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Beyond the Financial: How Visualisations, Language, and Temporal Distance Shape Investor Decisions

PhD thesis submitted for the degree of Doctor of Applied Economics at the University of Antwerp to be defended by Jo Mentens

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Summary

This thesis explores the influences of visualisations, language, and temporal distance on investor decision-making within an increasingly information-rich and globalised corporate reporting landscape. It examines how these elements, beyond traditional financial metrics, impact investors' cognitive and emotional responses, providing insights into their decision-making processes. Through three experimental studies, this work contributes to the field of behavioural accounting by illustrating how various aspects of corporate disclosures affect investor behaviour.

The first study examines the role of visualisations in mitigating information overload, leveraging the cognitive theory of multimedia learning to assess whether such tools enhance or impede investor understanding and decision-making. It integrates insights from motivated reasoning to understand the cognitive and emotional processes involved. The second study investigates the effects of language and ethical content in environmental, social, and governance (ESG) disclosures, examining how foreign language processing influences emotional and analytical responses to ethically charged content. The third study applies construal level theory to analyse the impact of temporal distance and narrative framing on investor perceptions, challenging traditional assumptions about the influence of temporal distance on abstract thinking.

The findings across the studies consistently reveal that how information is presented—through visualisations, language, and temporal distance—significantly shapes investor responses. Specifically, the first study shows that visualisations increased investment willingness, largely through enhanced processing fluency rather than improved comprehension, highlighting the affective impact of presentation style. The second study demonstrates that processing ESG disclosures in a foreign language generally led to less emotional and more analytical evaluations, thereby moderating emotional influences in investment decisions. In the third study, matching short-term goals with desirability framing significantly improved investors' perceptions of corporate credibility, suggesting that appropriate narrative framing can effectively align with investors' cognitive orientations to influence their investment decisions.

This research makes significant academic contributions by applying psychological theories in an accounting context, thus bridging a gap between these fields and offering new perspectives on investor behaviour. It underscores the need for accounting standards and practices to consider not only the content but also the format and presentation of information, thereby enhancing transparency and investor engagement in financial markets.

Samenvatting: ‘Voorbij het Financiële: Hoe Visualisaties, Taal en Tijdsafstand Investeringsbeslissingen Beïnvloeden’

Dit proefschrift is voorgelegd tot het behalen van de graad van Doctor in de Toegepaste Economische Wetenschappen aan de Universiteit Antwerpen. Het onderzoekt de invloed van visualisaties, taal en tijdsafstand op investeringsbeslissingen binnen een steeds informatie-rijker en geglobaliseerd rapporteringslandschap. Dit werk bestudeert hoe deze factoren, buiten de traditionele financiële maatstaven om, cognitieve en emotionele reacties van beleggers beïnvloeden en biedt inzichten in hun besluitvormingsprocessen.

Via drie experimentele studies illustreert dit werk hoe verschillende aspecten van bedrijfsrapportering het gedrag van beleggers beïnvloeden. De eerste studie onderzoekt de rol van visualisaties bij het verminderen van informatiestress en integreert inzichten uit gemotiveerd redeneren. De tweede studie beoordeelt de effecten van taal en ethische inhoud in milieu-, sociale en bestuurlijke rapportages en bekijkt hoe een vreemde taal emotionele en analytische reacties op ethisch geladen inhoud beïnvloedt. De derde studie past *construal level theory* toe om de impact van tijdsafstand en narratieve framing op de percepties van beleggers te analyseren, en daagt traditionele aannames uit over de invloed van tijdsafstand op abstract denken.

De bevindingen uit de studies tonen aan dat de manier waarop informatie wordt gepresenteerd—via visualisaties, taal en tijdsafstand—de reacties van beleggers significant vormt. Specifiek toont de eerste studie aan dat visualisaties de investeringsbereidheid verhoogden, voornamelijk door verbeterde *processing fluency* in plaats van door verbeterd begrip. De tweede studie demonstreert dat het verwerken van bedrijfsrapportering in een vreemde taal leidde tot minder emotionele en meer analytische evaluaties. In de derde studie leidde het afstemmen van kortetermijndoelen met wenselijkheidsframing tot een hogere geloofwaardigheid van het bedrijf, wat suggereert dat passende narratieve framing effectief kan aansluiten bij de cognitieve oriëntaties van beleggers om hun investeringsbeslissingen te beïnvloeden.

Dit onderzoek levert significante academische bijdragen door psychologische theorieën toe te passen in een accountancycontext, waardoor een brug wordt geslagen tussen deze velden en nieuwe perspectieven op beleggersgedrag worden geboden. Het benadrukt de noodzaak voor accountancynormen en -praktijken om niet alleen de inhoud maar ook het formaat en de presentatie van informatie te overwegen, wat de transparantie en betrokkenheid van beleggers in de financiële markten verhoogt.

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General Introduction

In today's accounting landscape, investors have to process an ever-increasing volume of information (Dyer et al., 2017). The globalisation of financial markets presents further complexities, especially when investors are faced with disclosures in languages other than their own. Moreover, the escalation in environmental, social, and governance (ESG) reporting[1] marks a significant expansion in the domain of corporate disclosures, underscoring a shift in the informational demands placed on investors (Rouen et al., 2022). Against this backdrop, this thesis brings together three experimental studies that collectively examine the impact of visualisations, language, and temporal distance on investor decision-making. By venturing beyond the traditional financial metrics to explore how these elements influence investor behaviour, this work contributes to a deeper understanding of how investors interpret and react to disclosures.

In response to the challenges presented by today's information-rich environment, the first chapter of this thesis examines the role of visualisations in mitigating information overload. While visualisations are increasingly used in corporate disclosures (e.g., T. E. Christensen et al., 2021; Kanbaty et al., 2020; Xu, 2021), whether these aid or hinder investor decision-making remains unclear. Building on the Cognitive Theory of Multimedia Learning (CTML), this study examines how effectively integrating visual and textual information can enhance investor understanding. According to the CTML, this integration engages dual coding channels in the brain, significantly reducing cognitive overload and improving understanding (Mayer, 2009). By applying CTML in the accounting context, this research explores if visualisations indeed foster more informed investor decisions.

As firms adapt their communication strategies in form and content, investors find themselves navigating the rising prominence of ESG reporting. This shift towards sustainability and long-term strategic planning marks a significant expansion in the scope of corporate disclosures and introduces additional layers of complexity (H. B. Christensen et al., 2021). These ESG disclosures often come with their own set of challenges, not only in terms of the linguistic and temporal dimensions of the information presented but also in the ethical and emotional content that is frequently integral to this type of reporting.

The complexities of ethical and emotional content in ESG reporting are further accentuated when investors encounter these disclosures in a language other than their

[1] In this thesis, the term 'Corporate Social Responsibility (CSR)' is used in Chapter 2, and 'Environmental, Social, and Governance (ESG)' in Chapter 3. For the purposes of this thesis, these terms are used interchangeably to refer to corporate disclosures related to environmental, social, and governance considerations.

native tongue. This scenario, increasingly common as financial markets globalise, presents unique challenges. The second chapter addresses the impact of processing ESG disclosures in a foreign language, utilising insights from the Foreign Language Effect (FLE; for two meta-analyses, see Circi et al., 2021; Del Maschio et al., 2022). This effect suggests that while a foreign language can reduce emotional bias, it may also suppress important emotional cues crucial for making well-rounded decisions about ethically charged content. By exploring how language influences the processing of ESG disclosures, this chapter provides insights into the cognitive and affective hurdles that global investors face.

In addition to linguistic challenges, ESG disclosures often involve projections and commitments extending over longer time horizons, challenging investors to think beyond immediate financial returns. The third chapter applies Construal Level Theory (CLT) to examine how these extended time horizons influence investor perception and decision-making. CLT posits that the psychological distance of an event affects how abstractly or concretely individuals perceive information; events perceived as distant are typically construed more abstractly, whereas those perceived as near are construed more concretely (Trope & Liberman, 2003). This provides a framework for analysing how ESG disclosures can be strategically crafted to align with investors' cognitive processes, ultimately influencing their investment decisions.

This thesis thus situates its research within the behavioural accounting literature (for a broad overview, see Birnberg, 2011), exploring how visual, linguistic, and temporal elements affect investor decision-making. The common thread across the three experimental chapters is the assumption that investors possess limited cognitive processing capacity and are susceptible to emotional influences, which can significantly affect their investment decisions (Blankespoor et al., 2020). This work investigates how different elements of corporate disclosures influence the cognitive load and emotional responses of investors and offers insights into how disclosures can be optimised to improve investor comprehension and decision-making efficacy. Each chapter contributes to our understanding of the interplay between investor psychology and the informational characteristics of accounting disclosures, highlighting the need for disclosures that are not only informative but also cognitively and emotionally attuned to investors' needs.

Each chapter employs a carefully designed experiment to investigate the influence of, respectively, visualisations, language, and temporal distance on investor decision-making. Participants in each study were presented with a hypothetical investment scenario. These scenarios were crafted to manipulate the focal variables of interest—visualisations, language, and temporal distance—thereby isolating their specific effects on investors' judgments and decision-making. Furthermore, to enhance the integrity and reproducibility of the findings, each experiment was pre-registered before data collection.

This pre-registration outlined the study hypotheses, methods, and analysis plans, committing to a transparent research process that adheres to the highest standards of scientific rigor (Simmons et al., 2021). This methodological approach not only allows for a precise assessment of how each variable impacts investor behaviour but also aligns with the overarching goal of the thesis to explore the cognitive and emotional processes influencing financial decision-making in an increasingly complex information landscape.

Specifically, to gain a more comprehensive insight into the cognitive and emotional processes that govern investors' decision-making, each experiment also introduces a secondary manipulation (in a moderation-of-process approach; Asay et al., 2021), reflecting different aspects of investment contexts. In the first chapter, motivated reasoning (or 'the notion that people are less sceptical consumers of desirable than undesirable information'; Ditto & Lopez, 1992, p. 568) is examined by manipulating participants' investment positions, allowing the study to assess how personal financial stakes influence the processing of visual information. The second chapter explores the role of ethical considerations by manipulating the ethicality of the content in disclosures, aiming to uncover how moral judgments interact with foreign language processing. Finally, the third chapter investigates the effects of narrative framing alongside temporal distance, exploring how the narratives alongside future-oriented information impact investor perceptions.

The first experiment explores the interaction between visualisations and investors' investment positions, focusing on the role of motivated reasoning. It hypothesises that investors whose positions are not aligned with the information presented benefit most from visualisations. This group is likely to scrutinise the information more thoroughly, hence experiencing a greater reduction in cognitive load due to the visual aids. Conversely, for investors whose investment position is aligned with the information presented, visualisations serve a different purpose. While the information also becomes easier for them to process, these investors may use the resulting ease of processing as a positive cue. This perceived processing fluency (or 'subjective experience of ease with which [they] process information'; Alter & Oppenheimer, 2009, p. 21) can enhance their affective response, subsequently increasing their willingness to invest based on positive feelings rather than an enhanced understanding. This dynamic suggests that personal investment stakes significantly influence the effects of visualisations on decision-making. By examining these contrasting effects, this chapter illuminates visualisations' dual role in enhancing true comprehension or promoting investment decisions through positive affective reactions.

Findings from the first experiment reveal that visualisations consistently increased investment willingness among investors, regardless of their investment position—whether

aligned or not with the information presented. Interestingly, the effect of processing fluency on investment willingness was only present for investors with aligned positions. These investors experienced heightened subjective feelings of processing fluency, which in turn led to increased investment willingness, indicating a reliance on the ease of processing as a cue for decision-making. This reliance was not evident among investors with non-aligned positions, who did not show the same enhancement in investment willingness based on processing fluency alone. Furthermore, while visualisations improved understanding for all investors, this increased understanding did not significantly influence their willingness to invest. This suggests that while visualisations effectively transmit information, the decision to invest is more heavily influenced by the affective response elicited by processing fluency rather than the cognitive appraisal of the information's content.

The second chapter of this thesis examines how language and ethical content in ESG disclosures affect investor decision-making. This study investigates the FLE, hypothesising that investors process ethically charged content in a foreign language with less emotional involvement, which could lead to more dispassionate and analytical decision-making. Moreover, it explores how ethicality of the content interacts with language to influence investment decisions, providing insights into the cognitive and emotional dynamics shaped by these two variables. The results of the study indicate that processing disclosures in a foreign language generally reduced the emotional impact, leading to more analytical decision-making among investors, regardless of the ethicality of the disclosures. This suggests that the influence of language on reducing emotional impact and increasing analytical approaches is consistent across disclosures with varying ethical charges. These findings highlight the pervasive influence of language on investor behaviour and point to the importance of considering language effects in the design and presentation of ESG disclosures.

Finally, the third chapter investigates how temporal distance and narrative framing in environmental disclosures influence investor decisions, leveraging the framework of CLT. This theory posits that temporal distance affects the level of abstraction in information processing, with near-future events perceived more concretely and distant-future events more abstractly (Trope & Liberman, 2003). The study specifically examines whether matching the narrative framing (feasibility vs. desirability) with the appropriate temporal construals—abstract for long-term and concrete for short-term—can enhance the effectiveness of environmental disclosures in influencing investor perceptions and decisions. By exploring the interplay between how near or distant future-oriented disclosures are and the narrative style employed, this chapter seeks to uncover the subtle

cognitive mechanisms that may influence investor perception and action in the context of sustainability reporting.

Results from an initial pilot experiment challenge conventional applications of CLT, revealing that short-term environmental goals evoked more abstract thinking among investors, contrary to the expectation that longer time horizons would do so. The main experiment focused on the congruence between the time horizon of environmental goals and narrative framing, particularly examining how well they align with investors' construal levels. The results demonstrate that environmental goals with a short time horizon paired with desirability framing significantly enhanced investors' perceived credibility of the firm and their willingness to invest. This chapter contributes to our understanding of how narrative techniques and temporal framing in environmental disclosures can be optimally employed to sway investor behaviour.

Together, these findings contribute to a deeper understanding of investor decision-making processes. This work illuminates how elements of corporate disclosures influence investors' cognitive and emotional responses, providing insights into the nuanced ways investors process and react to information. The relevance of this research is particularly pronounced in today's global financial landscape, where investors are increasingly faced with complex and voluminous information. By dissecting the cognitive and emotional pathways through which investors interact with corporate disclosures, this thesis contributes valuable insights that can inform the design of more effective communication strategies. This research also holds significant implications for regulatory bodies, helping to enhance the transparency and efficacy of corporate communications.

This thesis significantly advances the field of accounting research by exploring the interplay between accounting disclosures and investor decision-making. By examining how visualisations, language, and temporal distance within corporate disclosures impact investor responses, this research contributes to a growing body of literature that seeks to understand the efficacy of disclosure practices in contemporary corporate reporting. For instance, building upon Rennekamp's (2012) findings regarding disclosure readability, the first chapter integrates the SEC's (1998) advocacy for visual elements to enhance disclosure readability to aid investor comprehension and decision-making. In contrast, while studies such as those by Kim et al. (2023) examine the nuances of visual embellishments, assessing variations within visualisations themselves—such as the impact of vividness on investor perception—this research contrasts the broader effects of visualisations against traditional text-based disclosures.

The second chapter addresses the relatively underexplored area of language in accounting disclosures. Existing literature primarily examines translation issues in accounting

standards (e.g., Evans, 2018; Nobes & Stadler, 2018) or linguistic variation such as tone (Bassyouny et al., 2022), yet rarely tackles the implications of different languages themselves. Furthermore, recent research highlights the critical role of ethical considerations in shaping investor reactions to ESG initiatives (Garavaglia et al., 2023). This thesis extends these discussions by exploring how different languages impact the interpretation and effectiveness of ESG disclosures.

Responding to Weisner's (2015) call to integrate CLT into accounting research, the third chapter focusses on the temporal distance of ESG goals. While existing studies predominantly examine investors' personal investment horizons (Liu et al., 2020; Puspitasari et al., 2024), this research explores the temporal distance of ESG goals, providing a novel contrast. Intriguingly, the findings reveal deviations from traditional CLT predictions: shorter temporal distances unexpectedly evoke more abstract thinking among investors, suggesting that the typical association between distance and abstraction may not hold in financial decision contexts. This chapter contributes to refining our understanding of CLT's applicability in accounting, particularly in how temporal framing within corporate disclosures can differentially influence investor behaviour.

Overall, this thesis explores the application of psychological theories—specifically those related to cognitive load, processing fluency, foreign language processing, and construal levels—to an accounting context. While these theories offer robust frameworks, their application in financial decision-making reveals complexities not fully anticipated by existing psychological models. For instance, the findings challenge the conventional applications of CLT, and raise questions about the influence of visualisations and understanding on investment decisions as suggested by the CTML. This research underscores the importance of testing psychological constructs within specific domains to uncover nuanced behaviours that standard theories might not predict. Such insights advocate for a more nuanced consideration of psychological factors in corporate disclosure design, suggesting that integrating principles from behavioural sciences can provide substantial benefits in catering to diverse investor needs.

In summary, the findings offer empirical support for refining disclosure standards and practices, highlighting the need for accounting standards to consider not only the content but also the format and presentation of information. This is particularly relevant in light of recent regulatory changes and increasing demands for transparency and investor engagement in financial markets. Through its detailed analysis, this work provides empirical evidence that can guide future amendments in disclosure regulations, making it an invaluable resource for both academic researchers and practitioners in the field of accounting.

Chapter 1 The Influence of Visualisations in Corporate Disclosures on Nonprofessional Investors' Judgments and Decision-Making

Abstract We report the results from a pre-registered study on the influence of visualisations in corporate disclosures on investors' investment decisions. Specifically, we examine if visualisations improve investors' understanding of corporate disclosures and if investors incorporate this knowledge into their investment decisions. We find that visualisations in corporate disclosures increase investors' investment willingness regardless of whether the information is preference-consistent or not. Moreover, we find that this effect does not extend to subsequent non-visual disclosures. We also find that for investors that receive preference-consistent information, the effect of visualisations on investment willingness is partially due to increased feelings of processing fluency. Furthermore, we provide evidence that these subjective feelings of processing fluency lead to a higher reliance on a disclosure, which increases investors' investment willingness. Finally, while we find evidence that visualisations increase investors' understanding of corporate disclosures, we fail to find evidence that increased understanding influences investors' investment willingness.

Keywords visualisations, cognitive load, processing fluency, motivated reasoning

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1.1 Introduction

Companies increasingly use visualisations in their investor communications. For instance, by 2020, 23% of companies included at least one visualisation in their 10-K filing (T. E. Christensen et al., 2021). Visualisations are also becoming common in the presentation slides used during earnings conference calls (Xu, 2021) and even more so in sustainability reporting, where reports without visualisations are the exception (e.g., Kanbaty et al., 2020). In this study, we investigate the effects of visualisations on investor judgments.

Research in accounting and finance on visualisations in corporate disclosures and investor communications is still rare. Nevertheless, some recent studies indicate that visualisations affect investor judgments (e.g., T. E. Christensen et al., 2021; Cox et al., 2018; Nekrasov et al., 2021; Xu, 2021). However, it is still unclear how visualisations affect investor judgments. Therefore, we identify two potential mechanisms by which visualisations in corporate disclosures can affect investor judgments. First, visualisations may improve investors' understanding of the information, which should help them make more informed judgments (Bloomfield, 2002; Li, 2008). Second, visualisations may enhance investors' subjective feelings of the ease with which they process information (i.e., processing fluency), which may cause them to react more strongly to the information (Elliott et al., 2017; Rennekamp, 2012).

We extend existing research by examining the effects of visualisations in corporate disclosures on investors' investment decisions and by simultaneously studying two competing mechanisms, understanding and processing fluency. Specifically, we make the following contributions to the literature. First, we contribute to the general literature on disclosure formatting (e.g., Elliott, 2006; Hodge et al., 2010; Maines & McDaniel, 2000) and the rapidly growing literature investigating the effects of visualisations on investor judgments specifically (e.g., T. E. Christensen et al., 2021; Cox et al., 2018; Elliott et al., 2017; Nekrasov et al., 2021; Xu, 2021; Zhang, 2019). We explicitly examine the role of both understanding and processing fluency on the effect of visualisations on investors' information processing and investment decisions.

Second, by studying visualisations in corporate disclosures, we add to the literature on investors' feelings of processing fluency, which so far has mainly focused on readability (e.g., Asay et al., 2017; Rennekamp, 2012; Tan et al., 2015; Tan et al., 2014). In doing so, we also more broadly contribute to the experimental accounting literature that investigates the influence of non-financial features of corporate disclosures on investors' judgment and decision-making. For example, prior research has investigated the effects of jargon (e.g., Tan et al., 2019), mobile device use (e.g., Brown et al., 2019; Grant, 2020), information

disaggregation and interactivity (e.g., Kelton & Murthy, 2015), and concrete language (e.g., Elliott, Rennekamp, et al., 2014).

Third, we contribute to the accounting literature that investigates how different features of corporate disclosures affect investors' understanding (e.g., Tan et al., 2019; Tan et al., 2015) and cognitive load (e.g., Grant, 2020; Kelton & Murthy, 2015; Zhang, 2019). Lastly, we contribute to the accounting literature on motivated reasoning (e.g., Hales, 2007; Hales et al., 2011; Han & Tan, 2010) by examining if investors' directional preferences moderate the relation between visualisations in corporate disclosures and investors' information processing and investment decisions.

