (2002), we pretested the material for internal consistency and plausibility. Three institutional investors, three Ph.D. students with topic-related knowledge, and three retail investors without a deep understanding of sustainability and finance formed the pretest group.[11] Based on the recommendation of the pretest group, we have made minor adjustments to the material aimed at improving its comprehensibility and ensuring an appropriate and realistic level.

The FIN group was provided with financial information including balance sheet ratios and financial performance indicators (see Table A1 in the appendix for FIN documents). We calibrated and presented the financial information in a form that showed an overall positive financial performance. This was done to ensure a consistent basis of comparison and examine whether negative taxonomy-aligned information leads to a more negative judgment even if the investment is financially profitable. The direction of the information was validated by the pretest group (i.e., that it was primarily positive).

The experimental documents were framed based on corporate and financial information. By adding traditional commonly disclosed environmental information to the constant financial information given to the FIN group, we first created a pre-analysis group (ECO) to measure the effects of the unregulated disclosure segment and extracted this from our treatment groups to check treatment validity. Thus, a shortened version of qualitative and quantitative non-financial information was provided and linked to the financial information.[12] The qualitative environmental information was taken from a summary of listed companies' annual reports to keep information realistic. Due to the necessarily limited scope of the experimental material (Lachmann et al., 2015), certain quantitative environmental indicators were selected. Following Arnold et al. (2012) and Reimsbach et al. (2018), we considered the most useful indicators for investment decisions in the GRI to be commonly disclosed environmental information.[13] Thus, we chose indicators that investors are most likely to look at when considering environmental criteria. To avoid imposing a clear direction on the effects of unregulated environmental information, we presented a moderate environmental performance in the pre-analysis scenario.[14] The ECO group was used to perform treatment checks in a pre-analysis step to ensure that our design and the construction of our three treatment groups ($EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}) were appropriate.

Additional taxonomy-aligned information was used to manipulate the treatments ($EUT_{\varnothing}$/EUT_{pos}/EUT_{neg} = FIN + ΔECO + $\Delta EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}), where FIN and ΔECO were held constant in each treatment case.[15] Thus, the experimental documents were extended by the information on turnover shares and investment shares taken from the taxonomy report of the TEG. This quantitative information was supplemented with a brief explanation. When FIN and ΔECO information were included, the only differences between $EUT_{\varnothing}$/EUT_{pos}/EUT_{neg} were the taxonomy indicators (on/above/below the industry average) used to portray a moderate/positive/negative taxonomy-aligned environmental performance in the new form of disclosure (see Figures A1–A3 in the appendix for $\Delta EUT_{\varnothing}$; ΔEUT_{pos}; ΔEUT_{neg} documents).[16] If investors can interpret the information and it affects their perceptions, their judgments should match the direction of the moderate/positive/negative taxonomy treatments. Table 1 shows an overview of the treatment information and participants in the different experimental cases.

Based on the treatment information, participants were asked to evaluate an investment case. Institutional investors were asked to state the investment recommendation they would make (Figure 2), and retail investors were asked to give

an investment-related judgment by evaluating the attractiveness of the investment (Figure 3). These two items have been used as in previous studies (Reimsbach et al., 2018) and according to factor analysis.[17]

In the first study, we asked for institutional investors' recommendations on a 5-point scale (clear sell recommendation/sell/hold/purchase/clear purchase recommendation). In the second study, we measured retail investors' judgments using an 11-point scale ranging from 0 (absolutely not attractive) to 10 (absolutely attractive). In both investigations, these two items were used to measure investment-related judgments on a clear and simple scale and thus capture the assessment of the investment independent of the income, wealth, or similar correlated aspects[18] of the assessor. We used the results of other items for robustness checks. Since two measurement variables were used for the respective types of investors, our research was divided into two investigations.

4.2 | Experimental procedure

To compare investor judgments in the different treatment cases, we conducted two randomized online experiments on a sample of participants consisting of 168 institutional investors and 152 retail investors (see Table 1). A Kruskal–Wallis test did not reveal significant differences between the five groups in terms of personal characteristics in the first study (institutional investors) as well as in the second study (retail investors) ($p > .1$). Thus, within the two studies, demographic characteristics in the experimental groups were homogeneous. The experimental documents were based on actual reports of real listed companies to provide a reasonably realistic basis for an investment judgment. We kept the presentation format and content of the information constant, except for the manipulated taxonomy-aligned information,

TABLE 1 Overview of participants in both studies.

Case	Experimental information	Investor type	Recipients (Study 1: 617) (Study 2: 576)	Participants[a] (Study 1: 168) (Study 2: 152)
Reference group	FIN	Institutional	123	25
		Retail	121	28
Pre-analysis group ECO	FIN + ΔECO	Institutional	124	41
		Retail	108	31
$EUT_{\varnothing}$	FIN + ΔECO + $\Delta EUT_{\varnothing}$	Institutional	119	34
		Retail	119	31
EUT_{pos}	FIN + ΔECO + ΔEUT_{pos}	Institutional	117	31
		Retail	113	35
EUT_{neg}	FIN + ΔECO + ΔEUT_{neg}	Institutional	134	37
		Retail	115	27

[a]After adjustment by processing time, current investment, institutional investor occupation, and manipulation checks.

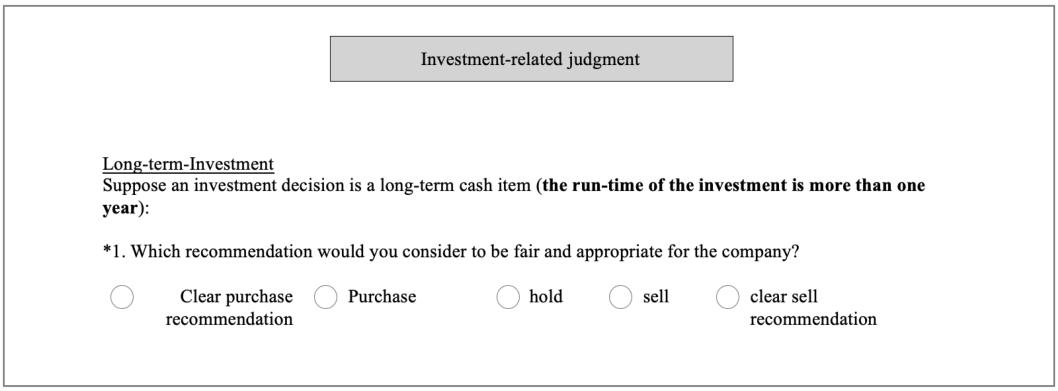

FIGURE 2 Excerpt of the question regarding investment judgment (dependent variable) in the experimental study for institutional investors.