We conducted an experiment with a 2 (presentation style: visual or textual) x 2 (investment position: long or short) x 2 (information impact: high or low) mixed factorial design.[2] Our primary focus is on presentation style, but we also manipulate investment position and information impact. First, we manipulate investment position because we expect differences in investors' information processing if they receive preference-consistent versus preference-inconsistent information. By manipulating investment position and keeping the valence of information constant (i.e., positive), participants holding a long and a short investment position receive respectively preference-consistent and preference-inconsistent information. Because of motivated reasoning (i.e., 'the notion that people are less sceptical consumers of desirable than undesirable information'; Ditto & Lopez, 1992, p. 568), we expect that visualisations have a different impact on investors when receiving preference-consistent or preference-inconsistent information. Specifically, we hypothesise that visualisations aid investors' understanding when they receive preference-inconsistent information (but not when information is preference-consistent). At the same time, we expect that visualisations increase feelings of processing fluency when investors receive preference-consistent information (but not when information is preference-inconsistent).

Second, we manipulate information impact within-subjects (i.e., all participants see both the high and low impact condition) to test if visualisations affect how well participants extract information from corporate disclosures and incorporate such information into their investment decisions. We measure participants' willingness to invest both after having seen high- and low-impact information. If participants properly extract and incorporate information from corporate disclosures into their investment decisions, their

[2] This study was pre-registered on the Open Science Framework (OSF): https://osf.io/nmky8. The pre-registration details the study's hypotheses, experimental design, randomization procedures, blinding, sample size (and rationale), data collection methods, variables (both manipulated and measured), statistical models, inference criteria, data exclusion criteria, and plans for exploratory analyses. Ethical approval for the experiment was granted by the institution where the online experiment was administered.

reaction to high-impact information should be stronger than to low-impact information. That is, properly understanding the company's business and financial situation should result in a larger impact on willingness to invest after receiving high-impact information than after receiving low-impact information.

Our experiment yields the following main results. First, we find evidence that visualisations in corporate disclosures increase investors' investment willingness. Against our expectations, this is true for both investors receiving preference-consistent and preference-inconsistent information. Second, subjective feelings of processing fluency explain part of the effect of visualisations on investment willingness for investors receiving preference-consistent information but not for investors receiving preference-inconsistent information. Furthermore, we provide evidence that enhanced feelings of processing fluency increase investors' reliance on a disclosure, increasing their investment willingness. Third, although we find evidence that visualisations increase investors' understanding of corporate disclosures, we fail to find evidence that increased understanding influences investors' investment willingness. Finally, we find no evidence for carryover effects of visualisations; that is, the effects of visualisations in corporate disclosures on investors' information processing and investment decisions do not affect their reactions to subsequent non-visual (textual) disclosures.

Our findings significantly advance our understanding of how visualisations influence investor behaviour. By demonstrating that visualisations can increase investment willingness regardless of whether the information is preference-consistent or preference-inconsistent, our study challenges the assumption that visualisations differently affect certain types of information processing. This broadens the implications of visualisation use in corporate communications and suggests that their impact is more universal than previously assumed.

Additionally, our research extends the literature on processing fluency by showing that its effects are context-dependent, specifically varying with the type of information consistency. This insight is crucial for designing corporate disclosures that effectively utilise visual elements to enhance investor engagement and decision-making. Furthermore, while we did not find a direct link between increased understanding from visualisations and investment willingness, our study underscores the importance of processing fluency in influencing investor decisions. This finding adds a new dimension to the discussion on cognitive load and information processing in financial contexts, indicating that ease of processing can sometimes outweigh depth of understanding in driving investment behaviour.

1.2 Background and hypotheses development

Visualisations and investor judgments

A small number of recent studies have investigated the effect of visualisations on investor judgments. Overall, these studies suggest that investors react to visualisations, although it is still unclear what drives their reactions. For instance, T. E. Christensen et al. (2021) find that visualisations are positively associated with the magnitude of 10-K filing abnormal returns and analysts' forecast revisions, which suggests that market participants use these visualisations. In earnings conference calls, Xu (2021) finds that data visualisations are positively associated with analysts' information acquisition and earnings call informativeness, suggesting that data visualisations enhance information dissemination and reduce information asymmetry between managers and stakeholders. Similarly, Nekrasov et al. (2021) find that visuals in earnings announcements on Twitter are associated with increased investor attention. However, they find that visuals are associated with lower earnings persistence and a post-earnings announcement return reversal, which suggests that visuals may not improve investors' understanding. Conversely, Cox et al. (2018) find that visualising key information of mutual funds decreases preventable fees for investors, which does suggest that visualisations can increase investors' understanding.

We extend this line of research by investigating two potential mediators for the effect of visualisations on investors' judgments: understanding and subjective feelings of processing fluency. As these two effects are intertwined, we rely on findings about motivated reasoning to disentangle them.

Motivated reasoning

After processing information, people's judgments and decisions are influenced by two factors: the information that has been processed and the experience of processing this information (Schwarz et al., 2020). Mayer's (2009) cognitive theory of multimedia learning (CTML) focusses on the first factor and describes how visualisations can improve understanding of the information being processed. Fluency theory focusses on the second factor and describes how visualisations can increase people's subjective experience of ease with which they process information (Alter & Oppenheimer, 2009). These two sources of information are intertwined in people's judgment and decision-making, but we expect that their relative impact on investment decisions varies with investors' motivation to process the information. When processing motivation is high, people are more likely to rely on the content of the information itself, while subjective feelings of processing fluency are more likely to exert influence when processing motivation is low (Schwarz et al., 2020).

There is considerable evidence that people interpret information and events in a manner consistent with their existing preferences and prior decisions (see Ditto & Lopez, 1992; Kunda, 1990). That is, when people have 'directional preferences' (i.e., a preference to arrive at a particular conclusion), they are more likely to arrive at the conclusions they want to arrive at because they turn into 'less sceptical consumers of desirable than undesirable information' (Ditto & Lopez, 1992, p. 568). Investors often have directional preferences about a company's financial performance and future prospects because of the direct implications for their return on investment. Consistently, a substantial body of accounting literature shows (e.g., Hales, 2007; Han & Tan, 2007; Thayer, 2011) that investors with a long (short) investment position have a directional preference to interpret information about companies positively (negatively).

Furthermore, recent research refines these findings by distinguishing between conventional preferences and incentivised preferences. Investors holding a long position are more prone than investors holding a short position to forming biased beliefs about a stock's value due to the conventional preference for prices to rise, which contrasts with short investors' incentivised preference for prices to fall (Elliott et al., 2023). This suggests that investors holding a short position have a higher processing motivation than investors holding a long position due to the (mis)alignment between conventional preferences and incentivised preferences in an investment context.

Moreover, we expect investors' directional preferences to further drive their motivation to process information. For instance, processing motivation should be high for investors holding a short position when confronted with positive information about a company (i.e., preference-inconsistent information). Conversely, investors holding a long position experience little motivation to process positive information about a company (i.e., preference-consistent information) deeply and are likelier to take such information at face value. In turn, this should affect the extent to which investors' understanding vis-à-vis their subjective feelings of processing fluency affect their investment decisions. As such, we rely on the phenomenon of motivated reasoning to gain insight into the underlying mechanism by which visualisations affect investors' willingness to invest (i.e., in a moderation-of-process approach; Asay et al., 2021).

Processing fluency

Visualisations may affect investors' 'subjective experience of ease with which [they] process information' (Alter & Oppenheimer, 2009, p. 21). Investors may experience increased feelings of fluency when information is visualised because processing such information requires less cognitive resources than textual information (e.g., Smerecnik et al., 2010; Stock & Watson, 1984). In turn, subjective feelings of processing fluency are

expected to influence investors' decisions affectively. If investors experience greater processing ease, they may confuse the positive affect induced by this feeling as useful information they should incorporate in their investment decisions.[3] As a result, subjective feelings of processing fluency can lead to stronger investor reactions to corporate disclosures (e.g., Asay et al., 2017; Elliott et al., 2017; Rennekamp, 2012).

As discussed earlier, processing motivation is low (high) for investors holding a long (short) position when confronted with positive information about a company. Hence, when they encounter positive information, we expect subjective feelings of processing fluency to influence the investment decisions of investors holding a long position, while having little effect on investors holding a short position (because such investors are sufficiently motivated to scrutinise positive information). Because we expect visualisations to be associated with increased feelings of fluency, we propose the following hypothesis:

H1: *Investors holding a short (long) position have the same (a higher) willingness to invest when shown visualisations versus text.*

Figure 1.1 graphically depicts the expected interaction in this hypothesis.

Understanding

Visualisations may be associated with increased feelings of fluency, but they may also improve investors' understanding of the information in corporate disclosures. The idea that presentation and formatting choices should help stakeholders make better decisions is widespread. For example, the SEC's (1998) *Plain English Handbook* urged companies to disclose information in plain English that investors and other stakeholders can easily understand.[4] In doing so, '[i]nvestors will be more likely to understand what they are buying and to make informed judgments about whether they should hold or sell their investments' (SEC, 1998, p. 3). Furthermore, the SEC (1998, p. 37) also provided guidelines on how companies should design and use graphics in their disclosures, arguing that '[t]he right design choices make a document easier to read and its information easier to understand.'

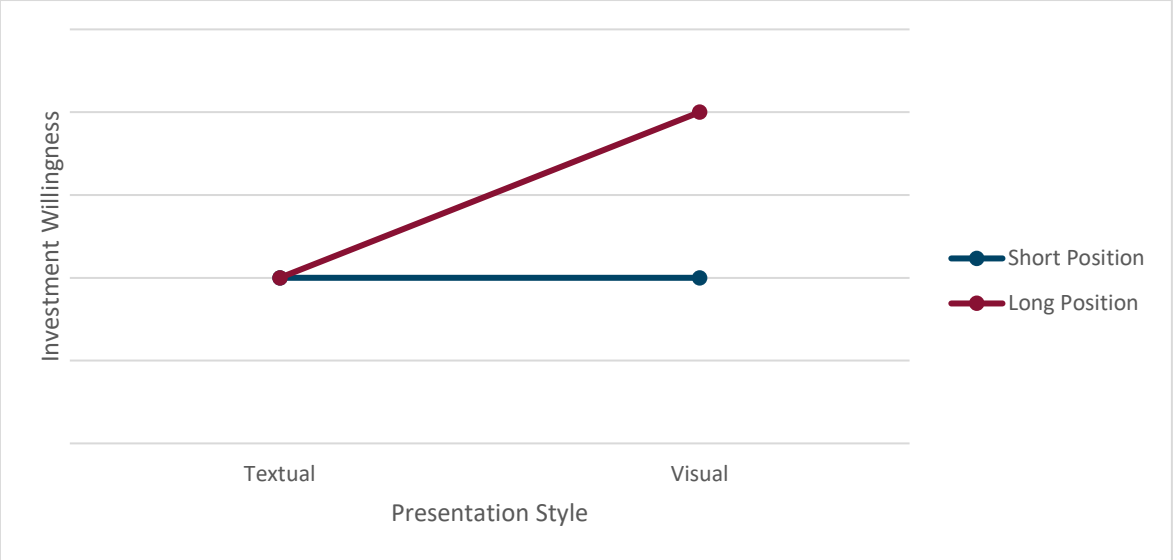
According to Mayer's (2009, p. 1) cognitive theory of multimedia learning, '[p]eople learn better from words and pictures than from words alone.' Cognitive processes such as selecting which information to attend to, organizing that information into a (coherent) mental representation, and integrating that representation with relevant knowledge stored in long-term memory, rely on working memory capacity. Research on memory

[3] This line of reasoning is consistent with feelings-as-information theory (Schwarz, 2012).

[4] Similarly, the Global Reporting Initiative (GRI, 2013) more recently provided guidelines about corporate social responsibility (CSR) reporting. In particular, their principle regarding clarity states that information should be made available 'in a manner that is understandable and accessible to stakeholders using the report' (p. 18).

capacity suggests that people can process more information when presented visually than textually (Eberhard, 2021).[5]

Figure 1.1 Predicted interaction in H1



This figure graphically depicts the predicted interaction in hypothesis 1 that posits that investors holding a short (long) position have the same (a higher) willingness to invest when shown visualisations versus text.

Combining these insights with expectations about motivated reasoning, we expect that visualisations improve the understanding of positive information about a company for investors holding a short position; while they have little effect on investors holding a long position (because such investors are motivated to take such information at face value, irrespective of their reporting format). As discussed earlier, processing motivation is high (low) for investors holding a short (long) position when confronted with positive information about a company. Hence, in such a scenario, investors holding a short position are likely to rely on the content of the information itself, which should improve their ability to incorporate such information in their investment decisions. Therefore, we propose the following hypothesis[6], which is depicted graphically in Figure 1.2:

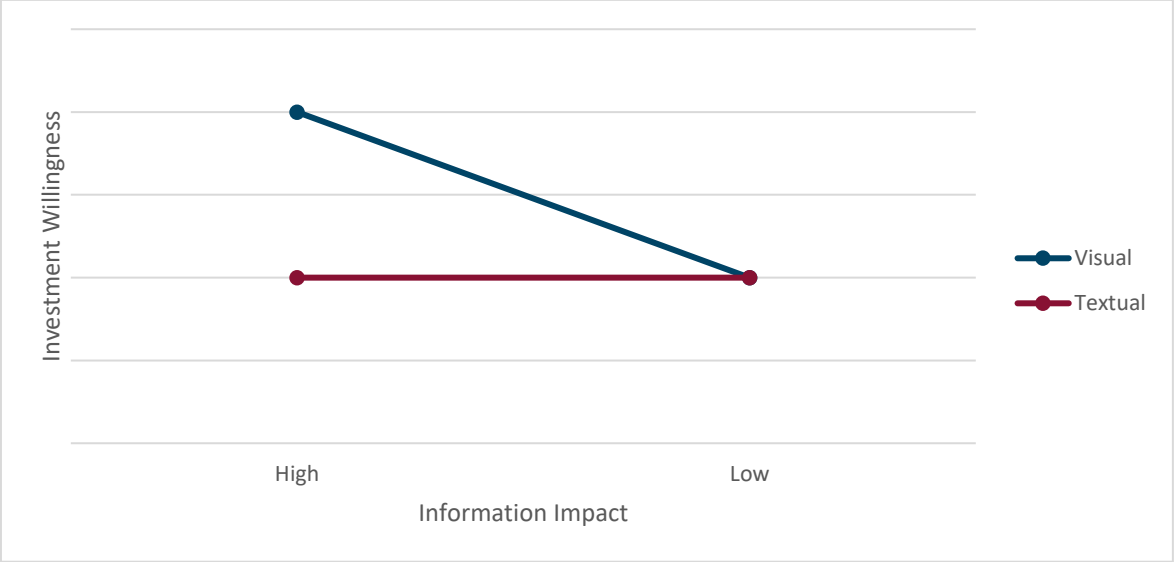
H2: *Investors holding a short (long) position will (not) better incorporate information into their investment decisions when shown visualisations versus text.*

[5] While the CTML originated in educational psychology, there are several theoretical similarities to the investment context. In a recent review, Blankespoor et al. (2020) identify three (costly) steps investors take to processing disclosures: awareness, acquisition, and integration. The process investors follow to assess a company is thus similar to what people do when learning new information (i.e., selecting, organising, and integrating information). Moreover, like other people, investors have limited processing capacity. If visualisations reduce cognitive load, this would reduce investors' processing costs and impact their investment decisions.

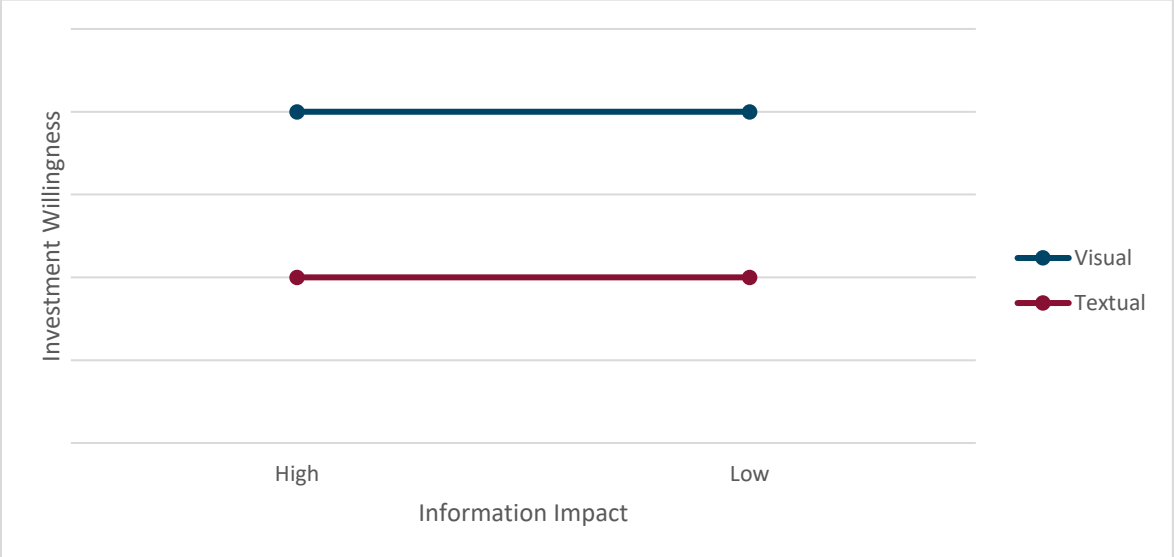
[6] Compared to our pre-registration, we changed the wording of this hypothesis slightly to bring it more in line with our empirical tests.

Figure 1.2 Predicted interactions in H2

Panel A Interaction between presentation style and information impact for investors holding a short investment position



Panel B Interaction between presentation style and information impact for investors holding a long investment position



This figure graphically depicts the predicted interactions in hypothesis 2 that posits that Investors holding a short (long) position will (not) better incorporate information into their investment decisions when shown visualisations versus text. In this figure, information incorporation is operationalised as investors reacting differentially to information that has a high vs. a low positive impact on a firm's stock price.

Our final hypothesis explicitly considers the underlying mechanisms through which visualisations can affect investor judgments. Specifically, we expect that processing fluency and understanding mediate the effect of visualisations in corporate disclosures on

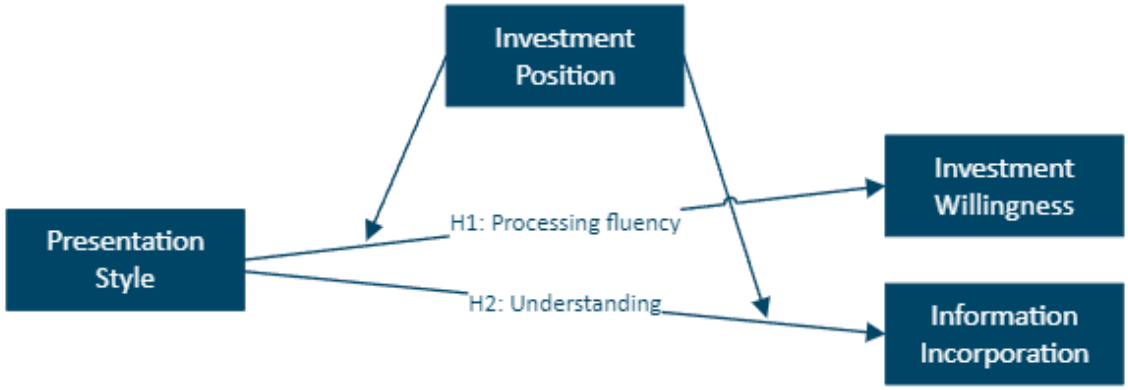
investor judgments. Incorporating insights about motivated reasoning, we formalise our expectation in the following hypothesis:

H3: *Subjective feelings of processing fluency have a smaller (larger) influence than understanding on the effect of visualisations versus text on investors' willingness to invest when holding a short (long) position.*

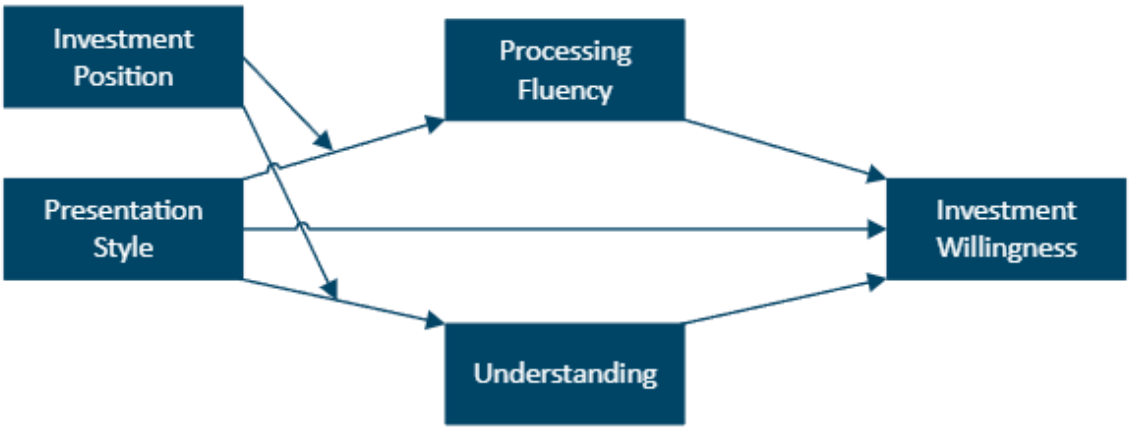
Figure 1.3 summarises our three hypotheses.

Figure 1.3 Conceptual framework

Panel A Hypothesis 1 and 2



Panel B Hypothesis 3



Panel A presents the conceptual framework for hypotheses 1 and 2. The first hypothesis is based on processing fluency and predicts that investors holding a short (long) position have the same (a higher) willingness to invest when shown visualisations versus text. The second hypothesis is based on the CTML and understanding and predicts that investors holding a short (long) position will (not) better incorporate information into their investment decisions when shown visualisations versus text. Panel B presents the conceptual framework for hypothesis 3. This hypothesis predicts that subjective feelings of processing fluency have a smaller (larger) influence than understanding on the effect of visualisations versus text on investors' willingness to invest when holding a short (long) position.

1.3 Experiment

Participants

We recruited 434 participants through Prolific, who served as a proxy for nonprofessional investors.[7] We determined our sample size in advance based on the recommendations by Bentley (2021).[8] We pre-screened participants by setting the following requirements: participants' first language must be English, they must be 18 years or older, they must have previously made investments in the common stock or shares of a company, they must have invested in the stock market, and they must sometimes, most of the time, or always examine a company's financial statements when evaluating a company's stock as a potential investment. Furthermore, we required participants to have an approval rate of 95% or more on Prolific.

We excluded 35 participants due to one or more failed attention checks.[9] As our first two attention checks, we asked participants two questions about our investment position manipulation. We placed these questions right after the manipulation to ensure participants would pay sufficient attention to the manipulation.[10] As our third and fourth attention checks, we asked participants two general attention check questions. We followed the approach by Liu et al. (2020) of surrounding these attention check questions with dummy questions that were similar to the other questions in the survey.[11] One potential downside of attention checks is that participants may be offended and would

[7] Like Amazon's Mechanical Turk (MTurk), Prolific is an online crowdsourcing platform. However, recent work suggests that participants on Prolific are more naïve and less dishonest, and that overall data quality is higher than on MTurk (Peer et al., 2017; Peer et al., 2021). Furthermore, Prolific is aimed specifically at scientific research and offers a wider range of pre-screening options. We recruited an additional 217 participants for a third presentation style condition where we combined the visual and textual manipulations. On average, participants took approximately 13 minutes to complete the experiment in exchange for £1.25. Participants assigned to the long position received a bonus of £0.25. On average, participants are 42 years old, they have 20 years of work experience, and they have taken 1.26 accounting courses and 1.35 finance courses on a university or college level. Furthermore, 69.5% of participants is male, 29.7% is female, and 0.7% identify in some other way. 4.5% of participants completed an MBA, 3.3% of participants is a Certified Public Accountant, and 23.3% of participants has worked in accounting or finance.

[8] As we expect an ordinal interaction in a two-way between subjects ANOVA (i.e., in our second analysis), Bentley (2021) recommends a sample size of 486 participants to detect a median ordinal effect in behavioural accounting research that uses MTurk participants ($\eta_p^2 = 0.0126$) with a power of 0.8 and an alpha of 0.05. As our other analyses are rarer or non-existent in accounting research, it is difficult to gauge effect sizes, and we thus refrain from conducting additional power analyses. To keep the experiment economical, we settle on a total of 600 participants (see Footnote 7 regarding additional participants).

[9] From our additional sample of 217 participants, we excluded 16 participants due to failed attention checks.

[10] We asked participants the following two questions: 'If the stock price of Enzymo increases over the fiscal year 2021, then which of the following is true?' and 'What kind of position do you hold in the firm?'

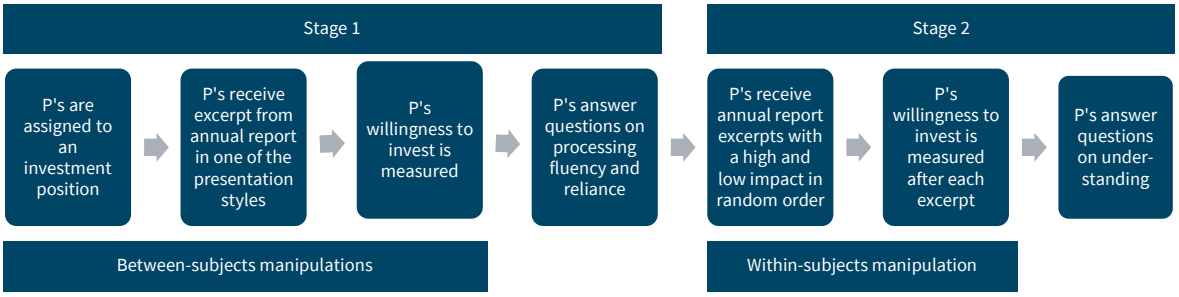
[11] As attention checks, we asked, 'I have never used the internet myself.' and 'I currently don't pay attention to the questions I am being asked in the survey.' On a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), we excluded all participants who did not answer 1 (strongly disagree). We surrounded these attention checks by the following questions: 'I believe Enzymo has a sustainable business model.', 'I am confident investing in Enzymo', 'I believe Enzymo's products are necessary for a sustainable future.', and 'Enzymo has shown good sales performance.'

therefore answer less thoroughly to subsequent questions (Peer et al., 2014). We mitigated this concern in two ways. First, our first two attention checks were specific to our study, so participants did not necessarily identify these questions as attention checks. Second, we placed our last two attention checks at the end of the survey so they could not influence previous questions.

Design

The study design is a 2 (presentation style: visual or textual) x 2 (investment position: long or short) x 2 (information impact: high or low) mixed factorial design where the first and second factors are manipulated between subjects and the third factor is manipulated within subjects.[12] Furthermore, we also measure the dependent variable before the within-subjects manipulation, so included in the broader study design is a 2 x 2 between-subjects factorial design. In Figure 1.4, this part of the study is represented as Stage 1, whereas the broader study design comprises both stages. Demographic questions were asked at the end of Stage 2.

Figure 1.4 Study design and order of tasks



This figure shows the study design and the order of tasks. Both manipulations in Stage 1 of the experiment are between-subjects (i.e., participants only see one version of both manipulations, and their willingness to invest is measured once). The manipulation in Stage 2 of the experiment is within-subjects (i.e., participants see both versions of the manipulation, and their willingness to invest is measured twice, after seeing each version of the manipulation).

Manipulations

We applied our first manipulation to an excerpt from the 2020 annual report of a fictitious biotechnology firm, Enzymo.[13] To manipulate presentation style, we started with a fully textual disclosure and then applied the relevant principles from the CTML (see Table A.1 in Appendix A). In this context, we began with a textual disclosure and aimed to enhance it by integrating visual elements. Consequently, not all CTML principles were applicable.

[12] We also include a third presentation style condition for exploratory analyses. In this condition, we combine the visual and the textual conditions.
[13] We adapted all experimental materials from those of a real biotechnology firm.

We selected the Multimedia, Coherence, and Spatial Contiguity principles because they directly address the integration of text and visuals, which was our primary goal.[14]

Processing information is cognitively demanding, and the CTML principles are designed to manage cognitive load (Mayer, 2009). To facilitate effective learning, it is important to minimise extraneous cognitive load, which is caused by unnecessary or poorly designed information. Essential processing should be as efficient as possible to ensure that the fundamental material is clearly understood. Additionally, maximising generative processing, which involves deeper understanding and making meaningful connections, enhances the overall learning experience.

First, as suggested by the Multimedia Principle, we visualised a part of the textual disclosure to foster generative processing. Specifically, we visualised all quantitative information; we visualised the relative amount of sales for the firms' regions on a geographic map and the relative amount of sales per business segment on a half-pie chart. Furthermore, we included pie charts per region on the geographic map and used a different shade of colour according to the region's relative amount of sales. We also included percentage sales growth with growth indicated by an arrow for both the regions and the business segments. Second, in line with the Coherence Principle, we avoided extraneous words and visualisations by presenting information only textually or visually.[15] Lastly, following the Spatial Contiguity Principle, we ensured that corresponding text and visualisations were presented close to each other to minimise extraneous cognitive load. Both manipulations can be found in Figures A.1 and A.2 in Appendix A.

We manipulated investment position by assigning participants to either a short or long investment position. To do so, we told participants that their bonus compensation depended on the stock price movement of Enzymo in the following year (adapted from Hales, 2007). As we only provide positive information on the firm, only the participants assigned to the long position received bonus compensation. Furthermore, based on pre-tests, we added two attention checks right below this manipulation to ensure participants properly read the manipulation (see Participants). The full manipulations are shown in Figures A.4 and A.5 in Appendix A.

[14] Other principles from CTML were not applied due to their irrelevance to a written report that combines text and visuals. For instance, the Modality Principle, which suggests using narration instead of on-screen text, is not relevant in a static, written format. The Temporal Contiguity Principle, which deals with the timing of presenting words and pictures, is less applicable as our disclosure is designed for a static, non-temporal reading experience. Principles like Segmenting, Pre-training, Personalization, Voice, and Image are geared towards dynamic multimedia presentations (such as videos or interactive modules) and thus do not fit the static nature of our textual and visual combination.

[15] In addition to a textual and a visual manipulation, we also created a manipulation that combines both and thus does not adhere to the Coherence Principle. This condition is excluded from our main analyses but is used for exploratory analyses. This manipulation can be found in Figure A.3 in Appendix A.

Lastly, we manipulated information impact within-subjects. Accordingly, we showed participants two excerpts from Enzymo's 2021 annual report that reported growth for a certain business in a certain region. Thus, all participants saw a high-impact and a low-impact excerpt regardless of their condition. We kept the growth rate constant for both low- and high-impact information excerpts while varying the business and the region. For the low-impact information excerpt, we chose the firms' smallest region and business. For the high-impact information excerpt, we chose the firms' largest region and business. To understand if a disclosure contained low or high-impact information (and incorporate that information in their investment judgments), participants needed to rely on their knowledge about Enzymo from its 2020 annual report. Figures A.6 and A.7 in Appendix A show these two excerpts.

Task and procedure

In Stage 1 of our experiment, we first told participants that, as part of their annual review of their portfolio holdings, they are considering investing in Enzymo. We then told them that their bonus compensation depends on the stock price movement of Enzymo and we randomly assigned participants to either a short or a long investment position. Participants then received the first information from Enzymo as an excerpt from their 2020 annual report. In this piece of information, we manipulated presentation style (i.e., we randomly provided participants with a visual or a textual version of Enzymo's 2020 annual report). After reading this report, we asked participants to perform an initial assessment of Enzymo as a potential investment.[16] At this point, we also asked participants questions related to processing fluency and reliance.

In the second stage of our experiment, we told participants that since reading Enzymo's 2020 annual report, approximately one year had passed and that they would receive two excerpts from Enzymo's 2021 annual report. One of these excerpts contained information with a high impact on Enzymo's stock price, whereas the other contained information with a low impact on Enzymo's stock price. We asked participants to consider each excerpt in isolation, and we showed participants the two excerpts in random order (to eliminate order effects). After each excerpt, we again asked participants to make an investment assessment. We then asked participants several questions related to understanding. We finished the experiment with several attention checks, demographic questions, and a short debrief.

[16] While participants' bonus compensation depended on Enzymo's stock price movement, participants did not yet hold a position in the company as an investor. Therefore, participants were still able to evaluate the company as a potential investment. This approach is similar to Han and Tan (2010), who asked participants holding a short and long position investment-related judgments (e.g., participants' preferred investment position).

Primary dependent and process variables

Investment willingness

After viewing the excerpt from Enzymo's 2020 annual report and the two excerpts from Enzymo's 2021 annual report, we asked participants 'How willing are you to invest in Enzymo?' Participants responded on an 11-point scale, ranging from 1 (absolutely not willing to invest) to 11 (absolutely willing to invest). We also asked participants 'How attractive is Enzymo as a potential investment?' Participants responded on an 11-point scale, ranging from 1 (not at all attractive) to 11 (very attractive). For our analyses, we use the average of these two measures. As a result, we have measures for investment willingness at three different time points. To test our first hypothesis, we use the first measure of investment willingness (investment willingness$_{(t)}$). For our second hypothesis, we use the second and third measure of investment willingness (investment willingness$_{(t+1, t+2)}$). For our last hypothesis, we calculate 'final investment willingness' as the average of the second and third measure.

Processing fluency, reliance, and understanding

We measured participants' subjective feelings of processing fluency by asking 'The process of assessing the report was…', ranging from 0 (difficult) to 100 (easy; adapted from Graf et al., 2018). We also measured participants' reliance on the report by asking 'I felt I could rely on the report.', ranging from 1 (strongly disagree) to 7 (strongly agree). To measure understanding, we asked participants to rank Enzymo's regions and businesses from large to small. If participants correctly identified the largest and the smallest region, we code this response as 1 and incorrect answers as 0. We do the same for the ranking exercise of Enzymo's businesses and take the average of the answers to these two questions as our overall understanding measure.

1.4 Results

Manipulation and recall checks

We assess the effectiveness of our investment position manipulation by asking participants 'How do you want Enzymo's sales growth to be over the fiscal year 2021?' on a 7-point scale ranging from 1 (extremely negative) to 7 (extremely positive). On average, participants in the short investment position condition answered 1.66 and participants in the long investment position condition answered 6.74, which indicates our manipulation was successful. Furthermore, at the end of the survey we included a recall check where we ask participants 'What kind of position did you hold in Enzymo?' and 99% of participants correctly indicated which investment position they held in the firm. Moreover, we included a recall check for our presentation style manipulation; we asked participants 'Did

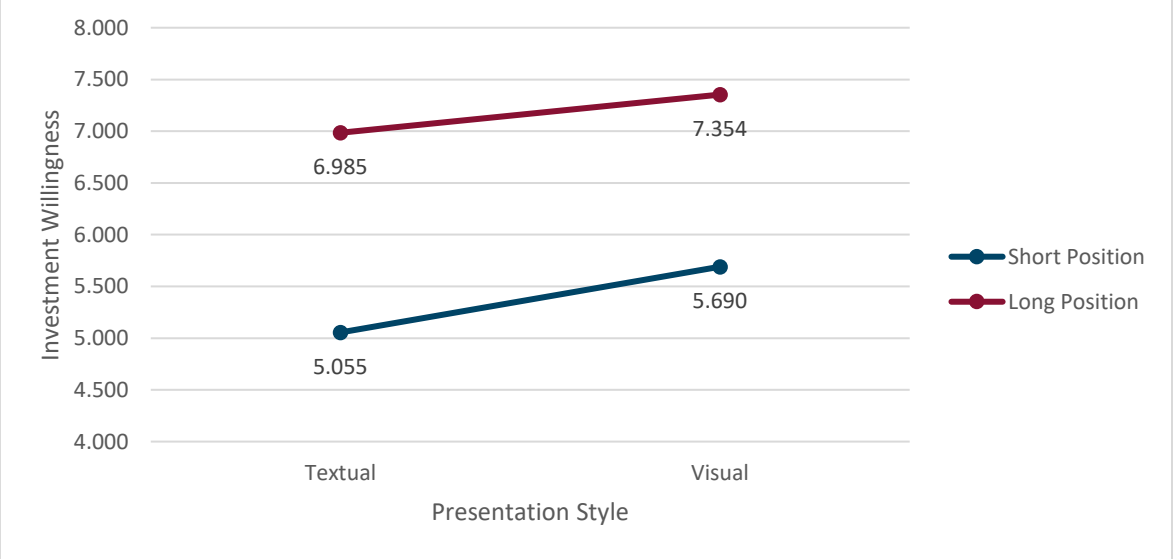
you see the following world map in Enzymo's 2020 annual report?' and 92% of participants correctly responded.

Confirmatory analyses[17]

Test of H1: Effect of visualisations on investment willingness

In our first hypothesis, we predict that investors holding a long position will have a higher willingness to invest when shown visualisations in corporate disclosures compared to fully textual disclosures. In contrast, we predict that investors' willingness to invest is unaffected by whether they are shown visualisations or textual disclosures when they hold a short position. In Table 1.1, Panel A, we show descriptive statistics for participants' investment willingness. In Figure 1.5, we present participants' mean investment willingness by condition. In Table 1.1, Panel B, we present the results of a two-way ANOVA with investment willingness as the dependent variable. The results show a statistically significant main effect for investment position ($F(1, 395) = 73.327$ $p < 0.001$) and presentation style ($F(1, 395) = 5.719$, $p = 0.017$).

Figure 1.5 Plot of participants' mean investment willingness



This figure illustrates the mean investment willingness by condition. For investment willingness, we use participants' investment willingness at the end of Stage 1 (i.e., investment willingness(t)).

However, the interaction effect of investment position and presentation style is not statistically significant ($F(1, 395) = 0.403$, $p = 0.526$), so our results only provide partial

[17] As we have pre-registered this study, we make the distinction between confirmatory and exploratory analyses. Our confirmatory analyses include all analyses for which we had a priori hypotheses, and these are included in the pre-registration. For our exploratory analyses, we had no clear a priori hypotheses.

support for our first hypothesis. Both investors holding a long and a short investment position have a higher willingness to invest when shown visualisations compared to text.

Table 1.1 Descriptive statistics and ANOVA: How presentation style and investment position affect investment willingness – tests of H1

Panel A: Descriptive statistics, Mean (Standard Deviation), n = 399			
	Presentation Style		
Investment Position	*Visual*	*Textual*	*Overall*
Short	5.690	5.055	5.373
	(2.161)	(2.175)	(2.186)
	n = 100	n = 100	n = 200
Long	7.354	6.985	7.168
	(1.909)	(2.124)	(2.023)
	n = 99	n = 100	n = 199
Overall	6.518	6.020	6.268
	(2.199)	(2.353)	(2.288)
	n = 199	n = 200	n = 399

Panel B: Two-way ANOVA					
Source of Variation	**SS**	**df**	**MS**	**F-statistic**	**p-value**
Investment Position	322.024	1	322.024	73.327	<0.001
Presentation Style	25.114	1	25.114	5.719	0.017
Investment Position x Presentation Style	1.771	1	1.771	0.403	0.526
Error	1734.691	395	4.392	0.000	

Panel A presents the mean investment willingness by condition. Panel B presents the results of a two-way between-subjects ANOVA with presentation style (visual and textual condition) and investment position (short and long position) as factors, and investment willingness as the dependent variable. For investment willingness, we use participants' investment willingness at the end of Stage 1 (i.e., investment willingness(t)). All p-values are two-tailed.

Test of H2: Effect of visualisations on how well investors incorporate their knowledge into their investment decision

Our second hypothesis predicts that visualisations improve how well investors incorporate their knowledge into their investment decision, but only when they hold a short position. In Table 1.2, Panel A, we show descriptive statistics for participants' investment willingness. Figure 1.6 presents participants' mean investment willingness by condition. In Table 1.2, Panel B, we present results of a three-way mixed analysis of variance (ANOVA) with investment willingness as the dependent variable. In a mixed ANOVA, we are interested in the change in the dependent variable (i.e., investment willingness). In our results, this change is represented by the main effect for information impact, which is statistically significant ($F(1, 395) = 5.531$, $p = 0.019$). This indicates that investors incorporate their knowledge into their investment decision. For our hypothesis, we are interested in whether this effect depends both on presentation style (i.e., visual vs. text) and investment position (i.e., a long vs. a short position).