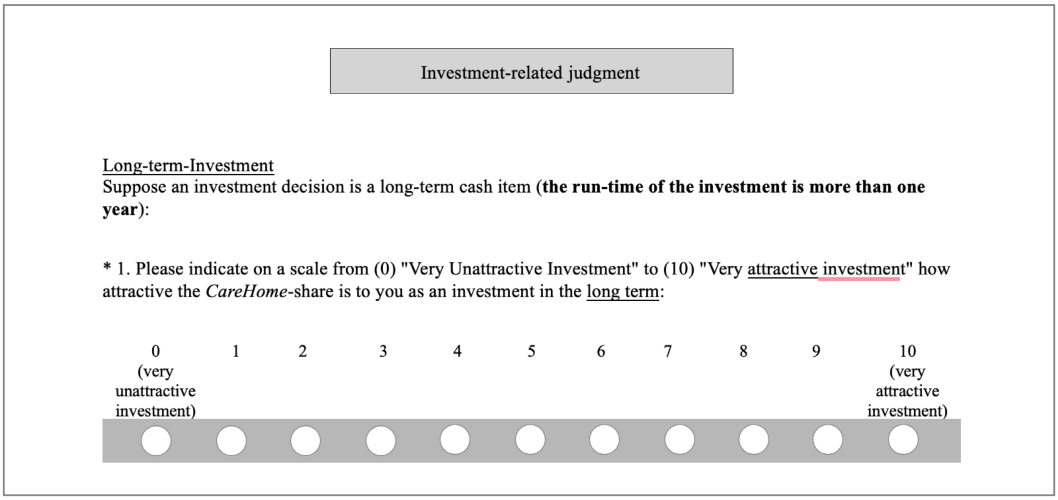

FIGURE 3 Excerpt of the question regarding investment judgment (dependent variable) in the experimental study for retail investors.

to ensure that any judgment differences were not caused by the participants or format. Before administering the final version of the research instrument, we ran a pretest on a group of potential subjects to validate the design. In both experimental studies, the documents sent to the experimental groups (FIN/ECO/$EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}) were divided into five parts:

1. Instructions.
2. Company presentation and treatment information.[19]
3. Questions about investment-related judgment.[20]
4. Additional survey and manipulation checks.
5. Demographic questions.

The first section of the documents introduced our research. The second section gave a short case description of a fictitious company with relevant data such as size, sector, and strategy. All the information provided was based on actual reports made by a real listed company from the consumer goods industry.[21] We changed the company's name to avoid the risk that judgments would be affected by prior knowledge. Participants were then given the information for the different experimental cases (FIN/ECO/$EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}), manipulated by adding taxonomy-aligned information showing different performances in each of the three treatment groups to examine the predicted steering effect. In the third section, institutional investors were asked about investment recommendations, and retail investors were asked about investment attractiveness.[22]

The fourth part of the study was a survey on the classification of the presented information (e.g., the perception of GRI indicators) with the included manipulation checks and questions about the comprehensibility and scope of the presented information.[23] To assess the effectiveness of the treatment information, we integrated a manipulation check into the experimental documents of the different experimental cases. We asked participants to rate whether the provided information included taxonomy-aligned information. On a 5-point Likert scale from 1 = definitely do not agree to 5 = definitely agree, they assessed whether they recognized the treatment information. In the first study, 40.23% of participants failed the treatment manipulation and in the second study, 46.08% failed. This high failure rate is due to the method of conducting an online experiment. Thus, we excluded these participants from the main analysis.[24]

In the last section, demographic information (e.g., gender, age, experience, profession, and income) was requested (see Table A2 in the appendix).

The experiment was conducted using the online survey tool SurveyMonkey, which allows randomization. Thus, we randomly assigned participants to one of five different cases (see Table 1). Participants in the online panel "SurveyMonkey Audience" are recruited via the survey software. Levitt and List (2007) pointed out that the careful design of the questionnaire as well as its distribution by an institutional intermediary aims to create a representative environment for the respondents, which is often seen as crucial to obtaining unbiased responses. While our target group was German participants,[25] the online panel included subjects from various countries and covered the respective investor groups of our

experimental cases. The demographic characteristics within our sample exhibit similarities to the shareholder structure in Germany (see Table A2 in the appendix for a comparison).

Participants termed "institutional investors" were individuals currently employed in a large organization, including pension funds, banks, investment funds, hedge funds, foundations, and insurance companies, that invest substantial amounts of money on behalf of their clients or members. This group of participants is tasked with evaluating investment information as part of their professional responsibility. Subjects termed "retail investors," on the other hand, are individuals who invest their own money, as defined by the panel item "stock trading" in our experimental study. Figure 4 illustrates the participants' occupations.

The five cases (FIN/ECO/$EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}) were sent to 617 institutional and 576 retail investors (see Table 1). Participants were randomly assigned to case versions to avoid systematic errors and ensure replicability. The average exclusion rate was approximately 75% due to the questions about retail investors' current investments, processing time,[26] manipulation checks, and job descriptions of the institutional investor group. The resulting usable responses varied between cases. On average the response rate was 27.23% in Study 1 (institutional investors) and 26.39% in Study 2 (retail investors). In total, we analyzed 168 usable documents in the study with institutional investors and 152 usable documents in the study with retail investors.

In the analysis procedure, the average differences of the judgments were used to measure the effects of the different experimental manipulations. Thus, the reference group FIN was compared with $EUT_{\varnothing}$/EUT_{pos}/EUT_{neg} treatments. The comparison of the average difference between the measurement of FIN versus $EUT_{\varnothing}$ as well as between FIN versus EUT_{pos}, and FIN versus EUT_{neg} reflects the impact of moderate/positive/negative taxonomy-aligned information in combination with additional commonly disclosed environmental information on the investment-related judgment. The comparison was undertaken as combining these sorts of information will be a realistic disclosure practice in the future. To ensure that our design and the construction of our three treatment groups ($EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}) were appropriate, we extracted the effect of the unregulated environmental information (ΔECO) in these experimental cases in a pre-analysis step. These treatment checks should show the single effects of the varying taxonomy-aligned information. Due to the lack of realism in our experimental cases, we could not provide solely taxonomy-aligned information to directly measure the effect of the taxonomy alone. Therefore, we approximated the effects by constructing a pre-analysis group (ECO) to extract the effects measured in this subsample. Thus, the analysis process consisted of a pre-analysis step and a main analysis.

In the pre-analysis, we measured the effects of the financial and commonly disclosed environmental information (FIN + ΔECO = ECO group) on institutional and retail investor judgments. The subjects were 31 institutional and 41 retail investors. The structure, measurement, and experimental procedure were the same as in the treatment cases

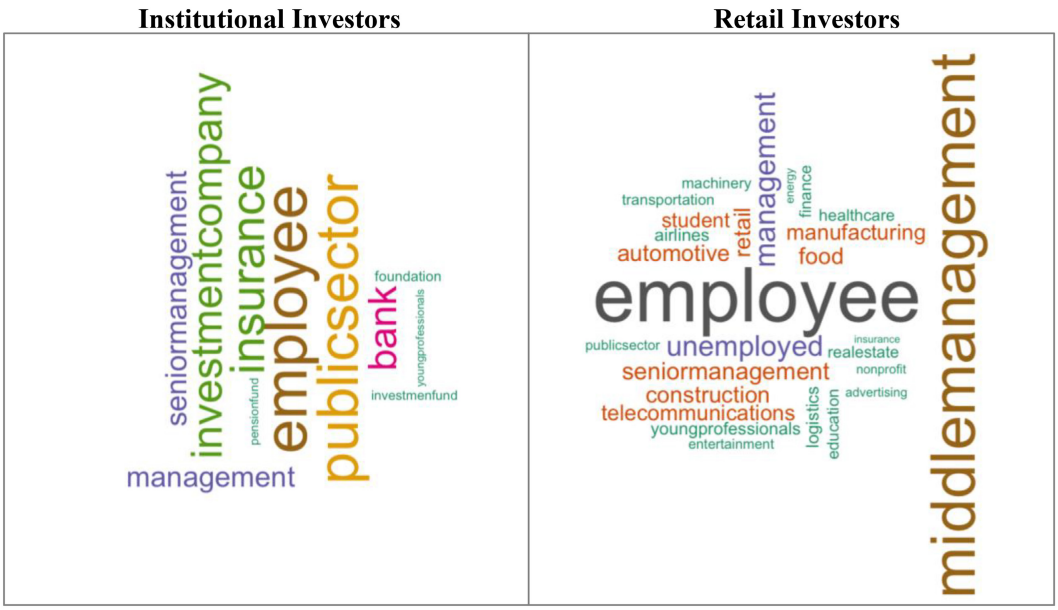

FIGURE 4 Occupation of institutional investors (left plot) and employment (position and sector) of retail investors (right plot) in the experimental sample.