Table 1.2 Descriptive statistics and ANOVA: How presentation style, investment position and information impact affect investment willingness – tests of H2

Panel A: Descriptive statistics, Mean (Standard Deviation), n = 399				
		Presentation Style		
Investment Position	**Information Impact**	*Visual*	*Textual*	*Overall*
Short	*High*	5.645 (2.560) n = 100	5.205 (2.648) n = 100	5.425 (2.607) n = 200
	Low	5.675 (2.490) n = 100	5.160 (2.622) n = 100	5.418 (2.563) n = 200
Long	*High*	8.207 (2.001) n = 99	7.820 (2.013) n = 100	8.013 (2.012) n = 199
	Low	7.975 (2.058) n = 99	7.565 (2.211) n = 100	7.769 (2.141) n = 199
Overall	*High*	6.920 (2.628) n = 199	6.513 (2.687) n = 200	6.716 (2.663) n = 399
	Low	6.819 (2.554) n = 199	6.363 (2.703) n = 200	6.590 (2.636) n = 399

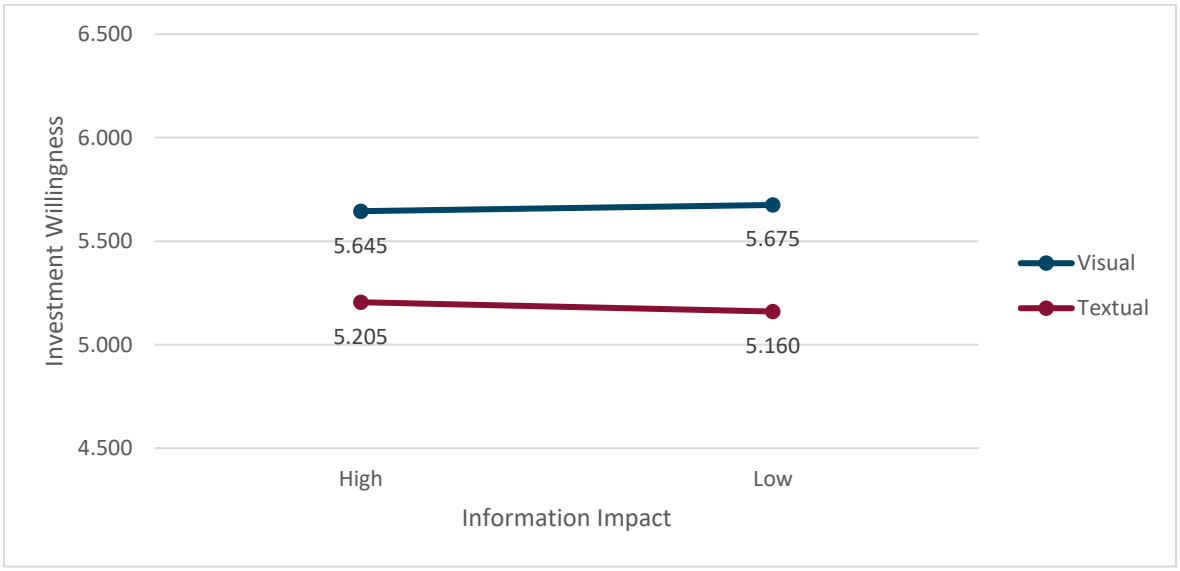
Panel B: Three-way mixed ANOVA					
Source of Variation	**SS**	**df**	**MS**	**F-statistic**	**p-value**
Information Impact	3.146	1	3.146	5.531	0.019
Information Impact x Investment Position	2.782	1	2.782	4.890	0.028
Information Impact x Presentation Style	0.119	1	0.119	0.209	0.648
Information Impact x Investment Position x Presentation Style	0.034	1	0.034	0.060	0.807
Error	224.681	395	0.569		

Panel C: Simple effects tests for investment willingness				
Source of Variation	**df**	**error df**	**F-statistic**	**p-value**
Effect of Information Impact given Short Position	1	395	0.010	0.921
Effect of Information Impact given Long Position	1	395	10.385	0.001

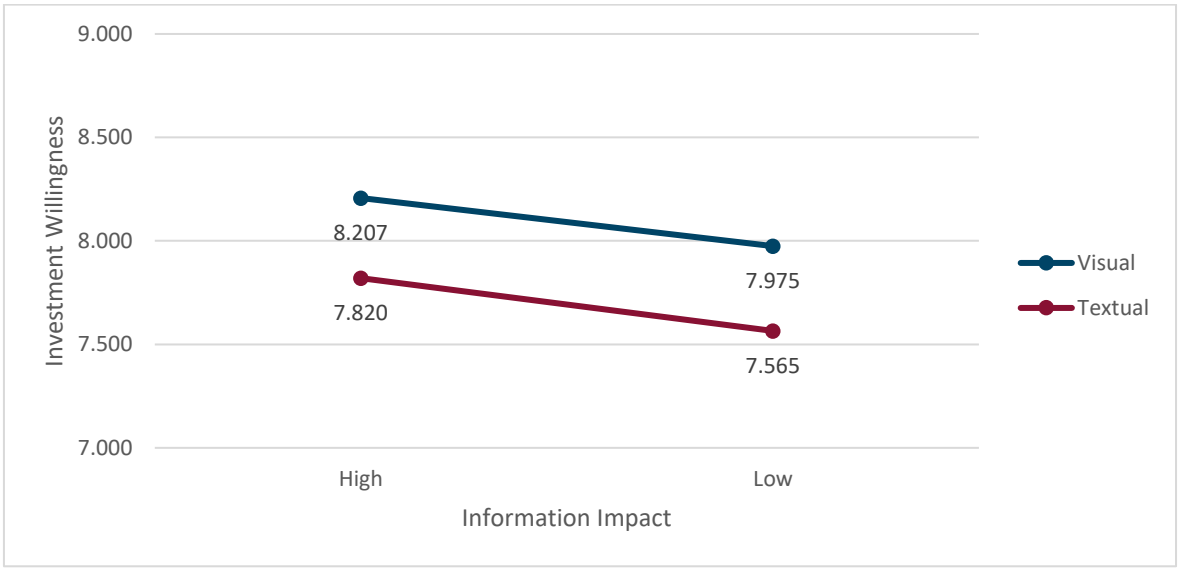
Panel A presents the mean investment willingness by condition. Panel B presents the results of a three-way mixed ANOVA with information impact (high or low) as the within-subjects factor, presentation style (visual and textual condition) and investment position (short and long position) as the between-subjects factors, and investment willingness as the dependent variable. Panel C presents the results of simple effects tests for investment willingness. For investment willingness, we use participants' investment willingness at Stage 2 after receiving each excerpt (i.e., investment willingness(t+1) and investment willingness(t+2)). All p-values are two-tailed.

Figure 1.6 Plots of participants' mean investment willingness

Panel A Plot of the mean investment willingness for participants in the short investment position condition



Panel B Plot of the mean investment willingness for participants in the long investment position condition



Panel A illustrates the mean investment willingness by condition for participants in the short investment position condition. Panel B illustrates the mean investment willingness by condition for participants in the long investment position condition. For investment willingness, we use participants' investment willingness at Stage 2 after receiving each excerpt (i.e., investment willingness$_{(t+1)}$ and investment willingness$_{(t+2)}$).

In addition to our statistically significant main effect for information impact, we find a statistically significant interaction between information impact and investment position ($F(1, 395) = 4.890$, $p = 0.028$), so our statistically significant main effect for information

impact should be interpreted with caution. Therefore, we follow up on this statistically significant interaction with simple effects tests. The results in Table 1.2, Panel C show that there is no statistically significant effect of information impact for investors holding a short position ($F(1, 395) = 0.010$, $p = 0.921$), but that there is a statistically significant effect of information impact for investors holding a long position ($F(1, 395) = 10.385$, $p = 0.001$). Lastly, we find no statistically significant interaction between information impact and presentation style ($F(1, 395) = 0.119$, $p = 0.648$) and no statistically significant three-way interaction between presentation style, information impact and investment position ($F(1, 395) = 0.060$, $p = 0.807$).

Our results thus provide no support for our second hypothesis. First, we find no statistically significant three-way interaction between information impact, presentation style, and investment position. This suggests that presentation style does not influence how well investors incorporate their knowledge into their investment decision, regardless of their investment position. Second, whereas we expected investors holding a short position to better incorporate their knowledge into their investment decisions, our results suggest the opposite; only investors in the long position react to different levels of information impact.

Test of H3: Effect of visualisations on investment willingness through processing fluency and understanding

In our third analysis, we test if the effect of visualisations on investment willingness is mediated by subjective feelings of processing fluency and understanding and whether these effects are moderated by investment position. Our dependent variable is final willingness to invest, measured as the average of participants' last two investment decisions. In doing so, we expect this measure to capture both the effects of subjective feelings of processing fluency (i.e., carried forward from Stage 1 of the experiment) and understanding (i.e., from Stage 2 of the experiment).

In Table 1.3, we present descriptive statistics for our process and dependent variables. In Figure 1.7, Panel A, we provide a conceptual depiction of our process model. In Figure 1.7, Panels B and C, we present the results from our conditional process analysis (following the approach by Hayes, 2017). Our results show that investment position moderates the effect of presentation style on processing fluency ($F(1, 395) = 4.825$, $p = 0.029$, untabulated); investors holding a long investment position experience higher subjective feelings of processing fluency when shown visualisations than investors holding a short investment position. Furthermore, for investors holding a long investment position, presentation style has a statistically significant indirect effect on investment willingness through processing fluency (95% CI [0.018, 0.289]). Moreover, this effect is statistically significantly different

from that for the investors holding a short investment position (95% CI [0.011, 0.416], untabulated).

The effect of presentation style on understanding is not moderated by investment position ($F(1, 395) = 0.006$, $p = 0.936$, untabulated). However, presentation style has a statistically significant main effect on understanding regardless of investment position ($p = 0.001$). Furthermore, the indirect effect of presentation style on investment willingness through understanding is not statistically significant regardless of investment position, and these indirect effects do not statistically significantly differ across investment position conditions (95% CI [-0.064, 0.070], untabulated).

Table 1.3 Descriptive statistics for process variables

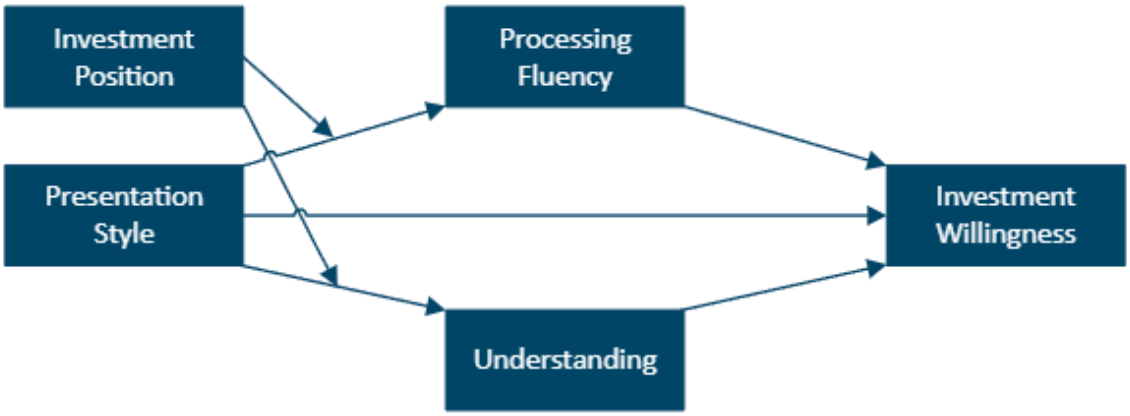
Investment Position	Presentation Style	Variable	N	Mean	Standard Deviation
Short	*Visual*	*Processing Fluency*	100	68.600	22.248
		Understanding	100	0.470	0.339
		Investment Willingness	100	5.660	2.413
	Textual	*Processing Fluency*	100	70.900	21.654
		Understanding	100	0.345	0.381
		Investment Willingness	100	5.183	2.590
Long	*Visual*	*Processing Fluency*	99	77.172	17.382
		Understanding	99	0.419	0.383
		Investment Willingness	99	8.091	1.981
	Textual	*Processing Fluency*	100	70.500	19.918
		Understanding	100	0.300	0.341
		Investment Willingness	100	7.693	2.077

This table presents the mean of processing fluency, understanding and investment willingness per condition. For investment willingness, we use the average of participants' last two measures of investment willingness (i.e., investment willingness$_{(t+1)}$ and investment willingness$_{(t+2)}$).

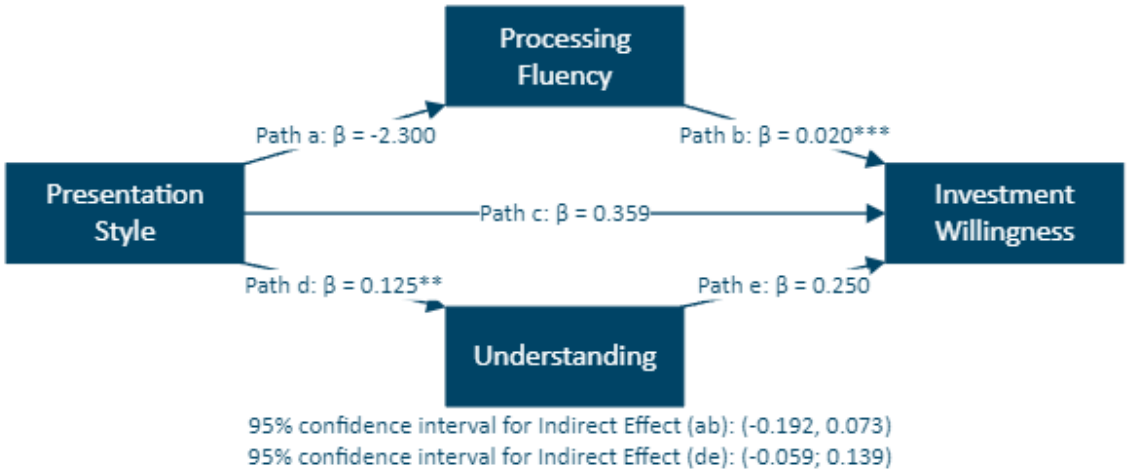
Our results only provide partial support for our third hypothesis. As expected, we find that for investors holding a long investment position, the effect of visualisations on investment willingness is mediated by subjective feelings of processing fluency. Furthermore, our results show that understanding is higher when shown visualisations for all investors regardless of investment position, but this has no statistically significant effect on investors' investment willingness.

Figure 1.7 Process model

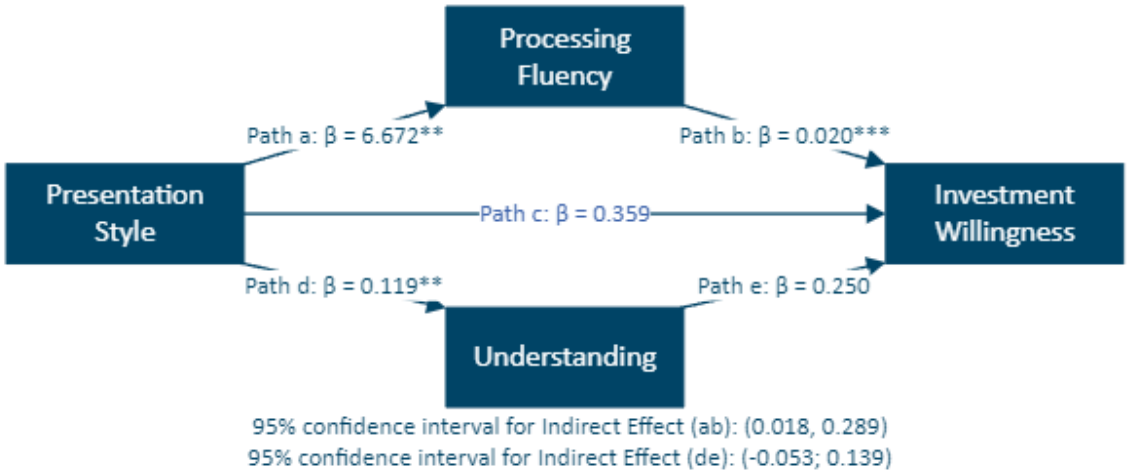
Panel A Conceptual depiction of the process model



Panel B Observed effects for participants in the short investment position condition



Panel C Observed effects for participants in the long investment position condition



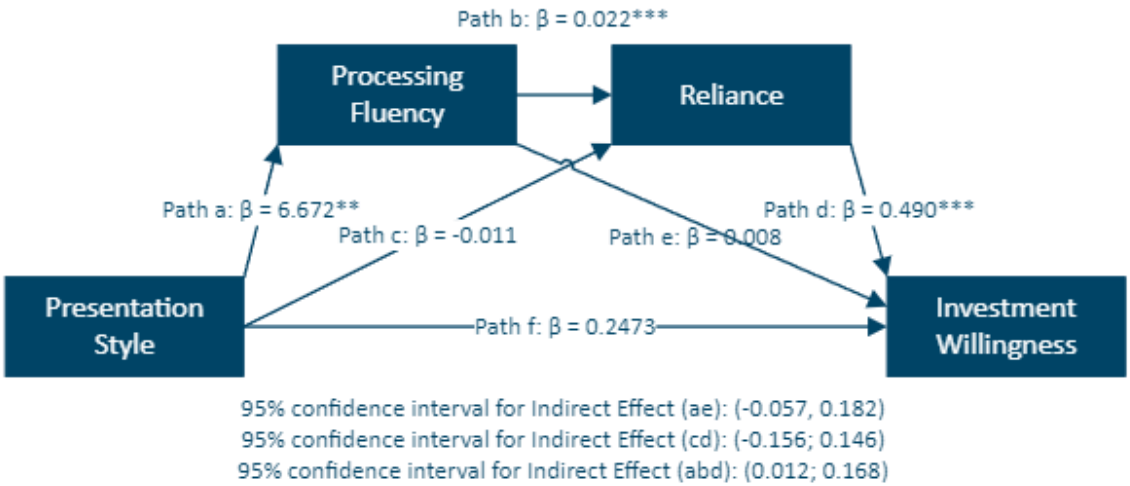
Panel A presents the conceptual depiction of the model (i.e., Model 7 from Hayes, 2017) and Panels B and C present the results per condition. For legibility, the results are presented separately per condition, but we calculated only one model including all conditions (i.e., in line with Brown et al., 2019). Presentation Style is coded -0.5 (0.5) for the textual (visual) condition and Investment Position is coded -0.5 (0.5) for the short (long) condition. We tested for conditional indirect effects using a bootstrapping procedure for each Investment Position condition and significant indirect effects are indicated by a 95% confidence interval that does not include zero. For investment willingness, we use the average of participants' last two measures of investment willingness (i.e., investment willingness$_{(t+1)}$ and investment willingness$_{(t+2)}$). ***p < 0.01, **p < 0.05.

Exploratory analyses

Effect of visualisations on investment willingness through processing fluency and reliance

Prior literature suggests that subjective feelings of processing fluency lead investors to rely more on a disclosure, leading them to react more strongly to the disclosure (e.g., Elliott et al., 2017; Rennekamp, 2012). We have already established that subjective feelings of processing fluency mediate the effect of visualisations on investment willingness for investors holding a long investment position. In this analysis we attempt to replicate prior findings by testing whether the effect of visualisations on investment willingness is serially mediated through processing fluency and reliance. As we are only interested in processing fluency, we use investment willingness at the end of Stage 1 as the dependent variable because we expect the effect of processing fluency to be the strongest here. In Figure 1.8, we present the results of a serial mediation analysis. Our results provide support that the effect of visualisations on investment willingness is indeed serially mediated by processing fluency and reliance (95% CI [0.012, 0.168]).

Figure 1.8 Serial mediation model



This figure presents the results of a serial mediation analysis (i.e., Model 6 from Hayes, 2017) for participants in the long investment position condition. Presentation Style is coded -0.5 (0.5) for the textual (visual) condition. We tested for indirect effects using a bootstrapping procedure and significant indirect effects are indicated by a 95% confidence interval that does not include zero. For investment willingness, we use participants' investment willingness at the end of Stage 1 (i.e., investment willingness$_{(t)}$). ***p < 0.01, **p < 0.05.

Do visualisations lead to more extreme reactions to disclosures?

Prior literature also suggests that higher subjective feelings of processing fluency and the resulting higher reliance on disclosures lead to more extreme reactions, and possibly an overreaction, to these disclosures (e.g., Elliott et al., 2017; Rennekamp, 2012). Our previous analyses indeed show that investors react more positively to visual disclosures, but whether this is an overreaction due to higher subjective feelings of processing fluency and a higher reliance on this information, is unclear. Investors holding a short investment position react similarly to the visual disclosure as those holding a long investment position, and our third analysis shows that these investors do not experience higher subjective feelings of processing fluency. Furthermore, our second analysis shows that investors holding a long investment position react directionally similar to subsequent high impact textual information regardless of presentation style. However, this analysis does not test whether reactions to this subsequent information are more extreme for participants who first received visual or textual information. Our research design allows us to conduct such an analysis as well.

In Table 1.4, we present the results of a two-way analysis of covariance (ANCOVA) with final investment willingness as the dependent variable. As a covariate, we add participants' investment willingness at the end of Stage 1 of the experiment. In this way, we can test whether investors who reacted stronger to visual disclosures, also react stronger to subsequent non-visual information. We find no statistically significant main effect of presentation style ($F(1, 394) = 0.000$, $p = 0.999$), so our results provide no evidence that investors react stronger to subsequent non-visual information when they previously saw a visual disclosure.

Table 1.4 ANCOVA: How presentation style and investment position affect final investment willingness, controlling for prior investment willingness

Source of Variation	SS	df	MS	F-statistic	p-value
Investment willingness	1320.623	1	1320.623	710.985	<0.001
Presentation Style	0.000	1	0.000	0.000	0.999
Investment Position	68.559	1	68.559	36.910	<0.001
Presentation Style x Investment Position	0.586	1	0.586	0.316	0.575
Error	731.837	394	1.857	0.000	

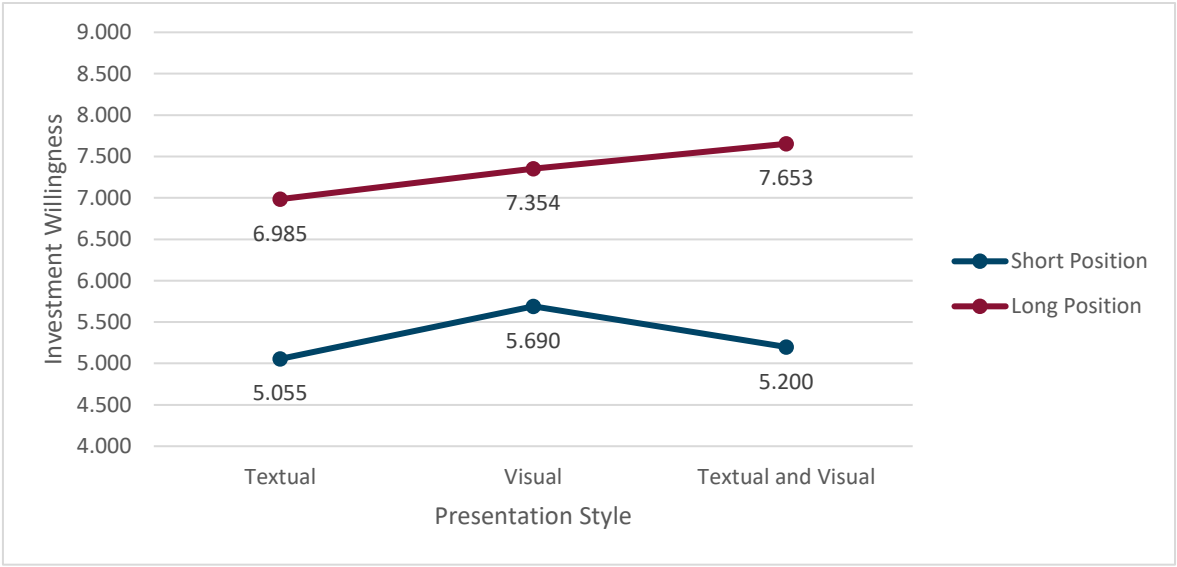
This table presents the results of a two-way between-subjects ANCOVA with presentation style (visual and textual condition) and investment position (short and long position) as factors, and final investment willingness (i.e., the average of investment willingness$_{(t+1)}$ and investment willingness$_{(t+2)}$) as the dependent variable. As a covariate, we use prior investment willingness (i.e., investment willingness$_{(t)}$). All p-values are two-tailed.

Variation in the integration of text and visuals

In addition to a textual and a visual disclosure manipulation, we also included a combined manipulation in our experiment. While we also included text in our visual disclosure, we were careful not to repeat information in both a textual and a visual format (in line with the Coherence Principle, see Table A.1 in Appendix A). For our combined manipulation, we included all text from the textual disclosure in the visual disclosure. Based on the CTML's Coherence Principle, we would expect this format to be less effective, but considering our specific investing context, more information might be considered better as this could lead to less uncertainty.

We conduct our first analysis again, but this time including the third presentation style condition. In Figure 1.9, we present the means per condition. The results remain inferentially the same as those of our first analysis, with a statistically significant main effect for presentation style ($F(2, 594) = 3.317$, $p = 0.037$, untabulated) and investment position ($F(1, 594) = 124.430$, $p < 0.001$, untabulated), and no significant interaction between presentation style and investment position ($F(2, 594) = 1.889$, $p = 0.152$, untabulated). However, a post hoc analysis shows no statistically significant difference between the combined presentation style manipulation and either the visual or the textual presentation style manipulation. These results thus suggest that the proper integration between visualisations and text is important to have an effect of visualisations on investment willingness.

Figure 1.9 Plot of participants' mean investment willingness



This figure illustrates the mean investment willingness by condition. For investment willingness, we use participants' investment willingness at the end of Stage 1 (i.e., investment willingness$_{(t)}$).

1.5 Discussion and conclusion

We investigate the effect of visualisations in corporate disclosures on investors' investment willingness and whether this effect is moderated by investors' information preferences. Furthermore, we investigate the role of subjective feelings of processing fluency and understanding in explaining the effect of visualisations on investment willingness. We find that visualisations in corporate disclosures increase investors' investment willingness regardless of whether the information is preference-consistent or not. Moreover, we find that this effect does not extend to subsequent non-visual disclosures. We also find that for investors that receive preference-consistent information, the effect of visualisations on investment willingness is partially due to increased feelings of processing fluency. Furthermore, we provide evidence that these subjective feelings of processing fluency lead to a higher reliance on a disclosure, which in turn increases investors' investment willingness. Additionally, we find that visualisations increase investors' understanding of a disclosure, but we find no evidence that this increased understanding influences investors' investment willingness.

Our first result that visualisations in corporate disclosures increase investors' investment willingness is consistent with prior literature on readability (e.g., Elliott, Rennekamp, et al., 2014; Rennekamp, 2012). We extend this research by showing this effect is applicable to both investors that receive preference-consistent and investors that receive preference-inconsistent information. Our results show that investors that receive preference-inconsistent react more conservatively to information in general (i.e., showing a lower willingness to invest based on the same information), but their reaction to visualisations is the same as investors that receive preference-consistent information. Furthermore, we show that investors that receive preference-consistent information experience higher subjective feelings of processing fluency when shown visualisations than investors that receive preference-inconsistent information. Together with their more conservative reactions, and consistent with motivated reasoning theory, this suggests that investors that receive preference-inconsistent information, process this information more carefully and are influenced less by their feelings.

Furthermore, our results show that investors' increased investment willingness when shown visualisations does not extend to subsequent (non-visual) information they receive; the change in investors' investment willingness to subsequent information is the same regardless of whether they first received visual or textual disclosures. Furthermore, we see a difference in the reaction to subsequent information depending on whether investors receive preference-consistent or preference-inconsistent information. Investors that receive preference-consistent positive information, react positively to this information,

whereas for investors that receive preference-inconsistent positive information, we find no such reaction. One explanation for this phenomenon is again that investors that receive preference-inconsistent information are more conservative in their reactions, and therefore they need even more positive information before they react.

Taken together, these results provide some evidence that the inclusion of visualisations in corporate disclosures does not lead to an overreaction. Our results show no difference in the reaction to visualisations of investors that receive preference-consistent or preference-inconsistent information, despite evidence for differences in these investors' information processing. Moreover, both these investors' reactions to subsequent non-visual information are the same regardless of whether they first received a visual or a textual disclosure. Both these findings suggest that investors' do not overreact to disclosures that include visualisations. In addition, after participants received their first disclosure in either a visual or a textual format and they made their first investment decision, we measured their subjective feelings of processing fluency. Feelings-as-information theory suggests that when people are made aware of the source of their feelings, they no longer misattribute them as useful information (Schwarz, 2012). As such, if participants had made such a mistake, they would have had the chance to revise their investment willingness when reacting to the subsequent information. As we detected no such revision, it does again not appear as if participants overreacted to the visual disclosure.

Additionally, we provide further process evidence suggesting that using visualisations in disclosures increases investors' understanding, but we find no evidence that this affects their investment willingness. This is also clear from the second stage of our experiment, where we show participants both 'high impact' and 'low impact' information. Regardless of whether participants first received a visual or a textual disclosure, their reactions to both pieces of information were the same. This suggests that perhaps the information was not complex enough to find an effect. In contrast, we do find a significant indirect effect of visualisations on investment willingness through processing fluency, but only for investors that receive preference-consistent information. Furthermore, we replicate prior research and show that this is due to these investors' higher reliance on information that is easier to process. However, this effect is small and does not explain the reaction to visualisations for investors that receive preference-inconsistent information.

Overall, our results provide no unequivocal evidence in favour of or against visualisations in corporate disclosures. In its Plain English Handbook, the SEC (1998) suggested that visualisations can make disclosures more readable and thus easier to understand, which should help investors make more informed investment decisions. We find evidence that visualisations indeed increase investors' understanding. However, we find no link with their willingness to invest. Furthermore, our results provide some evidence that the use of

visualisations in corporate disclosures does not lead to an overreaction. In future research, investigators could include more objective benchmarks to assess whether participants overreact. Lastly, while we find an indirect effect of visualisations on investment willingness through subjective feelings of processing fluency, this effect only holds for investors that receive preference-consistent information, which suggests that there may be a different mechanism in play.

Chapter 2 Language and Investors' Assessment of CSR Disclosures

Abstract I report the results from a pre-registered study on the role of language on investors' assessment of corporate social responsibility (CSR) disclosures. Drawing on research from psychology on the foreign language effect, I expect that investors will rely less on their emotions when assessing CSR disclosures in a foreign language compared to when they assess these disclosures in their native language. Specifically, I examine whether CSR disclosures have a smaller influence on investors' willingness to invest when these disclosures are presented in a foreign language compared to their native language. I conduct an experiment on Prolific involving 405 participants with a 2 (language: native or foreign) x 2 (CSR disclosure: lower ethicality or higher ethicality) between-subjects factorial design. The principal findings from the experiment indicate that processing CSR disclosures in a foreign language weakens their influence on investors' willingness to invest, regardless of the ethicality of the disclosures. Exploratory analyses show that investors' affective reactions and perceived risk mediate the effect of language on investors' willingness to invest. Moreover, these analyses reveal that investors experience lowered prosocial tendencies in a foreign language, which in turn mediate the effect of language on their willingness to invest. These findings underscore the nuanced interplay between language, CSR disclosures, and emotions in shaping investors' judgments and decisions.

Keywords CSR, foreign language, investor judgment and decisions

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2.1 Introduction

This study investigates whether presenting corporate social responsibility (CSR) disclosures in a foreign language instead of investors' native language, influences their judgments and decisions. Previous research in psychology documents a foreign language effect (FLE). This effect suggests that reading information in a foreign language can mute emotional responses, particularly in moral decision-making and risk aversion domains. As a result, individuals often exhibit reduced decision biases and tend to make more utilitarian decisions when processing information in a foreign language (Circi et al., 2021; Del Maschio et al., 2022; Hadjichristidis et al., 2019). Building on this literature, I hypothesise that investors will rely less on their emotions in assessing CSR disclosures in a foreign language compared to a native language.

Given the global nature of financial markets, investors are often faced with CSR disclosures in a foreign language. This becomes increasingly true as companies worldwide adopt English as an external reporting language (Jeanjean et al., 2010), leaving non-native English-speaking investors to read reports in a foreign language. Moreover, while CSR reports in Europe are also most often written in English, many are still presented in other languages, with Spanish, French, and German being the most common alternatives (Goloshchapova et al., 2019). In this globalised context, where investors frequently encounter disclosures in both native and foreign languages, understanding the potential influence of language on investor judgments and decisions becomes paramount. This is particularly relevant for CSR disclosures because these inherently possess both emotional and moral dimensions.

Unlike financial disclosures, CSR disclosures are often more emotional by nature because 'CSR disclosures are often vivid and imagery provoking' (Elliott, Jackson, et al., 2014, p. 279). This emotional resonance is further supported by research suggesting that investors' affective reactions play a significant role in how they incorporate CSR performance into firm value (Elliott, Jackson, et al., 2014; Guiral et al., 2020; Hartzmark & Sussman, 2019; Heeb et al., 2021). Moreover, the moral dimension emerges as investors not only assess a company's financial performance, but also weigh a company's broader societal and environmental contributions and consequences. Given the psychology literature's findings on the FLE, particularly its prominence in domains involving emotions and moral decision-making (Circi et al., 2021; Del Maschio et al., 2022), I expect CSR disclosures' effect on investors' willingness to invest to be muted in a foreign language due to a decreased emotional response (e.g., Hadjichristidis et al., 2019; Hayakawa et al., 2017).

Surprisingly, accounting research on language (i.e., native vs. foreign language) is quite scarce. Existing literature has mostly focussed on translation issues in accounting

standards (Evans, 2018; Nobes & Stadler, 2018), and related literature shows that financial report preparers' judgments and decision-making are influenced by these translated standards (Hellmann & Patel, 2021; Hellmann et al., 2021; Holthoff et al., 2015; Pan & Patel, 2016). Accounting literature on investors' judgments and decisions based on translated disclosures, however, is scarce (to the author's knowledge, there is only one unpublished paper on the subject; Chaskel & Fischer, 2022). One relevant finding from the archival literature in finance, is that investors are more likely to trade in companies that communicate in their native language, consistent with investors' home bias (Grinblatt & Keloharju, 2001). I suspect that one of the mechanisms that is driving this effect, is the FLE.

I conducted an experiment with a 2 (language: native or foreign) x 2 (CSR disclosure: lower ethicality or higher ethicality) between-subjects factorial design.[18] I recruited 405 Mexican participants on Prolific and presented the experiment in either Spanish, representing the native language condition, or English, signifying the foreign language condition. In addition, I manipulated the ethicality of the CSR disclosure: participants were exposed to a CSR issue either perceived as more ethically charged or one seen as less so. Moreover, issues with higher ethicality often carry a stronger emotional resonance, establishing a direct link between the ethical nature of a disclosure and the emotional response it elicits. This manipulation therefore facilitates a moderation-of-process design (Asay et al., 2021). Specifically, if an interaction between the language and the ethicality of the CSR disclosure emerges, it would provide evidence that the FLE is driven by a muted emotional response in a foreign language, consistent with prior psychological research.

The principal findings from the experiment indicate that processing CSR disclosures in a foreign language weakens their influence on investors' willingness to invest, regardless of the ethicality of CSR disclosures. As such, I find no direct evidence of a muted emotional response in a foreign language. However, exploratory analyses reveal that investors' affective reactions and perceived risk do mediate the effect of language on investors' willingness to invest. Moreover, exploratory analyses reveal that investors experience lowered prosocial tendencies in a foreign language, which in turn mediate the effect of language on their willingness to invest.

These findings significantly advance our understanding of how language affects investor behaviour in the context of CSR disclosures. By showing that CSR disclosures in a foreign language can weaken investors' willingness to invest, this study highlights the importance

[18] This study was pre-registered on the Open Science Framework (OSF): https://osf.io/gmk85. The pre-registration details the study's hypotheses, experimental design, randomization procedures, blinding, sample size (and rationale), data collection methods, variables (both manipulated and measured), statistical models, inference criteria, data exclusion criteria, and plans for exploratory analyses. Ethical approval for the experiment was granted by the institution where the online experiment was administered.

of language in shaping investor responses. This suggests that the FLE extends to financial decision-making, influencing emotional and cognitive processing. Although I did not find differences based on the ethicality of the disclosures, the results underscore the mediating roles of affective reactions and perceived risk. These insights contribute to the scarce literature on language effects in accounting and emphasize the need for companies to consider the language of their disclosures to effectively engage a global investor base. This study provides a foundation for further exploration into the nuanced impacts of language on financial decision-making.

2.2 Background and hypotheses development

CSR, financial performance, and investor judgments

Following Hales et al. (2016), I define CSR as companies trying to maximise positive externalities while limiting negative externalities. In the literature, there are competing views on whether CSR activities enhance financial performance. Some researchers argue that CSR activities should maximise owners' wealth and thus enhance financial performance, while other researchers argue that CSR activities should sacrifice financial performance for societal benefits (for a discussion, see Hales et al., 2016). In a meta-analysis of 251 studies, Margolis et al. (2009) find a small but statistically significant positive relationship between CSR and financial performance, which is mostly in line with the first view of CSR activities.

Yet, whether CSR activities benefit a firm's financial performance or not, does not appear to be the only factor investors consider. Indeed, while CSR activities may not have a direct influence on financial performance, they are still valued by investors for the societal benefits they provide (Arnold et al., 2017; Martin & Moser, 2016). Other research shows that investors overreact to CSR disclosures, as their reaction to CSR disclosures is lower when they are asked to explicitly assess CSR performance (Elliott, Jackson, et al., 2014).

Consistent with the affect-as-information hypothesis, investors unintentionally use their affective reactions towards CSR information as useful information in their valuation judgments and investment decisions (Elliott, Jackson, et al., 2014). More generally, '[t]he affect-as-information hypothesis proposes that affect assigns value to whatever seems to be causing it' (Clore & Huntsinger, 2007, p. 393). Therefore, when investors are asked to explicitly assess CSR performance, they can correctly attribute their affect to the CSR performance instead of firm value.

Further research shows that investors' unintentional overreaction to CSR disclosures is conditional upon the financial materiality of the CSR issues and the valence of the CSR performance. Financially material CSR issues are directly related to a firm's core business,

whereas financially immaterial CSR issues are peripheral and only remotely related to a firm's core business. Guiral et al. (2020) show that investors only overreact to financially immaterial CSR issues, and only when CSR performance is positive. Other research suggests investors use their affective reactions to CSR information in line with the affect heuristic (Hartzmark & Sussman, 2019). Importantly, research shows that if people use the affect heuristic, they negatively correlate benefits and risk (Slovic et al., 2007). Accordingly, Hartzmark and Sussman (2019) show that investors assess more sustainable investments as being less risky and having higher returns.

Foreign language effect and corporate social responsibility

In the psychology literature, researchers have documented a FLE. In a first study, Keysar et al. (2012) hypothesised and found that reading information in a foreign language, as opposed to in a person's native language, reduces decision biases. Since, many studies have replicated and extended these findings and three recent meta-analyses show a reliable FLE (Circi et al., 2021; Del Maschio et al., 2022; Stankovic et al., 2022). Several mechanisms for this effect have been proposed, but recent evidence indicates that a foreign language most likely reduces people's emotional response in making decisions (Hadjichristidis et al., 2019; Hayakawa et al., 2017). As a result, people make more utilitarian decisions in moral decision-making and risk-aversion domains that have an emotional component (Circi et al., 2021).

As previously discussed, CSR involves consideration of a company's positive and negative externalities, and it thus takes into account a company's broader societal and environmental impact. As such, assessing a company's CSR disclosures involves moral decision-making in considering a company's broader societal and environmental impact. Furthermore, accounting research shows that CSR issues elicit emotions in investors (Elliott, Jackson, et al., 2014; Guiral et al., 2020). Because I expect investors to experience stronger emotions when reading CSR disclosures in their native language, I propose the following hypothesis:

H1: *The impact of CSR disclosures on investors' willingness to invest is smaller when they are presented in a foreign language instead of an investors' native language.*

Furthermore, as there is a wide variety of CSR issues that companies face, I expect there to be differences in the extent to which these issues elicit emotions in investors and their subsequent judgments and decisions. Archival research provides some support for this notion; announcements about corporate philanthropy with more emotional expressions are associated with higher cumulative abnormal stock returns (Dang & Nguyen, 2020). Moreover, a survey by Morgan Stanley (2019) indicates that investors are not equally passionate about all CSR issues.

Specifically, I expect the effect predicted in the first hypothesis to be stronger for more ethically charged CSR issues.[19] As discussed, the FLE applies to moral decision-making that has an emotional component. Therefore, I expect the FLE to be strongest for more ethically charged CSR issues. For more ethically charged CSR issues, there is a larger role for moral decision-making, and I also expect investors to experience stronger emotional reactions to such issues.

In line with the FLE, I expect that investors reading disclosures on more ethically charged and emotional CSR issues in their native language will react stronger to this information as people experience emotional information as more emotionally intense in their native language (Puntoni et al., 2009). Conversely, when investors read these disclosures on more ethically charged and emotional CSR issues in a foreign language, I expect the degree of ethicality and emotionality of the CSR issue to have a limited impact on their judgments and decisions. While it is likely that the ethicality of the CSR issue would also affect investors' willingness to invest, this is not the primary focus of the study. Instead, ethicality serves as a moderator in a moderation-of-process design (see Asay et al., 2021) to provide insight into the underlying process by which language influences investment decisions. Therefore, I propose the second hypothesis:

H2: *The impact of CSR disclosures on investors' willingness to invest is moderated by language, such that the difference in willingness to invest between more ethically charged and less ethically charged CSR disclosures is greater when presented in a native language compared to a foreign language.*

Figure 2.1 graphically depicts the relationships predicted in H1 and H2.

Specifically, I expect CSR disclosures' influence on investors' judgments and decisions to be smaller in a foreign language because of a reduced emotional response to the disclosures. Elliott, Jackson, et al. (2014) and Guiral et al. (2020) have shown that investors incorporate CSR performance into firm value consistent with the affect-as-information hypothesis, in which they mistake their affective reactions to the CSR performance as useful information in valuing the firm. If affective reactions to CSR disclosures are reduced due to a foreign language, I consequently expect these affective reactions to play a smaller or negligible role in investors' decisions. Therefore, I propose the third hypothesis to provide additional process evidence:

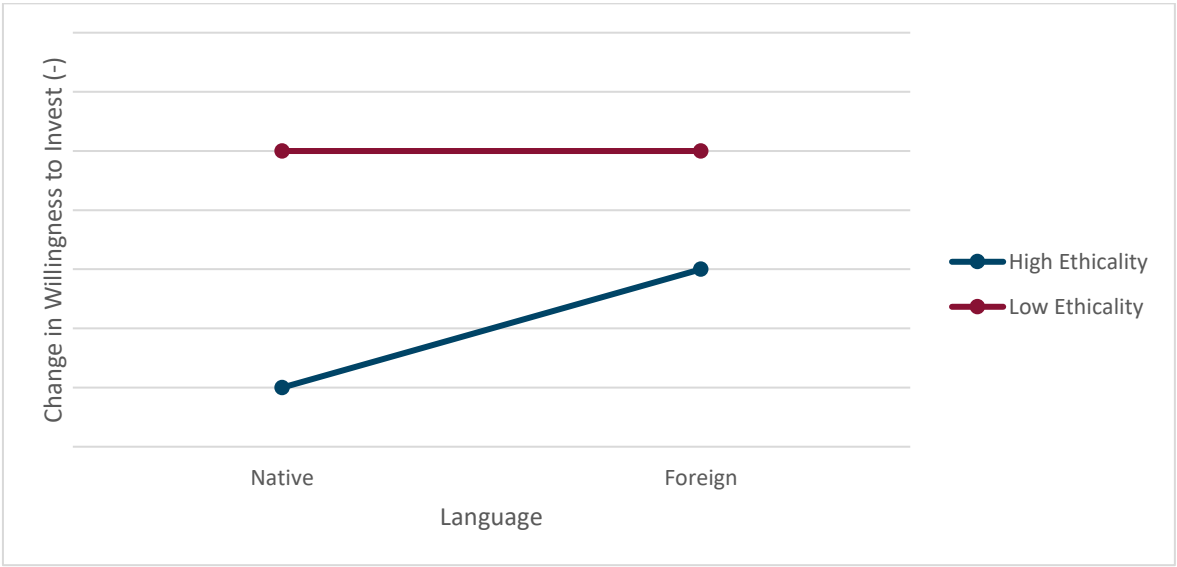
[19] Similarly, the 'ESG stopping effect' has been shown to be moderated by the degree of ethicality of ESG initiatives (Garavaglia et al., 2023).