so that we could measure the effects on the experimental group ECO. In this way, we were able to extract the effects of the unregulated commonly disclosed environmental information ΔECO from the treatment groups to check for the direction of the single taxonomy effects. Thus, we performed the experimental procedure described above and measured the effects of the treatment cases ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) for institutional and retail investors and adjusted for the effects of ΔECO. To make sure that group ECO was as representative as possible to extract the effects from the treatment groups,[27] we asked institutional and retail investors in every experimental treatment ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) about their perceptions of the commonly disclosed environmental information (ΔECO) and compared them with the perceptions of the pre-analysis group ECO, based on the same questions. We thus ensured that the environmental performance of the presented company, based on the commonly disclosed environmental information, was perceived similarly in all treatments. Hence, we were able to extract the effect of the pre-analysis group from our treatment groups for treatment checks. After presenting commonly disclosed environmental information in the form of the most important GRI indicators in our experiment, we asked about perceptions of the environmental performance using the following items:

> "I rate the company's environmental performance as follows: high/medium/poor."
>
> "The company acts in a sustainable manner: absolutely true/true/neutral/not true/absolutely not true."
>
> "Based on the presented indicators, it appears that the company acts in an environmentally conscious manner: absolutely true/true/neutral/not true/absolutely not true."

No significant differences were found between the subsamples (ECO vs. $EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) of either institutional or retail investors (see Table A3 in the appendix). Based on the available data, we assumed that the potential for selection bias was modest and that the pre-analysis group was representative to extract the effects in the treatment cases. Excluding the effects of the unregulated commonly disclosed environmental information (ΔECO) revealed the single effect resulting from the moderate, positive, and negative taxonomy-aligned information on investors' judgments.

After measuring the effect of ΔECO and extracting this from the different taxonomy treatments ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) in the pre-analysis, we checked with the single treatment effects the direction of investor reaction based on the different taxonomy treatments ($\Delta EUT_{\varnothing}/\Delta EUT_{pos}/\Delta EUT_{neg}$). We then captured the effects of the different taxonomy treatments in combination with commonly disclosed environmental information ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) in the main analysis, as combining the latter with taxonomy-aligned information is considered a realistic disclosure practice for the future.

5 | ANALYSIS AND PRESENTATION OF RESULTS

Our analysis is based on a simple single-factor model that includes a between-subjects factor (taxonomy-aligned information). To test the hypotheses about the steering effect of different expressions of taxonomy-aligned information on investment-related judgments, we used a single-factor design analysis of variance (ANOVA) in the studies with both institutional and retail investors. Due to the low and non-significant correlation between the dependent variables and characteristics such as age, sex, experience, education, and income, we did not consider covariates in our model. The variances of the mean values are compared within the different treatment groups. Post hoc tests were used to identify the direction (Hypotheses 1–3), so we ran pairwise comparison tests.[28]

5.1 | Pre-analysis

Descriptive statistics of the different experimental groups, such as cell sizes, means, and standard deviation, for participants' judgments across the treatment conditions are shown in Table 2. Overall, the descriptive results suggest that the direction of investor judgments differs between investor types. To ensure the absence of bias in the results, we tested to determine whether demographic data such as income or experience had a significant impact on investor judgments and did not find any significance.

Considering that excluding the ΔECO effect from our treatment groups ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) reveals the single effect resulting from the (moderate/positive/negative) taxonomy-aligned information, we first consider the direction of

institutional and retail investor reaction based on taxonomy performance. To ensure that our design and taxonomy treatments are appropriate, we illustrate the effects of the extension through taxonomy-aligned information $\Delta EUT_{\varnothing}/\Delta EUT_{pos}/\Delta EUT_{neg}$ in Figure 5, where we exclude the effects of ECO, derived from the pre-analysis group ECO = FIN + ΔECO. If investors are guided by signals from the clear classification of environmental performance, the reaction should match the direction of the moderate/positive/negative taxonomy-aligned information.

From a descriptive perspective, we see that both institutional and retail investors recognize the direction of the provided taxonomy information. Institutional investors seem to be slightly more affected by the different expressions of the treatment information than retail investors. We tested for significance (see Tables A4 and A5 in the appendix). The results reveal, in general, that different expressions of taxonomy-aligned information had significant effects on institutional investors' judgments measured by investors' recommendations ($p = .0244$). We found a significant difference in investor recommendation between positive and negative taxonomy-aligned information ($p = .0207$). In the study with retail investors, the direction is consistent through the extension of $\Delta EUT_{\varnothing}/\Delta EUT_{pos}/\Delta EUT_{neg}$ on investors' judgments, but the differences do not appear to be significant ($p > .1$). Considering that excluding the ΔECO effect from our treatment groups ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$) reveals the single effect resulting from the (moderate/positive/negative) taxonomy-aligned information, this pre-analysis indicates the intended direction of investor reactions based on the signals through the new classification of taxonomy-aligned environmental performance.

TABLE 2 Descriptive statistics of institutional (recommendation) and retail (attractiveness) investor judgment.

Study 1: Institutional investors			
Experimental group	**Mean recommendation**	**SD recommendation**	***N***
FIN	3.7600	0.5228	25
ECO = FIN + ΔECO	3.5122	0.6373	41
$EUT_{\varnothing}$ = FIN + ΔECO + $\Delta EUT_{\varnothing}$	3.9243	0.7675	34
EUT_{pos} = FIN + ΔECO + ΔEUT_{pos}	4.0542	0.6542	31
EUT_{neg} = FIN + ΔECO + ΔEUT_{neg}	3.5451	0.8119	37
Study 2: Retail investors			
Experimental group	**Mean attractiveness**	**SD attractiveness**	***N***
FIN	5.8571	2.8115	28
ECO = FIN + ΔECO	7.0323	1.8345	31
$EUT_{\varnothing}$ = FIN + ΔECO + $\Delta EUT_{\varnothing}$	5.9539	1.4547	31
EUT_{pos} = FIN + ΔECO + ΔEUT_{pos}	6.1106	1.3628	35
EUT_{neg} = FIN + ΔECO + ΔEUT_{neg}	5.9360	1.6946	27