H3: *Investors' affective reactions to CSR disclosures positively mediate the relationship between CSR disclosure ethicality and investors' willingness to invest, and this mediation is stronger when the disclosures are presented in a native language compared to a foreign language.*

Moreover, as discussed above, the affect heuristic should lead investors to judge a more sustainable investment, characterised by a firm providing positive CSR disclosures, as more beneficial and less risky. Conversely, a less sustainable investment, indicated by negative CSR disclosures, is likely to be seen as less beneficial and riskier. Because I expect investors' affective reactions to CSR disclosures, and consequent reliance on the affect heuristic, to be stronger in their native language, I expect them to judge more (less) sustainable investments with CSR disclosures in their native language as more (less) beneficial and less (more) risky than if these CSR disclosures were presented in a foreign language. Therefore, I propose the last hypothesis:

H4: *Investors' perceived riskiness of the investment negatively mediates the relationship between CSR disclosure ethicality and investors' willingness to invest, and this mediation is stronger when the disclosures are presented in a native language compared to a foreign language.*

Figure 2.1 Predicted relationships in H1 and H2



This figure graphically depicts the relationships predicted in H1 and H2. Specifically, H1 predicts that the impact of CSR disclosures on investors' willingness to invest is smaller when they are presented in a foreign language instead of an investors' native language. H1 thus concerns the main effect of language, disregarding differences in CSR disclosure ethicality. H2 refines this hypothesis and states that the difference in willingness to invest between more ethically charged and less ethically charged CSR disclosures is greater when presented in a native language compared to a foreign language. H2 thus predicts an interaction effect between language and CSR disclosure ethicality. This figure assumes negative CSR disclosures, such that investors' reaction to the disclosures would be negative.

2.3 Experiment

Participants

I recruited 449 participants through Prolific. Participants' first and primary language, as well as earliest language in life, was required to be Spanish, and they were required to be fluent in English. To limit cultural differences between participants, participants were required to live in Mexico. Furthermore, I required participants to be 18 years or older. Apart from pre-screening through Prolific, these pre-screening questions were verified before participants began the experiment and a short language proficiency test was administered after participants completed the experiment using LexTALE (see Lemhofer & Broersma, 2012).

The selection of Mexican participants was informed by both practicality and context. On a practical level, Prolific's user base provided enough bilingual Spanish-English speakers to support the study's sample size requirements. Contextually, Mexico's proximity to the U.S. creates a bilingual environment where English is commonly used in business settings, making English proficiency a relevant skill. In the experiment, the use of a hypothetical U.S. firm reflects the real-world scenario where English, as the global business lingua franca, is a common language of corporate communication. Therefore, English was chosen as the foreign language for the experiment, with Spanish as the native language, to ensure a realistic and applicable investigation into bilingual individuals' processing of CSR disclosures.

In total, 44 participants were excluded. Firstly, I investigated participants' time spent on three critical aspects of the experiment to ensure genuine participant engagement (DeSimone et al., 2015; Hunt & Scheetz, 2018). I combined threshold-based and percentage-based criteria. Participants reading below set times (background information: 17s; financial overview: 30s; CSR disclosure: 39s; derived from average reading times; Brysbaert, 2019) were flagged. Of these, approximately the quickest 10% (or 39) below these thresholds were excluded, balancing engagement assurance with the economy of participant inclusion. Furthermore, one participant was excluded due to two failed attention checks. Lastly, four participants were removed because they were extreme outliers on the Spanish proficiency test, indicating that they either did not read the instructions, went too quickly through the test, or were not truly native Spanish speakers. Consequently, the total remaining sample contains 405 participants.

Design and manipulations

The study employs a 2 (language: native or foreign) x 2 (CSR disclosure: lower ethicality or higher ethicality) between-subjects factorial design. To manipulate language, the entire

experiment (including instructions and questions) is in either a participant's native language (i.e., Spanish) or a foreign language (i.e., English). By presenting the whole experiment in a single language, any potential effects of language switching are eliminated (e.g., enhanced cognitive control; Oganian et al., 2016). One potential concern is that language could also interact with other information provided in the experiment apart from the CSR disclosure. To address this concern, I employ a pre-test/post-test design in which I measure the dependent variable both before and after the CSR disclosure manipulation.[20]

To ensure the validity and consistency of the content across both languages, the experiment was carefully translated. The original English version of the experiment was first proofread by a linguistic expert to ensure clarity and precision of the original version. Subsequently, the refined English version was translated into Spanish by a professional translator. To guarantee the quality and accuracy of the Spanish translation, a separate linguistic expert, who was not involved in the initial translation, reviewed and validated the Spanish content. Moreover, for the validated scales (risk aversion, prosocial behaviour, and environmental concern) utilised in this study, there was no need for a fresh translation process: these scales had already been translated and employed in past research. To ensure consistency and maintain the integrity of the original work, I adopted the previously translated versions directly from these sources (Mieres-Chacaltana et al., 2020; Schultz, 2001; Zuniga & Bouzas, 2005).

Case materials are loosely based on studies by Elliott, Jackson, et al. (2014), Guiral et al. (2020), Gao et al. (2022), and Garavaglia et al. (2023). Given the study's focus on the FLE, the CSR disclosure consists of narrative information on the company's CSR performance. Furthermore, as the theoretical underpinnings of the FLE point to emotions driving the effect, I opt for a CSR disclosure that shows negative CSR performance in both conditions. Firstly, due to negativity bias (for a review, see Baumeister et al., 2001), negative CSR performance is likely to elicit stronger emotions in participants than positive CSR performance. Secondly, the FLE has been shown to apply to moral decision-making with an emotional component; by juxtaposing the negative CSR disclosure with positive financial information, participants are facing a greater moral dilemma.

Similarly to Garavaglia et al. (2023), I manipulate the degree of ethicality of the CSR disclosure. This approach allows for process evidence through a moderation-of-process design (Asay et al., 2021). Specifically, confirming the second hypothesis would support the underlying assumption that the FLE is primarily driven by the ethicality and emotional

[20] Specifically, I measure the dependent variable after participants have received the background information, but before they have received the financial and CSR information. As prior research shows that explicitly assessing CSR disclosures can affect investors' judgment and decision-making (Elliott et al., 2014; Guiral et al., 2020), I let participants jointly assess the financial and CSR information.

content of the CSR disclosures, thereby circumventing the need to depend on potentially less reliable measured mediating variables.

To make a distinction between a lower ethicality and higher ethicality CSR disclosure, I first ran several pre-tests to determine which CSR disclosures are perceived as more ethically charged and elicit a stronger emotional response in participants. In these pre-tests, participants were shown two CSR disclosures on two different CSR issues, of which I expected one to be perceived as more ethical and emotional.

To measure participants' emotional response, I used the Affective Slider (see *Risk and affect*). Furthermore, I asked participants how concerning they found XYZ Clothing's (see *Task and procedure*) practices from an ethical standpoint, how committed they believed XYZ Clothing to be to upholding ethical values and practices, and how likely they were to boycott XYZ Clothing due to their ethical practices. Both manipulations can be found in Appendix B. Results from the final pre-test indicate a statistically significant difference between both manipulations for all measures. Specifically, participants reported higher arousal for high ethicality disclosures compared to low ethicality disclosures ($t(59) = 2.528$, $p = .014$), lower pleasure for high ethicality disclosures ($t(59) = -4.878$, $p < 0.001$), greater concern for high ethicality disclosures ($t(59) = 3.957$, $p < 0.001$), lower perceived commitment for high ethicality disclosures ($t(59) = -7.111$, $p < 0.001$), and a higher likelihood to boycott for high ethicality disclosures ($t(59) = 6.717$, $p < 0.001$).

In contrast to the main study, which utilises Mexican participants native in Spanish and fluent in English, these pre-tests were conducted with U.S. participants, who are native English speakers. This decision was made for practical reasons to avoid the need for multiple translations of the manipulations.

Task and procedure

Participants were first instructed to envision themselves as investors evaluating companies in the clothing sector. They received background information on a hypothetical firm, XYZ Clothing. Initial willingness to invest was then measured. Subsequently, participants were presented with financial details and a CSR report about the company. After reviewing all the information, their willingness to invest was measured again, as well as their perceived riskiness and affective reactions.

The survey concluded with manipulation checks and post-task questions. These included demographic questions and a language proficiency test. Additionally, questions were posed regarding participants' risk aversion, prosocial behaviour, and environmental concern.

Primary dependent, process variables, and control variables

Investors' willingness to invest

Following Asay et al. (2023), I began by identifying the key conceptual construct for my dependent variable based on theory. Given that investors may value a firm's CSR initiatives for their societal and environmental impacts, not solely their financial outcomes, I focused on measures that capture participants' overall perceptions of the firm. Accordingly, I employed a three-item scale to measure willingness to invest, feelings towards the investment, and general perceptions of the company's stock, with responses ranging from 'Very Unwilling' to 'Very Willing', and 'Significantly Negative' to 'Significantly Positive' on a 7-point scale. Participants' responses were collected twice in a pre-test/post-test design, before and after exposure to financial and CSR disclosures.

To assess the internal consistency of this three-item measure, I calculated Cronbach's alpha. For the pre-test, the English version yielded an alpha of 0.895, while the Spanish version had an alpha of 0.879. In the post-test phase, the reliability further increased, with the English version reaching an alpha of 0.947 and the Spanish version reaching 0.926. These values underscore the scale's robust internal consistency across both language versions and measurement points. Furthermore, based on the confirmatory factor analysis by Asay et al. (2023), all three measures assess the same construct: investors' holistic perceptions of the firm. Consequently, I averaged the three responses to create a composite measure of investors' willingness to invest. Moreover, since I am interested in the impact of CSR disclosures on investors' willingness to invest, I used the difference between the pre-test/post-test scores as my dependent variable.

Affect and risk

In line with H3, I expect the effect of language on participants' willingness to invest to be mediated by affect. In line with the affect heuristic, one way to test this is to examine whether there is an inverse relationship between participants' judgment of benefits and risks. Benefits are already captured by the dependent variable, and I measured their perceived risk by asking participants how risky they considered an investment in the company using a 7-point Likert scale (1 = not at all risky, 7 = very risky; adapted from Hartzmark & Sussman, 2019).

Furthermore, as a direct measure of affect, I measured participants' affective reactions to the CSR disclosure using the Affective Slider (AS), a modern version of the Self-Assessment Manikin (SAM), which is a non-verbal pictorial assessment tool for measuring affect (Betella & Verschure, 2016; Bradley & Lang, 1994). Compared to the SAM, the AS uses a more modern design language which is more suitable for digital surveys. Hadjichristidis

et al. (2015) note that people may react differently to emotional scales in their native language compared to their foreign language because the endpoints are experienced as less extreme in a foreign language (also see De Langhe et al., 2011). By using the AS, I circumvented this issue because the endpoints are presented graphically.

Additional variables

While randomization controls for systematic differences, both the effect of language and the effect of the CSR disclosure may differ across participants within the groups. First, the FLE could differ depending on participants' language proficiency, and second, participants that display higher prosocial behaviour or environmental concern might react stronger to the CSR disclosures. Therefore, I included measures for language proficiency, prosocial behaviour, and environmental concern. I measured language proficiency using LexTALE (Lemhofer & Broersma, 2012), prosocial behaviour using the Prosociality Scale (Luengo Kanacri et al., 2021), and environmental concern using the Schultz (2001) Environmental Concern Scale.

Additionally, given the heterogeneous nature of my participant sample, there may be a wide variance in their risk aversion, especially as I do not pre-screen based on investing experience. A difference in inherent risk aversion could notably influence an individual's reaction to CSR disclosures and their subsequent willingness to invest. To account for this potential variation, I utilised the Domain-Specific Risk-Taking (DOSPERT) scale (Blais & Weber, 2006). The DOSPERT scale provides a comprehensive assessment of individual differences in risk-taking propensities across various domains, including financial decisions. By including this measure, I aim to control for the effects of participants' risk aversion on their willingness to invest, ensuring that my findings are not confounded by this individual difference.

Apart from differences in risk aversion across participants, the differences in investing experience itself could also substantially influence how individuals perceive and interpret CSR disclosures, and consequently, their willingness to invest. Novice investors might react differently to CSR information compared to seasoned investors. To control for this potential variation, participants were asked about their investing experience, including how many times they have evaluated a company's performance by analysing its financial statements, whether they ever bought or sold an individual company's common stock or debt securities, and whether they plan to invest in an individual company's common stock or debt securities in the next five years. By considering these variables, I aim to account for the differential effects that investing experience might have on my outcomes.

2.4 Results

Manipulation and comprehension checks

While the ethicality manipulation was extensively pre-tested, these pre-tests were conducted with U.S. participants in English (see *Design and manipulations*). These pre-tests yielded positive results, indicating the potential effectiveness of the manipulations. To verify the applicability of these pre-tests' findings to the Mexican participants used in this study, as well as to both Spanish and English, I asked participants three questions related to their perceived ethicality of the CSR disclosure.

I asked participants how concerning they found XYZ Clothing's practices from an ethical standpoint, how committed they believed XYZ Clothing to be to upholding ethical values and practices, and how likely they were to boycott XYZ Clothing due to their ethical practices. To confirm the effectiveness of the ethicality manipulation, I compared participants' responses to the three ethicality questions between the two CSR disclosure conditions using an independent samples t-test. The results indicated a statistically significant difference in perceived ethicality between the two groups. Specifically, participants found XYZ Clothing's practices more concerning in the high ethicality condition ($t(403) = 7.198$, $p < .001$), believed the company was less committed to upholding ethical values ($t(403) = -8.236$, $p < .001$), and were more likely to boycott the company due to their ethical practices ($t(403) = 8.109$, $p < .001$). These results further demonstrate the manipulation's effectiveness and validate the initial pre-test results.

Furthermore, as a comprehension check for the ethicality manipulation, I asked participants 'Which of the following best describes the primary issue discussed about XYZ Clothing in the report you read?' To check whether participants had paid attention to the financial overview, I asked them 'Based on the financial overview you read, how was XYZ Clothing's financial performance compared to its industry peers?' The first question was answered correctly by 94.5% of participants, and the second question by 81.7%.

Confirmatory analyses[21]

Tests of H1 and H2

In this section, I assess the following two hypotheses. Firstly, I posited that the impact of CSR disclosures on investors' willingness to invest would be smaller when these disclosures are presented in a foreign language instead of an investors' native language. Secondly, I hypothesised that language would moderate the impact of CSR disclosures on

[21] As I have pre-registered this study, I make the distinction between confirmatory and exploratory analyses. My confirmatory analyses include all analyses for which I had a priori hypotheses, and these are included in the pre-registration. For my exploratory analyses, I had no clear a priori hypotheses.

investors' willingness to invest. Specifically, the difference in willingness to invest between more ethically charged and less ethically charged CSR disclosures would be more pronounced when the information is presented in a native language.

Table 2.1, Panel A presents the descriptive statistics of the change in investors' willingness to invest across the experimental conditions. Figure 2.2 depicts the mean change in willingness to invest across the four conditions.

Table 2.1 Descriptive statistics and ANOVA: How language and CSR disclosure ethicality affect willingness to invest – tests of H1 and H2

Panel A: Descriptive statistics, Mean (Standard Deviation), n = 405			
	CSR Disclosure Ethicality		
Language	*High Ethicality*	*Low Ethicality*	*Overall*
Native	-3.176 (1.328) n = 104	-1.657 (1.396) n = 108	-2.402 (1.558) n = 212
Foreign	-2.909 (1.449) n = 99	-1.479 (1.579) n = 94	-2.212 (1.671) n = 193
Overall	-3.046 (1.391) n = 203	-1.574 (1.483) n = 202	-2.312 (1.614) n = 405

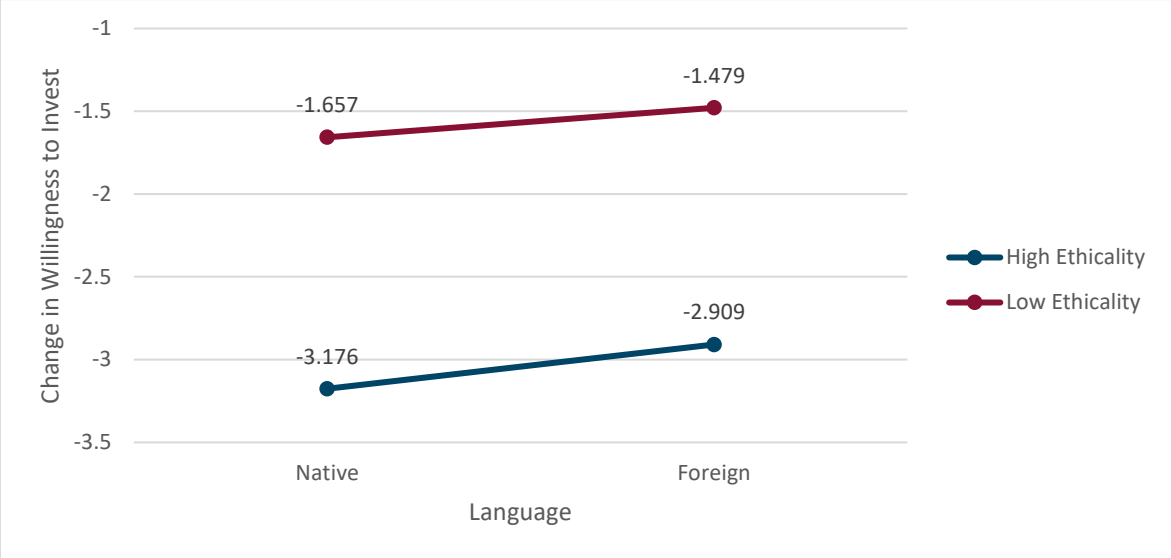
Panel B: Two-way ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**t**	**p-value**
Language	5.019	1	5.019	2.431	-1.559	0.060[a]
CSR Disclosure Ethicality	219.570	1	219.570	106.372	-10.314	<0.001
Language x CSR Disclosure Ethicality	0.198	1	0.198	0.096	-0.310	0.379[a]
Error	827.732	401	2.064			

Panel A presents the mean change in investment willingness by condition. Panel B presents the results of a two-way between-subjects ANOVA with language (foreign = 0 and native = 1) and CSR disclosure ethicality (low = 0 and high = 1) as factors and change in investment willingness as the dependent variable. For the change in willingness to invest, I use participants' pre-test/post-test change in willingness to invest. [a] One-tailed p-values for directional predictions based on the signed t-tests.

Table 2.1, Panel B shows the results of a two-way between-subjects ANOVA conducted to examine the main effects of language and CSR disclosure ethicality on the change in investors' willingness to invest, as well as their interaction. In line with H1, there is a marginally statistically significant main effect for language, $t(401) = -1.559$, $p = 0.060$, one-tailed, indicating that disclosures presented in a native language resulted in a larger decrease in willingness to invest than those presented in a foreign language. Furthermore, there is a statistically significant main effect for CSR disclosure ethicality, $F(1, 401) = 106.372$, $p < 0.001$, suggesting that the ethicality of CSR disclosures negatively influenced investors' willingness to invest.

Contrary to H2, there is no significant interaction between CSR disclosure ethicality and language, t(401) = -0.310, p = 0.379, one-tailed. This suggests that there is no evidence that the difference in the change in investors' willingness to invest based on the ethicality of CSR disclosures depends on the language in which the disclosures are presented.

Figure 2.2 Plot of participants' mean change in willingness to invest



This figure illustrates the mean investment willingness by condition. For investment willingness, I use participants' pre-test/post-test change in investment willingness.

Tests of H3 and H4

In this section, I address the mediating roles of investors' affective reactions and their perceived riskiness of the investment in the relationship between CSR disclosure ethicality and investors' willingness to invest. These mediating effects were posited to be moderated by the language in which the CSR disclosures were presented.

Table 2.2 presents the descriptive statistics of Affect (Pleasure and Arousal) and Perceived Risk based on the experimental conditions. It can be observed that participants exposed to more ethically charged CSR disclosures reported more pronounced affective reactions and perceived riskiness. Moreover, this effect appears more pronounced for participants who received the information in a native language, compared to a foreign language.

To assess the mediating role of affective reactions, I utilised conditional process analyses following Hayes' (2017) approach, employing model 8 from the PROCESS macro. In this model, CSR disclosure ethicality serves as the independent variable, Language as the moderator, Affect (Pleasure or Arousal) or Perceived Risk as the mediator, and Willingness to Invest as the dependent variable. In Figure 2.3, Panel A, a conceptual depiction of the process model is provided, visually encapsulating the relationships assessed in H3 and H4. In Figure 2.3, Panels B, C and D, I provide the results of the conditional process analyses.

For the analyses that involve pleasure and perceived risk as the mediator, the index of moderated mediation is statistically non-significant (90% CI [-0.157, 0.267] and 90% CI [-0.171, 0.072] respectively; untabulated), which indicates that there is no evidence that language moderates the indirect effect of CSR disclosure ethicality on investors' willingness to invest through pleasure or perceived risk. In contrast, for arousal, there is a is a statistically significant index of moderated mediation (90% CI [-0.230, -0.014]; untabulated). Delving deeper into the conditional indirect effects, we see that in a foreign language, there is no statistically significant indirect effect (90% CI [-0.105, 0.047], whereas in a native language, there is (90% CI [-0.234, -0.053]). In line with H3, this thus provides some evidence for a differing indirect effect of CSR disclosure ethicality through arousal on investors' willingness to invest, depending on language. However, given the incongruent results for the different mediators, it is important to interpret this finding with caution.