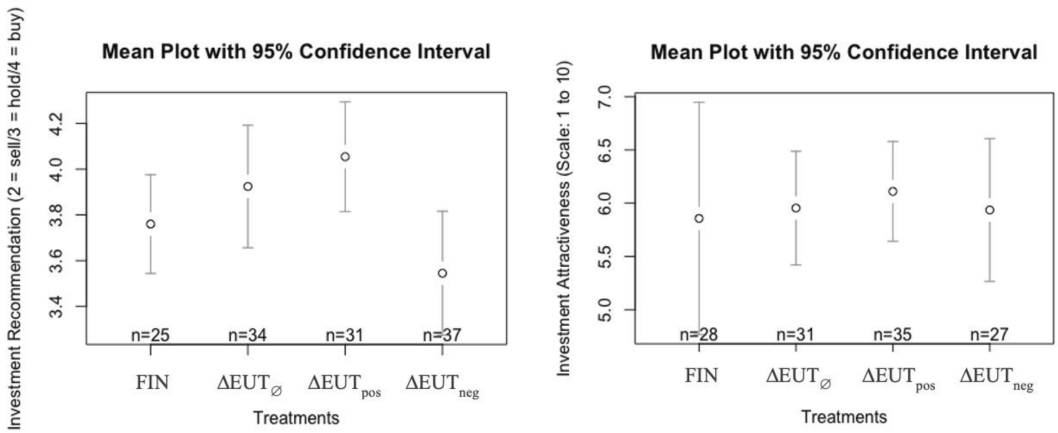

FIGURE 5 Single effects of taxonomy information on institutional investors' judgment (left plot) and retail investors' judgment (right plot) by excluding the effects of ECO.

5.2 | Results of the main analysis

In the main analysis, we look at the effects of the new form of environmental disclosure. According to the EU Commission, taxonomy-aligned environmental information must be integrated into non-financial statements. Thus, taxonomy-aligned information must be combined with commonly disclosed environmental information, which is captured in our treatment groups ($EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$). For better visualization, we mark the significant effects according to the analyses of variance and post hoc tests depicted in Tables 3 and 4 in Figure 6. Our results indicate a difference in the direction of the institutional investors' judgments from those of the retail investors due to the treatments.

In the first study with institutional investors (Table 3), negative taxonomy-aligned information combined with commonly disclosed environmental information affects investor judgments significantly ($p = .0640$). Additionally, the negative reaction is significantly different from the judgments in the treatment with positive taxonomy-aligned information combined with commonly disclosed environmental information ($p = .0207$). Institutional investors seem to be negatively affected by negative taxonomy-aligned information even if the investment is financially profitable. Thus, we can confirm H3 in the study of institutional investors. There is no significant difference in the FIN versus EUT_{pos} ($p = .9950$) or FIN

TABLE 3 Results of the ANOVA and the post hoc tests for the effects of the different taxonomy treatments in combination with ECO in the first study with institutional investors.

Results of ANOVA institutional investors			
Dependent variable	**Comparison groups**	***F*-value**	***p*. Adj.[a]**
Recommendation	$FIN/EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$	3.62	.0151**
TukeyHSD post hoc test			
Dependent variable	**Comparison groups**	**Diff.**	***p*. Adj.[a]**
Recommendation	FIN vs. $EUT_{\varnothing}$	−0.0835	.9706
	FIN vs. EUT_{pos}	0.0465	.9950
	FIN vs. EUT_{neg}	−0.4627	.0640*
	$EUT_{\varnothing}$ vs. EUT_{pos}	0.1300	.8833
	$EUT_{\varnothing}$ vs. EUT_{neg}	−0.3792	.1189
	EUT_{pos} vs. EUT_{neg}	−0.5092	.0207**

[a]Mauchly test for sphericity as well as Greenhouse–Geisser and Huynh–Feldt corrected *p*-values were computed for the respective effects.
*$p < .1$. **$p < .05$.

TABLE 4 Results of the ANOVA and the post hoc tests for the effects of the different taxonomy treatments in combination with ECO in the second study with retail investors.

Results of ANOVA retail investors			
Dependent variable	**Comparison groups**	***F*-value**	***p*. Adj.[a]**
Attractiveness	$FIN/EUT_{\varnothing}/EUT_{pos}/EUT_{neg}$	3.613	.0154**
TukeyHSD post hoc test			
Dependent variable	**Comparison groups**	**Diff.**	***p*. Adj.[a]**
Attractiveness	FIN vs. $EUT_{\varnothing}$	1.42857	.0519*
	FIN vs. EUT_{pos}	1.27189	.0175**
	FIN vs. EUT_{neg}	1.25397	.0701*
	$EUT_{\varnothing}$ vs. EUT_{pos}	−0.1567	.9867
	$EUT_{\varnothing}$ vs. EUT_{neg}	−0.1746	.9999
	EUT_{pos} vs. EUT_{neg}	−0.0179	.9837

[a]Mauchly test for sphericity as well as Greenhouse–Geisser and Huynh–Feldt corrected *p*-values were computed for the respective effects.
*$p < .1$. **$p < .05$.

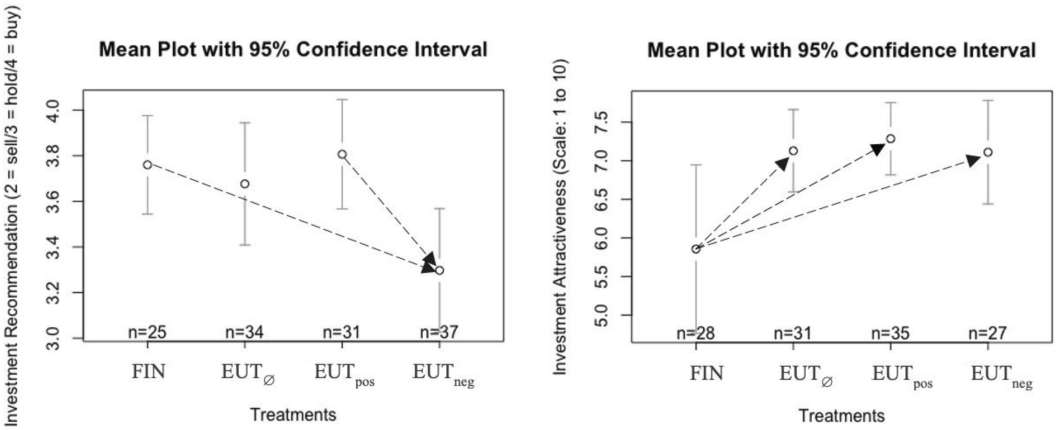

FIGURE 6 Institutional investors' judgment (left plot) and retail investors' judgment (right plot) with treatment information in combination with commonly disclosed environmental information.

versus $EUT_{\varnothing}$ ($p = .9706$) judgments; thus, we can reject H1 and H2. This finding leads to the assumption that institutional investors are more sensitive to negative environmental information than to moderate or positive taxonomy information in combination with commonly disclosed environmental information.

The results of the second study (Table 4) show that retail investors are positively affected by the presence of the different extensions of taxonomy-aligned information in combination with commonly disclosed environmental information even if the provided information direction is negative. This finding indicates that retail investors reward additional taxonomy-aligned environmental information independent of the content. We observe significant positive effects of moderate ($p = .0519$) and positive ($p = .0175$) taxonomy treatments; thus, we can confirm H1 and H2. Additionally, negative taxonomy-aligned environmental information shows unexpectedly significant positive reactions ($p = .0701$), so we can reject H3.

To test whether the results are robust, we ran non-parametric tests.[29] By running the Kruskal–Wallis test[30] for institutional investors, we examined the robustness of the significant effects in the treatment groups (see Table A6 in the appendix). We see robust results for the reaction to the different taxonomy treatments. The differences between FIN versus EUT_{neg} ($p = .0542$) and EUT_{pos} versus EUT_{neg} ($p = .0316$) are still significant. The results of the Kruskal–Wallis test and Dunn post hoc tests for retail investors (see Table A7 in the appendix) show robust and significant effects on the treatment groups where we presented a positive environmental taxonomy performance ($p = .0860$). Based on the robustness analysis, we see no contradiction with our findings that taxonomy information in corporate disclosures, in combination with commonly disclosed environmental information, affects investor judgments significantly, but to different extents.

6 | DISCUSSION AND CONCLUSION

In this study, we aimed to address the existing theoretical gap on the extent to which more standardized ESG information has a steering effect on investors' decision-making processes. We investigated the effectiveness of ESG information in communicating signals to investors in the context of consistent and transparent dissemination of information. Thus, we experimentally examined the steering effect of integrated EU taxonomy information at different levels of environmental disclosure on investor judgments.

Based on five experimental cases (financial, commonly disclosed environmental information, and additional moderate/positive/negative taxonomy-aligned information), we conducted two experimental investigations in which institutional and retail investors were asked to evaluate an investment of a real listed company (with its identity concealed). We examined whether varying the disclosure of moderate/positive/negative taxonomy-aligned information, along with commonly disclosed environmental information, could effectively guide investors in their judgments by transmitting distinct signals at different levels of the new information format.

Our study makes a significant contribution by shedding light on investors' information perceptions and assessing the effectiveness of the EU policy measure in establishing a uniform information base. In this context, the inclusion of

comparable taxonomy information serves the purpose of fostering a consistent understanding of environmental performance. This, in turn, enables investors to make more informed investment decisions by relying on signals derived from this novel form of information. Therefore, if taxonomy-aligned information enhances value and fosters a consistent understanding among investors, and if investors possess the capability and motivation to process such information, their investment judgments should align with the moderate/positive/negative direction indicated by the integrated taxonomy-aligned environmental information. By manipulating the presented taxonomy-aligned information, we observed its impact on individuals' investment-related judgments. Consequently, we examined the potential effects of the recently introduced EU taxonomy even though secondary data have not yet become available.

According to the EU Commission, taxonomy-aligned environmental information must be integrated into non-financial statements, which to date have not been standardized. We captured the integration of such information in our taxonomy treatment groups in the main analysis, where we combined taxonomy-aligned information with unregulated commonly disclosed environmental information. Using ANOVA, we provide evidence that different extensions of taxonomy information in corporate disclosure, in combination with commonly disclosed environmental information, affect investor judgments significantly, but we identified asymmetric effects. We found a significant negative impact of underperforming taxonomy-aligned information in combination with commonly disclosed information on institutional investor judgments and a significant difference between the positive and negative taxonomy treatments. In this case, it appears that institutional investors respond to taxonomy-aligned information by interpreting it as a clear signal in alignment with the information direction. In contrast, when taxonomy-aligned and unregulated environmental disclosure was combined, the reactions of retail investors were consistently positive regardless of the information direction. While the isolated effects of taxonomy information exhibit the anticipated direction of investor reaction, the combination with unregulated commonly disclosed environmental information appears to diminish the guiding impact on retail investors.

However, signaling theory would suggest that taxonomy information sends signals to investors, influencing their judgments. The identified result, where institutional investors interpret clear signals conveyed by new taxonomy indicators in alignment with the information direction, can be classified as an important contribution to the existing literature on how investors consider ESG information. This aligns with prior research highlighting the growing significance of ESG factors in investment decision-making (e.g., Ballou et al., 2012; Porter & Kramer, 2011). The findings suggest that institutional investors are receptive to the use of new taxonomy indicators, which provide clearer signals regarding ESG-related information. This interpretation underscores the evolving nature of ESG considerations among institutional investors and supports the notion that taxonomy-aligned information plays a crucial role in guiding their decision-making.

Our study's results with institutional investors demonstrate the particular usefulness of negative taxonomy environmental information, which can also be interpreted through a financial lens when considering taxonomy-aligned information. This finding aligns with prospect theory, as explained by Kahneman and Tversky (2013), which suggests that investors perceive the decrease in utility from a loss to be greater than the increase in utility from an equivalent gain. Consistently, the notion that there is an asymmetric effect in investors' reactions to positive and negative ESG practices was identified by Crifo et al. (2015). Moreover, we observed that a more comprehensive information framework, combining taxonomy-aligned information with commonly disclosed environmental information, proved more valuable for institutional than retail investors, particularly in the context of unfavorable environmental disclosure. It appears that for institutional investors the taxonomy-aligned information is useful to identify potential red flags. This observation is consistent with the findings of Van Duuren et al. (2016), who concluded that investors employ ESG information as a risk management tool.

The identified result, namely, that retail investors reward additional taxonomy information regardless of its content and the environmental performance it represents, is a noteworthy contribution to the current body of literature on investors' assessment of ESG information. This finding deviates from previous studies that primarily focused on the influence of content and environmental performance on investor decision-making. While numerous studies have indicated that financial markets tend to reward favorable ESG performance and penalize low ESG scores, there is also evidence suggesting negative reactions to adverse events without corresponding benefits from positive environmental events (Capelle-Blancard & Petit, 2019; Ender & Brinckmann, 2019). In contrast to these findings, our results imply that retail investors place significant value on the mere presence of taxonomy-aligned information when assessing ESG information, regardless of specific details or the associated environmental performance.

Interestingly, it seems that environmental information consistently conveys positive signals to retail investors, regardless of the company's actual environmental performance. This finding is supported by Edmans (2011), who argued that capital market participants may not fully comprehend ESG information. Future research could explore the impact of social factors on investors and the potential limitations of rationality in integrating ESG information

(Capelle-Blancard & Petit, 2019) to contribute to the understanding of the complex landscape surrounding the interpretation and integration of ESG information. While the single effects of clear taxonomy information show investor reactions in the predicted directions, adding unregulated environmental information seems to eliminate the steering effect for retail investors. This finding leads to the assumption that unregulated environmental information, where there is room for CSR management, explains the uncertainty of retail investors since they do not or cannot interpret the information direction and only value its existence. As explained by Nekrasov et al. (2023), the uncertainty may be caused by limited attention in the decision-making process of retail investors. Therefore, future research is needed to understand the underlying motivations and implications of retail investors' behavior in relation to taxonomy information.

By integrating cognitive and behavioral aspects into the experimental analysis of CSR reporting policies we can provide practical and investor-oriented insights for standard setting. Unregulated environmental information, where there is room for CSR management (as in disclosure practices before the EU taxonomy was introduced), seems to be a source of uncertainty for retail investors. Hence, the presence of taxonomy-aligned information positively affects retail investors, even if the environmental performance is poor. If there are no legal regulations (e.g., labels) to ensure that retail investors have taken note of the direction of unstandardized environmental disclosure segments, we can assume that the effectiveness of the EU Taxonomy Directive is limited.