Table 2.2 Descriptive statistics for process variables

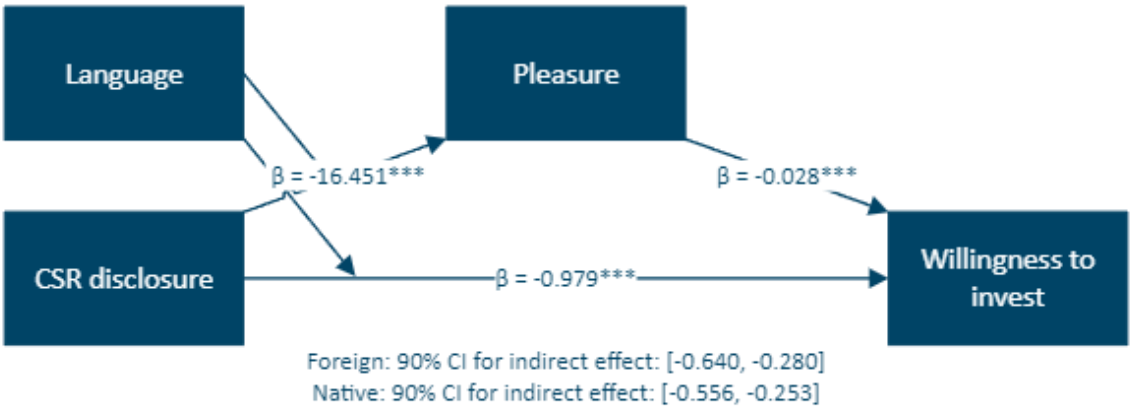
Language	CSR Disclosure	Variable	N	Mean	Standard Deviation
Native	*High Ethicality*	*Pleasure*	104	11.904	17.592
		Arousal	104	21.644	27.686
		Perceived Risk	104	4.712	1.556
		Willingness to Invest	104	-3.176	1.328
	Low Ethicality	*Pleasure*	108	26.380	23.513
		Arousal	108	34.769	27.911
		Perceived Risk	108	3.954	1.203
		Willingness to invest	108	-1.657	1.396
Foreign	*High Ethicality*	*Pleasure*	99	15.879	22.204
		Arousal	99	35.404	32.890
		Perceived Risk	99	4.343	1.540
		Willingness to Invest	99	2.909	1.449
	Low Ethicality	*Pleasure*	94	32.330	28.515
		Arousal	94	37.553	27.338
		Perceived Risk	94	3.766	1.387
		Willingness to Invest	94	-1.479	1.579

This table presents the mean of Affect (Pleasure and Arousal), Perceived Risk and Willingness to Invest per condition. For Willingness to Invest, I use participants' pre-test/post-test change in willingness to invest.

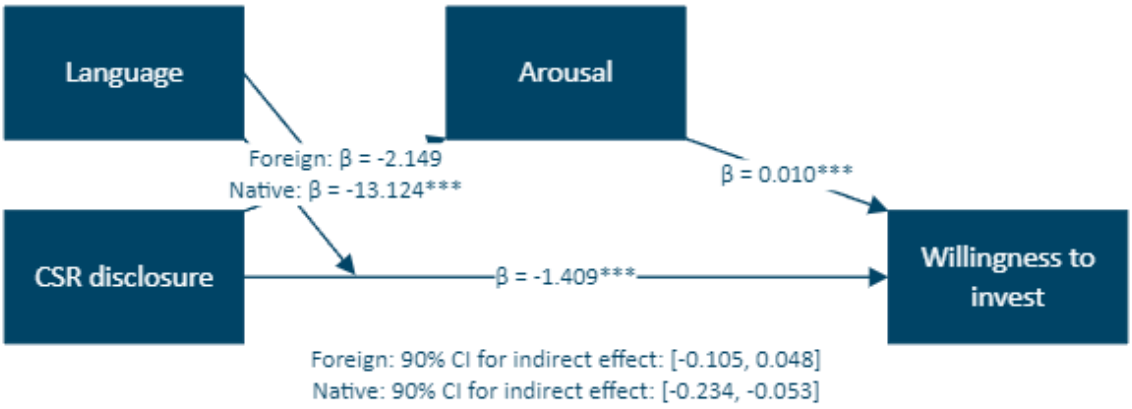
Figure 2.3 Process model

Panel A: Conceptual depiction of the process model

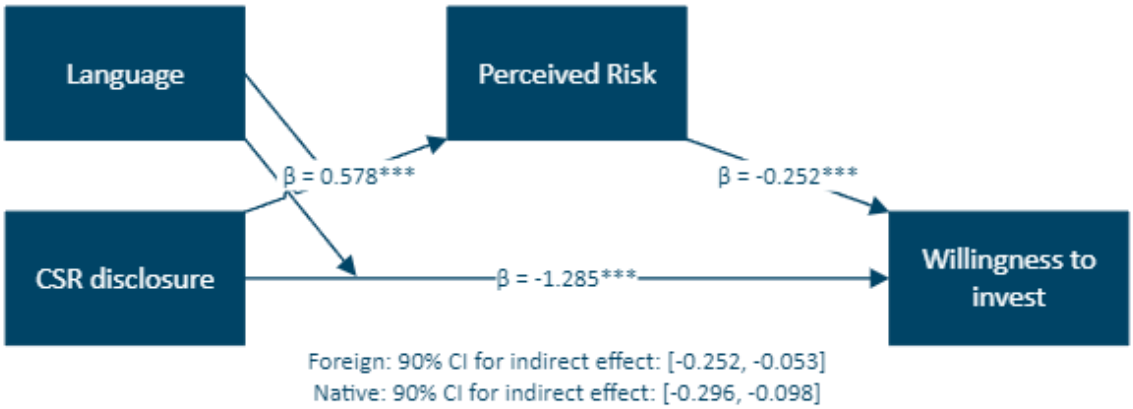
Panel B: Results from the process model with Pleasure as the mediator



Panel C: Results from the process model with Arousal as the mediator



Panel D: Results from the process model with Perceived Risk as the mediator



Panel A presents the conceptual depiction of the model (i.e., Model 8 from Hayes' (2017) PROCESS macro) and Panels B, C, and D present the results for each of the mediators. Language is coded 0 (1) for the foreign (native) condition and CSR disclosure is coded 0 (1) for the low ethicality (high ethicality) condition. For willingness to invest, I use participants' pre-test/post-test change in willingness to invest. I tested for conditional indirect effects using a bootstrapping procedure for each language condition and statistically significant indirect effects are indicated by a 90% confidence interval that does not include zero. If the direction of the effects is in line with my hypotheses, this corresponds to a one-sided p-value <0.05. All p-values are one-tailed, ***p < 0.01, **p < 0.05.

Exploratory analyses

Affect and perceived risk

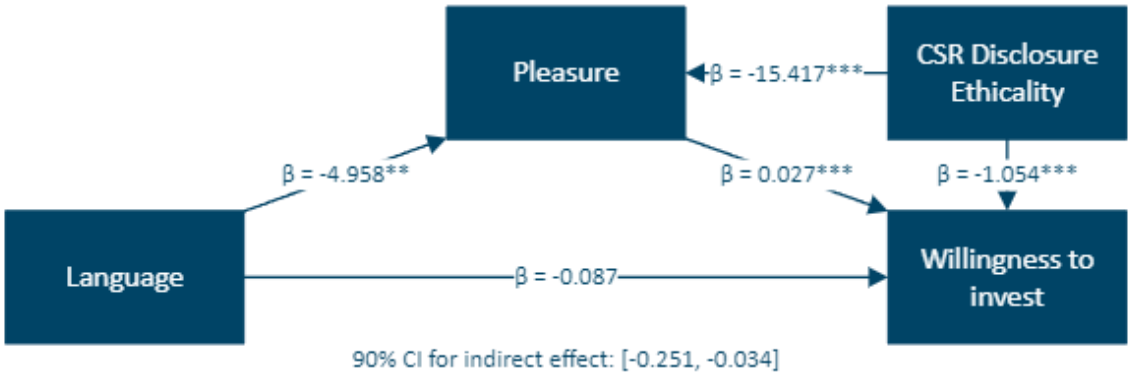
In the preceding section, I explored whether language moderates the indirect influence of CSR disclosure ethicality on investors' willingness to invest through their affective reactions or perceived risk, as hypothesised in H3 and H4. I posited that language would amplify this pathway for highly ethically charged CSR disclosures compared to less ethically charged ones. However, given the mixed findings regarding a statistically significant moderation of these indirect effects, it is informative to investigate whether language, regardless of CSR disclosure ethicality, operates through increased affective reactions or perceived risk. Therefore, I simplify the model from the previous section. Again, using Hayes' (2017) approach, I now utilise model 4 from the PROCESS macro, which represents a simple mediation model. In Figure 2.4, Panel A, I visually present the conceptual model for my analysis, and in Panels B, C and D, the results from the analyses.

The results reveal that language statistically significantly affects both affective reactions (pleasure and arousal), as well as perceived riskiness. Consistent with theory, we see that in a native language, investors experience stronger affective reactions, as well as have a higher perception of risk. Furthermore, the results show the indirect effect of language through these mediators to be statistically significant.

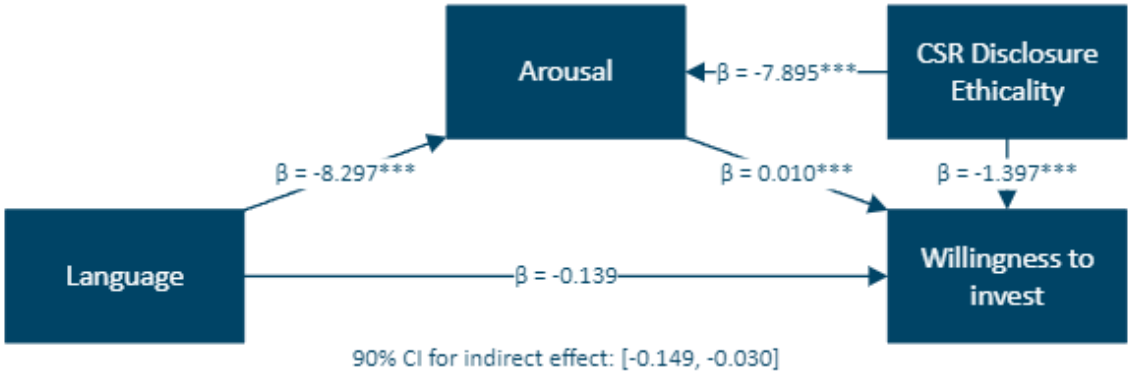
Figure 2.4 Mediation model

Panel A: Conceptual depiction of the mediation model

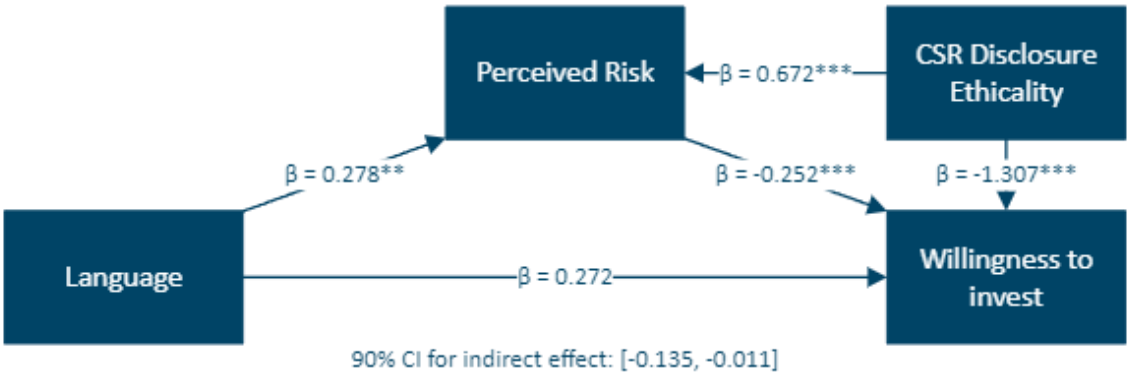
Panel B: Results from the mediation model with Pleasure as the mediator



Panel C: Results from the mediation model with Arousal as the mediator



Panel D: Results from the mediation model with Perceived Risk as the mediator



Panel A presents the conceptual depiction of the model (i.e., Model 4 from Hayes' (2017) PROCESS macro) and Panels B, C, and D present the results for each of the mediators. Language is coded 0 (1) for the foreign (native) condition and CSR disclosure is coded 0 (1) for the low ethicality (high ethicality) condition. For willingness to invest, I use participants' pre-test/post-test change in willingness to invest. I tested for indirect effects using a bootstrapping procedure and statistically significant indirect effects are indicated by a 90% confidence interval that does not include zero. If the direction of the effects is in line with my hypotheses, this corresponds to a one-sided p-value <0.05. All p-values are one-tailed, ***p < 0.01, **p < 0.05.

Individual differences

Given the potential influence of individual-level variables on investment behaviour, exploratory analyses were planned to further probe the main findings. These individual differences, including language proficiency, risk aversion, prosocial behaviour, and environmental concern, can contribute to the variability in the responses. By accounting for these as covariates, the precision of the analyses can be enhanced, allowing for a clearer assessment of the primary effects of language and CSR disclosure ethicality on investment behaviour (Piercey, 2023).

However, as one of the primary interventions in this study involves a manipulation of all language in the experiment, I first investigated whether these individual-level variables manifest differently across the two language groups. To this end, I provide descriptive statistics for each of these individual-level variables, stratified by language group, in Table 2.3. To test whether differences between language groups are significant, results from independent samples t-tests are included in Table 2.3. Results from the t-tests indicate statistically significant differences across language groups for language proficiency, risk aversion and prosocial behaviour.

Expectedly, participants exhibit varying language proficiency across language groups, given their native Spanish background and English as a foreign language. The disparities in risk aversion and prosocial behaviour, however, warrant a more intricate analysis. The FLE is notably pronounced in domains of moral decision-making and risk aversion. Thus, it is logical to infer that language might influence outcomes in risk aversion and prosocial

behaviour tests. Yet, when examining the directionality of the effect, only the amplified prosocial tendencies resonate with previous studies. In contrast, risk aversion appears to diminish (the variable is reverse-coded) in a foreign language, a finding that diverges from established research.

Table 2.3 Descriptive statistics for individual-level variables per language group and independent samples t-test to test differences between groups

Variable	Native Mean (SD) N = 212	Foreign Mean (SD) N = 193	t-test	p-value
Language Proficiency	92.52 (4.45)	79.53 (10.20)	-16.87	<0.001
Risk Aversion	3.25 (0.77)	2.91 (0.94)	-4.02	<0.001
Prosocial Behaviour	3.72 (0.62)	3.57 (0.67)	-2.22	0.027
Environmental Concern	5.56 (1.03)	5.65 (0.88)	0.94	0.349

This table presents descriptive statistics for individual-level variables per language group, as well as independent samples t-tests to test for differences between groups.

Considering that as a native language increases participants' prosocial behaviour, it is plausible that this could be a channel through which language influences investment behaviour. Therefore, I will conduct a mediation analysis to test whether prosocial behaviour mediates the effect of language on investors' willingness to invest. Moreover, to account for individual-level differences between participants that could influence the dependent variable, I will conduct an ANCOVA with risk aversion and environmental concern as covariates.

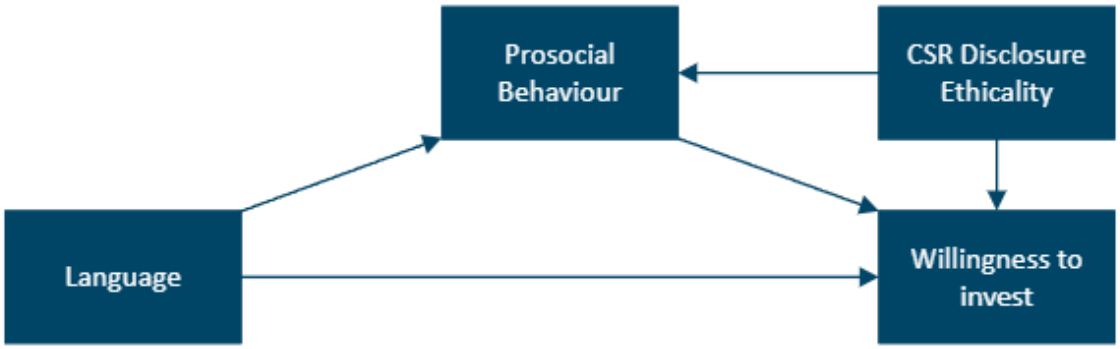
Prosocial behaviour

To examine the mechanisms by which language influences investment decisions, I conduct a process analysis that focusses on prosocial behaviour as a potential pathway. I probe the mediating influence of prosocial behaviour using Model 4 from Hayes' (2017) PROCESS macro. This model clarifies both the direct effect of language on willingness to invest and its indirect effect through prosocial behaviour, providing a clear picture of this potential channel. Figure 2.5, Panel A provides a conceptual depiction of the model.

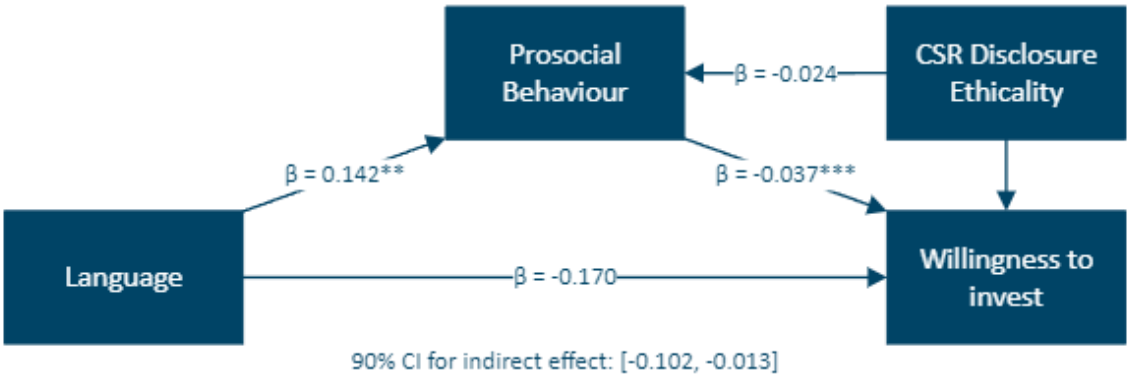
Figure 2.5, Panel B shows the results from the mediation analysis. As anticipated, using a native language statistically significantly elevates investors' prosocial tendencies. These heightened prosocial tendencies, in turn, significantly reduce investors' willingness to invest. Furthermore, the analysis shows that the indirect effect of language through prosocial behaviour is statistically significant (90% CI [-0.149, -0.030]. This suggests that the influence of language on investment decisions operates, at least in part, through its impact on prosocial behaviour.

Figure 2.5 Mediation model

Panel A: Conceptual depiction of the process model



Panel B: Results from the mediation model



Panel A presents the conceptual depiction of the model (i.e., Model 4 from Hayes' (2017) PROCESS macro) and Panel B presents the results. Language is coded 0 (1) for the foreign (native) condition and CSR disclosure is coded 0 (1) for the low ethicality (high ethicality) condition. For willingness to invest, I use participants' pre-test/post-test change in willingness to invest. I tested for indirect effects using a bootstrapping procedure and statistically significant indirect effects are indicated by a 90% confidence interval that does not include zero. If the direction of the effects is in line with my hypotheses, this corresponds to a one-sided p-value <0.05. All p-values are one-tailed, ***p < 0.01, **p < 0.05.

Risk aversion and environmental concern

In the study, I included measures such as language proficiency, risk aversion, prosocial behaviour, and environmental concern, as they were believed to introduce variability in the responses. By considering these measures as covariates, I aimed to enhance the precision of my previous ANOVA analysis (see Table 2.1). However, this approach is valid only if these measures are consistent across treatment groups. If language, the treatment, influences these measures, their inclusion might dilute the analysis, as they could inadvertently act as mediators (Maxwell et al., 2017; Piercey, 2023). Specifically, prosocial behaviour was found to act as a mediator in the preceding section.

As a result, measures for risk aversion and environmental concern are left to potentially increase power of the analysis. While risk aversion, like prosocial behaviour, differed

across language groups, this is likely not driven by the same effect of language on the dependent variable, so inclusion in an ANCOVA could still be useful. I executed two ANCOVAs: one considering only the main effects of the covariates and another that also factors in their interactions with the primary variables. Following this, I performed a semiomnibus F-test for all interactions of the covariates. This dual approach aimed to determine if the effects of language and CSR disclosure ethicality are contingent on risk aversion and environmental concern. If not, a simplified model is appropriate for heightened analytical power.

Table 2.4 presents results from an ANCOVA with the covariates included as main effects. A semiomnibus F-test for all interactions of the covariates was not statistically significant ($F(6,393) = 1.90$, $p = 0.08$; untabulated), so the reduced model with only the main effects is appropriate.

Table 2.4 ANCOVA: How language and CSR disclosure ethicality affect willingness to invest, controlling for risk aversion and environmental concern

Source of Variation	SS	df	MS	F	t	p-value
Language	8.491	1	8.491	4.249	-2.061	0.020[a]
CSR Disclosure Ethicality	223.878	1	223.878	112.029	-10.584	<0.001
Language x CSR Disclosure Ethicality	0.004	1	0.004	0.002	0.046	0.482[a]
Risk Aversion	5.710	1	5.710	2.857	1.690	0.092
Environmental Concern	27.931	1	27.931	13.977	-3.739	<0.001
Error	797.358	399	1.998			

This table presents the results of an ANCOVA with language (foreign = 0 and native = 1) and CSR disclosure ethicality (low = 0 and high = 1) as factors and risk aversion and environmental concern as covariates and change in investment willingness as the dependent variable. For the change in willingness to invest, I use participants' pre-test/post-test change in willingness to invest. [a] One-tailed p-values for directional predictions based on the signed t-tests.