The limitations of this study are related to the experimental method. One of the most important points is that the scope of the experimental material was necessarily limited (Lachmann et al., 2015). In addition, the taxonomy was not fully implemented during the execution of the experiment, reflecting a limited representation of the real scenario. Additionally, the experimental procedure requires that the pre-analysis group is as representative as possible so the effects can be extracted from the taxonomy treatments in the main analysis. We showed a certain degree of representativeness by using control questions to measure the single taxonomy effects. However, this limitation did not affect the results of our main analysis, where the taxonomy-aligned information was combined with commonly disclosed environmental information. In addition, future studies could investigate the impact of CSR management in the unregulated information segments, as this seems to explain the limited nature of steering effects.

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ORCID

Sandra Chrzan https://orcid.org/0000-0002-2717-1075

ENDNOTES

[1] The NFRD (Directive 2014/95/EU) was implemented in Germany as §§289b, c, of the German Commercial Code (HGB).

[2] See Article 8 (4) of EU Regulation 2020/852 of 18 June 2020 on the establishment of a framework to facilitate sustainable investment and amending Regulation (EU) 2019/2088.

[3] For example, 25% of the market volatility caused by COVID-19 is due to individual investors, up from 10% in 2009 (Winck, 2022).

[4] Companies listed in the EU that are considered public interest entities in terms of their activities and have more than 500 employees.

[5] This may be a separate report or part of the management report [Directive 2014/95/EU Article 1, 19a (1)].

[6] The draft Taxonomy Directive refers to the first two environmental objectives so far. Others are currently in development.

[7] See Communication from the Commission. Guidelines on non-financial reporting (methodology for reporting non-financial information), C 215/2 C.F.R. (2017).

[8] The classification is based on the NACE industry classification.

[9] The financial information from experimental documents was held constant in all groups. Table A1 in the appendix shows the original extract of the experimental study.

[10] The commonly disclosed environmental information from experimental documents was held constant in all groups.

[11] Their processing times were used for comparison when conducting the online experiment. Suggested changes for plausibility and comprehensibility led to minor revisions and ensured appropriateness.

[12] Arnold et al. (2012) and Reimsbach et al. (2018) found that the integration of non-financial information was more useful for investors.

[13] GRI guidelines are considered the standard for CSR reports (Jackson et al., 2020; Katsouras & McGraw, 2010; Willis, 2003).

[14] The indicators were adjusted as follows: In the ESG ranking (aggregation of MSCI ESG Rating, S&P Global ESG Score, Sustainalytics ESG Risk Rating) of the Dax 40 companies in Germany (see Haller, 2021 "DAX40 Nachhaltigkeitscheck 10–2021"), the environmental indicators of 10 companies classified as moderate in the ESG ranking served as the basis in this experimental treatment.

[15] We verified this by manipulation checks in the later part of the experimental documents.

[16] To make the direction of the given information understandable, we added the industry average of these ratios. The manipulation is shown in Figures A1–A3 in the appendix.

[17] When assessing sampling adequacy using the Kaiser–Meyer–Olkin (KMO) measurement, a value of MSA = 0.91 is obtained for the item "Investment Recommendation" in Study 1, suggesting an appropriate factor for measuring investment-related judgment among institutional investors. However, other items such as "Investment Probability" (MSA = 0.54), "Investment Amount" (MSA = 0.43), "Buy Scale from 0 to 100" (MSA = 0.57), and "Attractiveness" (MSA = 0.58) exhibit MSA values below 0.6, indicating their unsuitability as factors for measuring the investment-related judgments of institutional investors. In Study 2, an MSA value of 0.82 is observed for "Attractiveness." Conversely, all other items in this study, with MSA values ranging between 0.51 and 0.57, fall below the threshold of 0.6, rendering them unsuitable for measuring the investment-related judgments of retail investors.

[18] Due to the feedback of the pretest group and based on experimental observations, we concluded that the evaluation of the investment was more tangible for the participants when they were asking about the investment attractiveness (retail investors) and recommendation (institutional investors).

[19] See Table A1 for FIN; Figure A1 = ΔEUT_{pos}; Figure A2 = $\Delta EUT_{\varnothing}$; Figure A3 = ΔEUT_{neg}.

[20] See Figures 2 and 3.

[21] The domestic sector was chosen so that the results would be as unaffected as possible by the prevailing market conditions during the period under study (in particular the COVID-19 pandemic and the Wirecard scandal). The study was conducted in the time of May 2021 to Novembre 2021.

[22] Because a realistic scenario for an investment decision within an experimental study involves additional financial, conceptual, and/or human resources that were not available to us during the pandemic lockdown, we limited ourselves to measuring investors' judgments. Doing so nevertheless allowed us to draw conclusions about the steering effect of taxonomy information.

[23] Figure A4 in the appendix illustrates an excerpt of the experimental study regarding participants perception of the financial performance of the presented company. This serves as an example from the raw data, where we aggregated responses from institutional and retail investors.

[24] Participants who failed the manipulation checks did not agree or did not definitely agree that the provided information contained the treatment information.

[25] Given that our study encompasses not only institutional but also retail investors of diverse ages, backgrounds, and experiences, we acknowledge the potential risk of bias due to language restrictions that would arise in an international study. Thus, our decision to focus on German participants is strategic.

[26] Based on the pretest, it was determined that responses under a processing time of 4 min could not signal attentive participation in the experiment.

[27] In Table A2 in the appendix, we show an overview of the demographic data of participants.

[28] We verified whether the requirements for an ANOVA model were met. To test the assumption of a normal distribution, we ran a Shapiro–Wilk test, which revealed non-normally distributed data in most subsamples. We also tested for variance homogeneity with a Levene test, as the measurement variation should be equally distributed across all possible values of the independent variables. Due to failure, we ran non-parametric tests (Kruskal–Wallis and WELCH tests) that showed consistent results (see results on page 29).

[29] The Kruskal–Wallis rank sum test is a non-parametric alternative to a one-way ANOVA that can be used when ANOVA assumptions are not met.

[30] Alternative WELCH test and Games Howell post hoc tests show the same significances.

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APPENDIX 1

Taxonomy information

The taxonomy regulation of EU Commission defines sustainable economic activities in relation to climate change based on fixed criteria. With the help of this taxonomy classification system, corporate activities that contribute to climate protection and adaptation to climate change are classified as ecologically sustainable ("taxonomy-compliant").
This makes it possible to indicate the proportion of our generated sales that are achieved with environmentally sustainable activities according to the EU criteria. The share of investments in taxonomically sustainable activities can also be defined:

Taxonomy-aligned share of sales = 15.9% (10% sector average)

Taxonomy-aligned investment share = 18.1% (14% sector average)

FIGURE A1 Experimental manipulation to investigate H1—excerpt of the experimental documents: taxonomy information (part of EUT_{pos}).

Taxonomy information

The taxonomy regulation of EU Commission defines sustainable economic activities in relation to climate change based on fixed criteria. With the help of this taxonomy classification system, corporate activities that contribute to climate protection and adaptation to climate change are classified as ecologically sustainable ("taxonomy-compliant").
This makes it possible to indicate the proportion of our generated sales that are achieved with environmentally sustainable activities according to the EU criteria. The share of investments in taxonomically sustainable activities can also be defined:

Taxonomy-aligned share of sales = 10.2% (10% sector average)

Taxonomy-aligned investment share = 14.1% (14% sector average)

FIGURE A2 Experimental manipulation to investigate H2—excerpt of the experimental documents: taxonomy information (part of $EUT_{\varnothing}$).

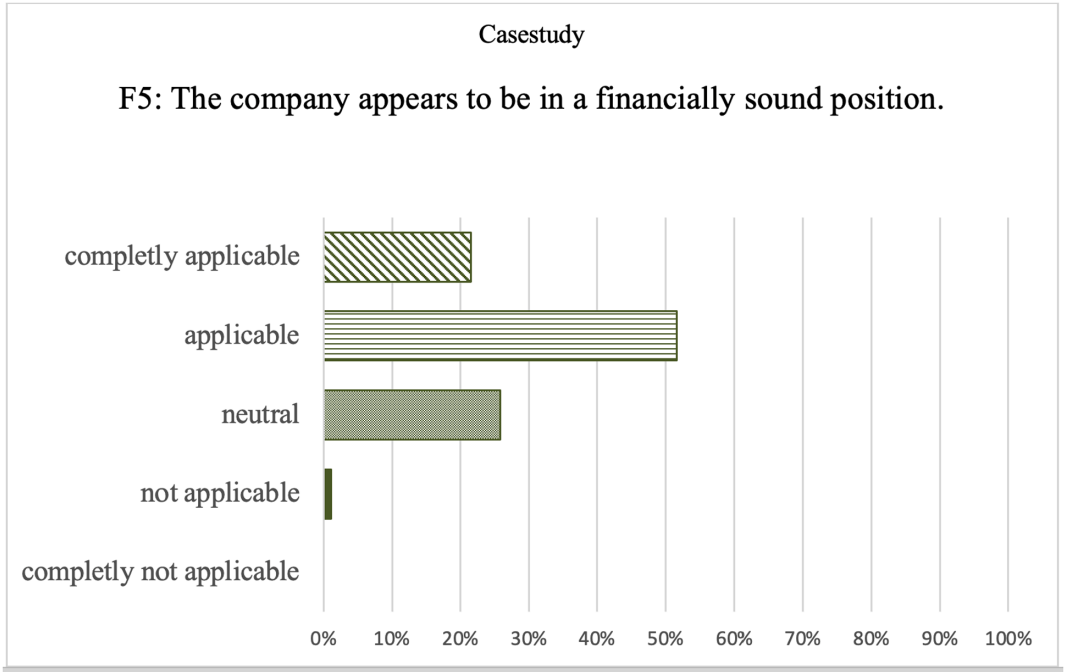
Taxonomy information

The taxonomy regulation of EU Commission defines sustainable economic activities in relation to climate change based on fixed criteria. With the help of this taxonomy classification system, corporate activities that contribute to climate protection and adaptation to climate change are classified as ecologically sustainable ("taxonomy-compliant").
This makes it possible to indicate the proportion of our generated sales that are achieved with environmentally sustainable activities according to the EU criteria. The share of investments in taxonomically sustainable activities can also be defined:

Taxonomy-aligned share of sales = 8.9% (10% sector average)

Taxonomy-aligned investment share = 12.1% (14% sector average)

FIGURE A3 Experimental manipulation to investigate H3—excerpt of the experimental documents: taxonomy information (part of EUT_{neg}).



ANSWER OPTION	
Completely applicable	21.71%
Applicable	50.41%
Neutral	26.81%
Not applicable	1.08%
Completely not applicable	0.00%

FIGURE A4 Excerpt of the experimental study: questions about the perception of financial performance (aggregation of institutional and retail investors perceptions).

TABLE A1 Excerpt of the experimental documents: financial information—key performance indicators and balance sheet ratios (part of FIN—constant for all experimental groups).

In million €	2017	2018	2019	Change 18/19
Sales revenue	20,029	19,899	20,114	+1.1%
EBIT (operating profit)	3055	2899	3116	+7.5%
Return on sales (EBIT margin)	15.3%	14.6%	15.5%	+0.9 PP (percentage points)
EBITDA	4133	3977	4074	+2.4%
Operational cash flow	2468	2698	3241	+20.1%
Research and development expenses	469	484	499	+3.1%
Investment expenses (CapEx)[a]	700	837	842	+0.6%
Financial liabilities	2356	2082	2045	−1.8%
Earnings after taxes	2541	2103	2330	+10.8%
Balance sheet figures:				
Total assets in million €	28,339	29,562	31,403	+6.2%
Equity ratio in %[a] (equity/total assets)	55.2%	57.5%	59.3%	+1.8 PP
Dept-equity ratio in %[a] (liabilities/equity)	44.8%	42.5%	40.7%	−1.8 PP
Asset coverage I in %[a] (equity/long-term assets)	78.8%	81.4%	83.6%	+2.2 PP
Financing structure in %[a] (short-term liabilities/ liabilities in total)	61.1%	71.9%	66.6%	−5.3 PP
Return on equity in %[a] (ROE) (net income/equity)	16.2%	12.4%	12.5%	+0.1 PP
Key figures for the share:				
Price- earnings- ratio (*at the year-end price in €*)	17.24	16.11	17.50	+8.6%
Earnings per share (EPS) in €	5.80	4.80	5.32	+10.8%
EV/EBITDA (EBITDA-multiple)	11.5x	10.1x	10.2x	
Dividend return at the end of the year	1.62%	1.94%	1.98%	+0.04 PP

[a]Not defined by International Financial Reporting Standards (IFRS).

TABLE A2 Demographic data of participants[a] (Total $N = 320$) in comparison with the shareholder structure in Germany in 2023 according to the German Institute of Stocks.

	Institutional investors ($n = 168$)					Retail investors ($n = 152$)					All participants ($N = 320$)	Share-holder structure in Germany (DAI, 2023)[2]
Category	**ECO**	**FIN**	**$EUT_{\varnothing}$**	**EUT_{pos}**	**EUT_{neg}**	**ECO**	**FIN**	**$EUT_{\varnothing}$**	**EUT_{pos}**	**EUT_{neg}**	**in %**	**in %**
Age												
18–29	7	9	3	7	6	9	10	8	7	10	24	16
30–44	16	8	18	8	14	15	7	14	17	13	41	32
45–59	12	4	11	11	12	5	11	6	8	4	26	24
60+	6	4	2	5	5	2	–	3	3	–	9	28
Sex												
Male	33	17	20	19	25	17	22	25	20	24	69	62
Female	7	8	14	12	11	13	6	6	15	3	30	38
–	1	–	–	–	1	1	–	–	–	–	1	N.A
Investment experience												
<1 year	2	2	2	4	3	11	4	–	3	1	10	N.A
1–2 years	4	3	5	3	3	9	5	8	6	10	18	N.A
2–5 years	7	2	11	7	8	6	3	11	11	10	24	N.A
5–10 years	10	7	8	9	9	1	5	5	8	3	20	N.A
>10 years	18	11	8	8	14	4	11	7	7	3	28	N.A
Education												
High school Diploma	8	5	6	11	5	12	15	6	7	7	26	47
A-level	12	12	10	9	13	9	6	10	7	12	31	53
Bachelor/Master	21	6	17	11	18	10	7	13	20	7	41	N.A
Ph.D	–	2	1	–	1	–	–	2	1	1	3	N.A
Income												
<1.000 € per month	–	–	–	–	–	1	5	1	2	3	4	10
1.000–1.999 €	7	4	8	5	6	7	8	4	6	3	18	26
2.000–3.999 €	16	8	12	14	16	16	9	12	11	10	39	39
4.000–5.999 €	11	5	10	10	9	4	4	10	12	7	26	12
>6.000 €	7	8	4	2	6	3	2	4	4	4	14	12

[a]We excluded participants who failed the manipulation checks.

TABLE A3 Tests of significances for representativeness of ECO.

***p*-Values* of pairwise comparison tests**								
Control questions	**Institutional investors**				**Retail investors**			
I rate the company's environmental performance as follow: high/medium/poor	ECO	$EUT_{\varnothing}$	EUT_{pos}	EUT_{neg}	ECO	$EUT_{\varnothing}$	EUT_{pos}	EUT_{neg}
$EUT_{\varnothing}$	0.11	–	–	–	0.66	–	–	–
EUT_{pos}	0.72	0.45	–	–	0.77	0.18	–	–
EUT_{neg}	0.17	0.75	0.66	–	0.18	0.77	0.10	–
The company acts in a sustainable manner: absolutely true/true/neutral/not true/ absolutely not true	ECO	$EUT_{\varnothing}$	EUT_{pos}	EUT_{neg}	ECO	$EUT_{\varnothing}$	EUT_{pos}	EUT_{neg}
$EUT_{\varnothing}$	0.98	–	–	–	1	–	–	–
EUT_{pos}	0.98	0.98	–	–	1	1	–	–
EUT_{neg}	0.14	0.98	0.19	–	1	0.99	1	–
Based on the presented indicators it appears that the company act in an environmentally conscious manner: absolutely true/true/ neutral/not true/absolutely not true	ECO	$EUT_{\varnothing}$	EUT_{pos}	EUT_{neg}	ECO	$EUT_{\varnothing}$	EUT_{pos}	EUT_{neg}
$EUT_{\varnothing}$	0.81	–	–	–	1	–	–	–
EUT_{pos}	0.55	0.81	–	–	1	1	–	–
EUT_{neg}	0.10	0.74	0.82	–	0.75	1	1	–

*p-Value adjustment method: holm.

TABLE A4 Results of the ANOVA and the post hoc tests in the first study with institutional investors for the isolated effects of taxonomy treatments.

Results of ANOVA institutional investors			
Dependent variable	**Comparison groups**	***F*-value**	***p*. Adj.[a]**
Recommendation	$FIN/\Delta EUT_{\varnothing}/\Delta EUT_{pos}/\Delta EUT_{neg}$	3.244	.0244**
TukeyHSD post hoc test			
Dependent variable	**Comparison groups**	**Diff.**	***p*. Adj.[a]**
Recommendation	FIN vs. $\Delta EUT_{\varnothing}$	0.1643	.8182
	FIN vs. ΔEUT_{pos}	0.2943	.4200
	FIN vs. ΔEUT_{neg}	−0.2149	.6507
	$\Delta EUT_{\varnothing}$ vs. ΔEUT_{pos}	0.1300	.8833
	$\Delta EUT_{\varnothing}$ vs. ΔEUT_{neg}	−0.3892	.1189
	ΔEUT_{pos} vs. ΔEUT_{neg}	−0.5092	.0207**

[a]Mauchly test for sphericity as well as Greenhouse–Geisser and Huynh–Feldt corrected p-values were computed for the respective effects.

**$p < .05$.

TABLE A5 Results of the ANOVA and the post hoc tests in the second study with retail investors for the isolated effects of taxonomy treatments.

Results of ANOVA retail investors			
Dependent variable	**Comparison groups**	***F*-value**	***p*. Adj.[a]**
Attractiveness	FIN/$\Delta EUT_{\varnothing}$/ΔEUT_{pos}/ΔEUT_{neg}	.102	.959
TukeyHSD post hoc test			
Dependent variable	**Comparison groups**	**Diff.**	***p*. Adj.[a]**
Attractiveness	FIN vs. $\Delta EUT_{\varnothing}$	0.0958	.9973
	FIN vs. ΔEUT_{pos}	0.2535	.9514
	FIN vs. ΔEUT_{neg}	0.0789	.9987
	$\Delta EUT_{\varnothing}$ vs. ΔEUT_{pos}	0.1567	.9867
	$\Delta EUT_{\varnothing}$ vs. ΔEUT_{neg}	−0.0179	.9999
	ΔEUT_{pos} vs. ΔEUT_{neg}	−0.1746	.9837

[a]Mauchly test for sphericity as well as Greenhouse–Geisser and Huynh–Feldt corrected *p*-values were computed for the respective effects.

TABLE A6 Significant results of the Kruskal–Wallis test and the Dunn post hoc tests for the effects of the different taxonomy treatments in the first study with institutional investors.

Results of Kruskal–Wallis test for institutional investors' recommendation			
Comparison groups		**Comparison groups**	
Treatments without ΔECO	***p*. Adj.[a]**	**Treatments with ΔECO**	***p*. Adj.[a]**
FIN/$\Delta EUT_{\varnothing}$/ΔEUT_{pos}/ΔEUT_{neg}	.0077***	FIN/$EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}	.02783**
Dunn post hoc tests			
Comparison groups	***p*. Adj.[a]**	**Comparison groups**	***p*. Adj.[a]**
FIN vs. ΔEUT_{neg}	.2375	FIN vs. EUT_{neg}	.0542*
FIN vs. $\Delta EUT_{\varnothing}$	.0506*		
FIN vs. ΔEUT_{pos}	.0087***		
ΔEUT_{pos} vs. ΔEUT_{neg}	.0285**	EUT_{pos} vs. EUT_{neg}	.0316**

[a]Mauchly test for sphericity as well as Greenhouse–Geisser and Huynh–Feldt corrected *p*-values were computed for the respective effects.
*$p < .1$. **$p < .05$. ***$p < .01$.

TABLE A7 Significant results of the Kruskal–Wallis test and the Dunn post hoc tests for the effects of the different taxonomy treatments in the second study with retail investors.

Results of Kruskal–Wallis test for retail investors (investment attractiveness)			
Comparison groups		**Comparison groups**	
Treatments without ΔECO	***p*. Adj.[a]**	**Treatments with ΔECO**	***p*. Adj.[a]**
FIN/$\Delta EUT_{\varnothing}$/ΔEUT_{pos}/ΔEUT_{neg}	.6526	FIN/$EUT_{\varnothing}$/EUT_{pos}/EUT_{neg}	.1333
Dunn post hoc tests			
Comparison groups	***p*. Adj.[a]**	**Comparison groups**	***p*. Adj.[a]**
FIN vs. ΔEUT_{pos}	.8843	FIN vs. EUT_{pos}	.0860*

[a]Mauchly test for sphericity as well as Greenhouse–Geisser and Huynh–Feldt corrected *p*-values were computed for the respective effects.
*$p < .1$.