From the analysis, we first see a statistically significant main effect for environmental concern ($F(1, 399) = 13.977$, $p < 0.001$). Furthermore, compared to the previous ANOVA (see Table 2.1), we see a reduced p-value for language ($t(399) = -2.061$, $p = 0.020$, one-tailed) underscoring the ANCOVA's heightened statistical power.

Investment experience

Given the constraints of participant availability on Prolific, the study included both experienced and inexperienced investors to ensure a sufficient sample size. However, previous research suggests that investment experience significantly influences how nonprofessional investors interpret financial accounting disclosures, thereby impacting their investment-related judgments (Krische, 2019). Accordingly, measures for investment experience were integrated into the study design.

For this specific analysis, I examine whether the foreign language effect varies based on participants' prior investment experience. Figure 2.6, Panel A displays the mean change in willingness to invest for participants with investment experience, while Panel B focusses on those without investment experience. The figure indicates that the foreign language effect is notably stronger for participants with investment experience. To formally test this observation, I conducted a three-way ANOVA with investment experience as a factor.

Table 2.5, Panel A shows the results from this ANOVA. Consistent with prior analyses, there was a statistically significant main effect for language ($t(397) = -2.966$, $p = 0.002$, one-tailed) and for CSR disclosure ethicality ($F(1, 397) = 73.919$, $p < 0.001$). A statistically significant main effect for investment experience was also observed ($F(1, 397) = 10.965$, $p = 0.001$). Notably, the interaction between language and investment experience was significant ($F(1, 397) = 6.875$, $p = 0.009$), indicating that the foreign language effect is dependent on investment experience.

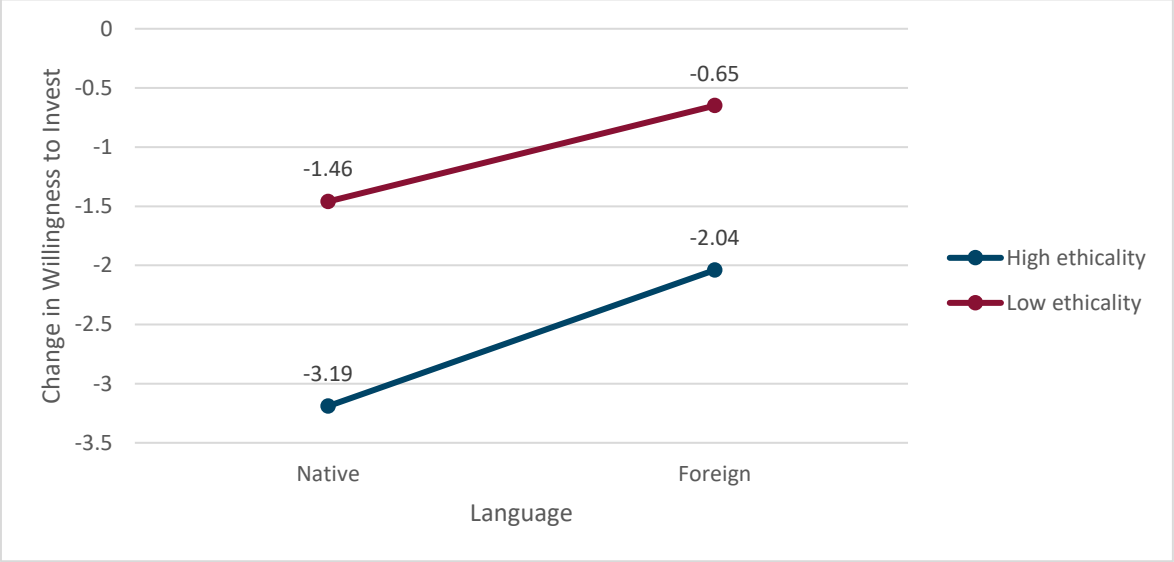
Table 2.5 ANOVA: How language, CSR disclosure ethicality, and investment experience affect willingness to invest

Panel A: Three-Way ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**t**	**p-value**
Language	17.625	1	17.625	8.799	-2.966	0.002[a]
CSR Disclosure Ethicality	148.055	1	148.055	73.919	-8.598	<0.001
Investment Experience	21.962	1	21.962	10.965	-3.311	0.001
Language x CSR Disclosure Ethicality	0.443	1	0.443	0.221	-0.470	0.319[a]
Language x Investment Experience	13.770	1	13.770	6.875	2.622	0.009
Language x CSR Disclosure Ethicality x Investment Experience	0.489	1	0.489	0.244	0.494	0.621
CSR Disclosure Ethicality x Investment Experience	0.149	1	0.149	0.074	0.273	0.785
Error	795.168	397	2.003			
Panel B: Simple Effects Tests						
Comparisons			**df**	**F**	**t**	**p-value**
Effect of *Language* given *Investment Experience*			1	9.787	-3.128	0.001[a]
Effect of *Language* given *No Investment Experience*			1	0.147	-0.383	0.702[a]
Effect of *Investment Experience* given *Native Language*			1	0.276	-0.525	0.600
Effect of *Investment Experience* given *Foreign Language*			1	15.458	-3.932	<0.001

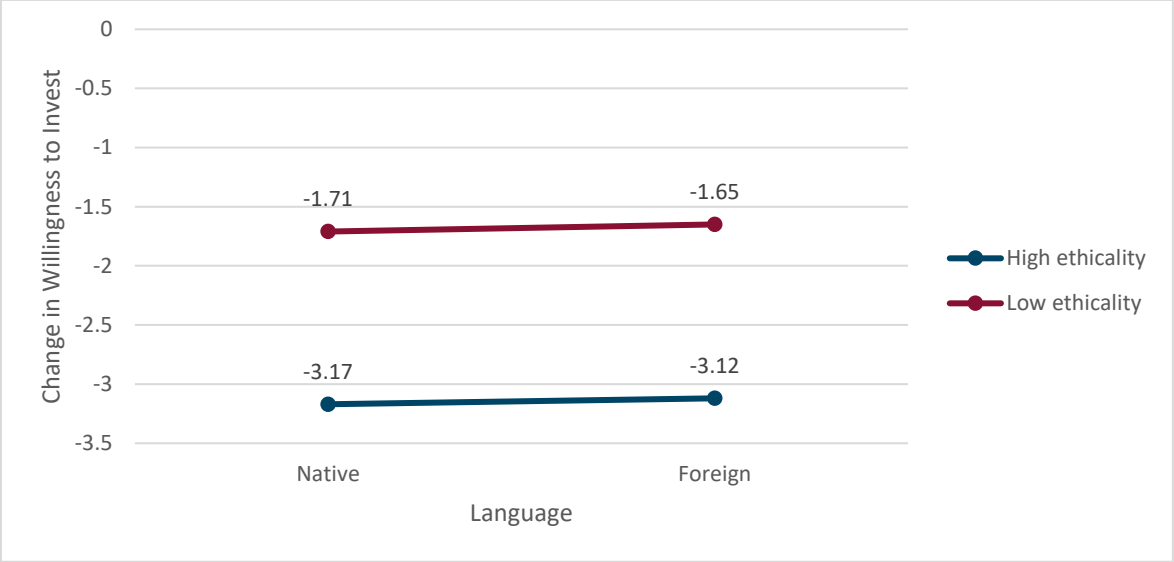
Panel A presents the results of a three-way between-subjects ANOVA with language (foreign = 0 and native = 1), CSR disclosure ethicality (low = 0 and high = 1), and investment experience (prior investment experience = 0 and no prior investment experience = 1) as factors and change in investment willingness as the dependent variable. For the change in willingness to invest, I use participants' pre-test/post-test change in willingness to invest. [a] One-tailed p-values for directional predictions based on the signed t-tests.

Figure 2.6 Plots of participants' mean change in willingness to invest

Panel A Participants with investment experience (N = 84)



Panel B Participants without investment experience (N = 321)



Panel A illustrates the mean investment willingness by condition for participants with investment experience and Panel B for participants without investment experience. For investment willingness, I use participants' pre-test/post-test change in investment willingness.

Panel B displays results from simple effects tests, which further probe the interaction between language and investment experience. The responsiveness difference between foreign and native languages was statistically significant only among experienced investors ($t(397) = -3.128$, $p = 0.001$, one-tailed). Furthermore, only when CSR disclosures were presented in a foreign language, there was a statistically significant difference in behaviour based on investment experience. Specifically, experienced investors exhibited

a less intense reaction to CSR disclosures in a foreign language compared to non-experienced investors ($F(1, 397) = 15.458$, $p < 0.001$).

2.5 Discussion and conclusion

In this study, the primary objective was to examine the relationship between the mode of language presentation—whether native or foreign—and investor responses to CSR disclosures. Four hypotheses were posited, assessing both the direct effects of language on investment decisions and the potential mediation roles of affective reactions and perceived risk. It was further hypothesised that the ethicality of CSR disclosures—either highly ethically charged or less so—might be differentially interpreted based on the language of presentation.

Upon analysis of the data, only H1 was empirically supported, suggesting that the influence of CSR disclosures on an investor's willingness to invest is indeed less pronounced when presented in a foreign language compared to their native language. While H2, H3, and H4 were not corroborated, subsequent exploratory analyses revealed other significant patterns. Specifically, affective reactions and perceived risk were identified as mediators between language and investors' willingness to invest. Further, the data showed enhanced prosocial tendencies when information was processed in one's native language as opposed to a foreign one, and analyses revealed that this may be a pathway through which language affects investors' willingness to invest.

Although the predefined hypotheses did not receive full empirical support, the exploratory results of the study remain consistent with the established theoretical framework. In particular, the proposition that the FLE diminishes emotional resonance when engaging with content in a foreign language, is paralleled in the identified mediating roles of affective reactions and perceived risk. While the exact mechanisms proposed were not confirmed in their entirety, the patterns found in the exploratory analyses corroborate the foundational principles of the FLE. Furthermore, the observed amplification of prosocial tendencies during native language processing reinforces the argument that language can exert a considerable influence over emotional and evaluative processes. Thus, despite the absence of direct confirmatory evidence for the hypothesised pathways, the overarching proposition—that language can influence emotional and ethical dimensions in investment decision-making—gains support from the supplementary analyses.

Moreover, the analysis incorporating investment experience sheds additional light on how the foreign language effect is moderated by an investor's background. Interestingly, the foreign language effect was notably stronger among investors with prior investment experience, suggesting that such investors are more sensitive to the language used in disclosures. This effect manifested primarily as a diminished response to CSR disclosures

in a foreign language, highlighting a potential desensitisation among experienced investors who are frequently exposed to corporate disclosures, often in English.

Conversely, the lack of a foreign language effect among investors without prior investment experience suggests that emotional resonance might consistently influence their investment decisions, regardless of the language used. This notion is further supported by the observation that experienced investors respond to CSR disclosures in their native language in a manner similar to non-experienced investors. This pattern lends compelling evidence for the FLE, suggesting that experienced investors' emotional responses are dampened when engaging with disclosures in a foreign language.

The current research provides valuable insights into the intersection of language and investor responses to CSR disclosures; however, there are inherent limitations that also pave the way for future research. First, the reliance on a Mexican participant pool raises questions about the broader generalisability of these findings. Future research could benefit from exploring diverse populations, acknowledging the potential modulation of observed effects by cultural and linguistic nuances. Furthermore, findings from my exploratory analyses, though promising, underscore the need for their validation in additional contexts and samples. Moreover, the dichotomy of the language condition—native versus foreign—can be expanded upon. Future studies might explore the nuances of this relationship by delving into the continuum of language proficiency, thereby providing a richer understanding of its influence on investor responses.

The findings from this study carry important practical implications for corporations, investors, and policymakers. Companies that disclose CSR initiatives should be aware that the language in which they present these disclosures can influence investors' emotional responses and consequent investment decisions. As such, corporations operating in multilingual markets might consider adapting their communication strategies based on the linguistic profiles of their target audiences. For investors, understanding that their affective reactions can be modulated by the language of the presentation can promote more informed investment decisions. This is especially crucial in today's globalised market where cross-border investments are increasingly commonplace. Regulators and policymakers might also find it beneficial to acknowledge the influence of language when designing disclosure standards, ensuring that key information is comprehensible and resonates appropriately with diverse investor populations.

In summary, this study sheds light on the intricate interplay between language and investor responses to CSR disclosures. While not all hypotheses were empirically supported, the study offers a nuanced understanding of the underlying mechanisms at play and underscores the importance of language in influencing investor behaviour. It is

hoped that these insights inspire both the academic and corporate worlds to consider the complexities of language and its manifold effects on the global investment landscape.

Chapter 3 The Influence of Time Horizon and Narrative Framing in Environmental Disclosures on Investor Decisions

Abstract This study investigates the impact of time horizon and narrative framing in environmental disclosures on investor decisions. Environmental disclosures often vary in their time horizon, ranging from short-term initiatives to long-term projects. Moreover, these disclosures can emphasise the practical aspects (feasibility) of environmental projects or focus on their aspirational goals (desirability). Through the lens of construal level theory (CLT), this study investigates whether this distinction in time horizon, alongside the narrative framing of environmental initiatives, plays a role in shaping investor responses and preferences. Contrary to conventional CLT predictions, findings from an initial experiment suggest that short-term environmental goals evoke more abstract thinking among investors than long-term goals. A subsequent study further investigates how the congruence between the time horizon of environmental goals and narrative framing affects investors' perceived credibility of the firm and their willingness to invest. Results reveal that environmental goals with a short time horizon paired with desirability framing significantly enhanced investors' perceived credibility of the firm and their willingness to invest. These findings challenge and extend the application of CLT in environmental communication, suggesting that a strategic match between the time horizon and narrative framing can enhance a firm's attractiveness to investors.

Keywords environmental disclosures, time horizon, narrative framing, goal setting, investor judgment and decisions

Acknowledgements I thank Kris Hardies and Joachim Gassen for helpful comments on earlier drafts of this paper.

3.1 Introduction

In recent years, corporate reports increasingly feature environmental disclosures, highlighting their growing significance to both organizations' financial performance and their broader societal and environmental impacts (KPMG, 2020; Rouen et al., 2022). While the literature underscores the value of such sustainability activities (Amel-Zadeh & Serafeim, 2018; Edmans, 2023; Friede et al., 2015), communicating these initiatives poses a challenge due to their varying time horizons—from immediate projects to visionary strategies. This paper explores how the interplay of these time horizons with narrative framing—be it practical feasibility or aspirational desirability—affects investor decisions, offering fresh insights into environmental communication's role in investor behaviour.

More specifically, this paper investigates the time horizon of firms' environmental goals. Many of these goals inherently possess long-term orientations, often entailing multi-year projects and investments that may not immediately translate into quantifiable financial returns (H. B. Christensen et al., 2021). Given this temporal landscape, firms are faced with a strategic choice in their communication: they can highlight the ultimate, long-term environmental achievements they aim to reach, or they can focus on the nearer-term, interim milestones that mark progress towards these broader goals. This strategic choice could significantly impact investor decisions: construal level theory (CLT) posits that individuals construe events in the distant future in more abstract terms, while near-future events are construed more concretely (Trope & Liberman, 2003).

Given that investors' construal levels might be shaped differently based on the time horizon of an environmental goal, the role of narrative framing becomes particularly salient. Narrative framing can be oriented towards feasibility, focusing on the practical, 'how' aspects of environmental goals, or towards desirability, emphasizing aspirational goals or the 'why'. Therefore, I expect it to be most effective to match the narrative framing to fit these construal levels. In this way, distant environmental goals would be most effectively conveyed in terms of desirability or the 'why', and temporally closer environmental goals in terms of feasibility or the 'how'. Conversely, communicating long-term goals in terms of feasibility could also prove effective, as this could make these distant goals more concrete and bring them psychologically closer. This potential interaction between time horizon and narrative framing remains a salient gap in the literature, necessitating empirical exploration.

In a first preliminary experiment, I investigated the hypothesis that long-term environmental goals would lead to more abstract thinking compared to short-term goals. This experiment thus served as an initial exploration to validate the application of CLT within the context of environmental goal communication. Surprisingly, the findings

challenge conventional CLT predictions: investors exposed to short-term horizons adopted more abstract construals than those considering long-term horizons. This outcome hints at the complex interplay between temporal framing and environmental engagement, suggesting that immediate, actionable goals may invoke broader, value-driven considerations among investors, potentially due to a perceived direct impact on environmental sustainability.

A subsequent study was conducted to further examine these findings. This main experiment aimed to understand how the time horizon of environmental goals and their narrative framing together influence investors' willingness to invest. This study hypothesised that the congruence between the time horizon of environmental goals and the type of narrative framing (desirability for short-term, feasibility for long-term) affects investors' perceived credibility of the firm's efforts and, consequently, their willingness to invest. It also proposed that processing fluency would mediate this relationship. However, the results are mixed: while narrative framing did moderate the relationship between time horizon and perceived credibility, influencing investment willingness as predicted for short-term goals with desirability framing, the hypothesised mediation effect of processing fluency was not supported.

These findings partly validate the initial experiment's surprising results, underscoring the nuanced interplay between time horizon, narrative framing, and investor responses within the environmental sustainability context. Specifically, they highlight that short-term goals framed in terms of their broader, value-driven implications can enhance a firm's perceived credibility and, by extension, its attractiveness to investors. This research contributes to the body of knowledge by challenging and extending the application of CLT in environmental communication, suggesting that immediate action towards sustainability, when communicated with an emphasis on desirability, may indeed foster a stronger investor commitment.

The current research thus presents a compelling contrast to the findings of Puspitasari et al. (2024). They discovered that short-term investors are more inclined to invest when disclosures are framed in terms of feasibility, not desirability. Both studies, grounded in CLT, suggest intriguingly divergent strategies for engaging short-term perspectives, whether related to the goals themselves or the investors' horizons. These contrasting insights enrich our understanding of CLT's application in environmental sustainability communication, underscoring its role in shaping investor perceptions.

This paper also contributes to the broader discourse on environmental, social, and governance (ESG) communications as highlighted by recent studies, such as the work by Garavaglia et al. (2023). They unveiled the 'ESG stopping effect,' revealing that while

investors react similarly to the initiation of both ESG-related and non-ESG-related initiatives, their reactions turn significantly more negative when firms terminate ESG initiatives compared to general business initiatives, suggesting that investors attribute a unique sense of ethical responsibility to ESG efforts. Young's (2023) discussion of this research emphasises the nuanced investor expectations surrounding ESG commitments and the critical role of goal attributes and communication in managing these expectations. Against this backdrop, the present study examines two such attributes—the time horizon and narrative framing of environmental goals. By examining their influence on investor perceptions, this research responds to the call for deeper understanding of effective ESG communication strategies.

3.2 Background

In the last decade, Environmental, Social, and Governance (ESG) considerations have steadily ascended the corporate and investment agenda. Key international agreements, such as the Paris Agreement on climate change and the United Nations' Sustainable Development Goals (SDGs), have underscored the urgency and centrality of sustainable practices. Concurrently, a growing cohort of investors and stakeholders are actively prioritizing ESG performance, evidenced by the surging inflow of capital into ESG-themed funds and investment vehicles (Hartzmark & Sussman, 2019).

Given this increasing attention, there have been concerted efforts to establish comprehensive and coherent standards for ESG reporting. Recently, the European Commission (EC) together with the European Financial Reporting Advisory Group (EFRAG) and the International Financial Reporting Standards (IFRS) Foundation, have been at the forefront of this endeavour (Giner & Luque-Vílchez, 2022). Importantly, recognising the diverse temporal scales at which ESG initiatives operate, the European Sustainability Reporting Standards (ESRS) explicitly categorise disclosures into short, medium, and long-term frameworks (Delegated Regulation 2023/2772; Wagenhofer, 2023). This move towards nuanced temporal categorisation represents a significant departure from the traditional focus on short-term financial reporting, highlighting an evolving understanding of the importance of sustainability in the long-term corporate strategy.

Time horizon

Prior research indicates a link between investors' investment horizons and their preferences for ESG initiatives. For instance, the presence of long-term institutional investors promotes ESG engagement (Meng & Wang, 2019) and long-term nonprofessional investors are more willing to invest in sustainable firms than their short-term counterparts (Puspitasari et al., 2024). This preference for ESG strategies among long-term investors

accentuates a notable challenge in current reporting practices. Financial reporting and management are often geared towards short-term outcomes, emphasizing immediate financial performance and quarterly earnings (Geng et al., 2023; Hahn et al., 2014).

Such short-term focus can obscure the long-term benefits and impacts of ESG initiatives, making it challenging for companies to effectively communicate these aspects. The disparity between the time horizon of ESG initiatives and the short-term orientation of traditional financial reporting underscores the importance of understanding how stakeholders perceive and process information about ESG initiatives, a perception potentially influenced by psychological distance, a key concept in construal level theory.

Construal level theory

Construal level theory (CLT) is a psychological theory that explores how different dimensions of psychological distance—temporal, spatial, social, and hypothetical—affect people's mental representation of events, objects, and actions (Trope & Liberman, 2010). According to CLT, as the psychological distance from an event increases, people tend to think about the event in more abstract terms (high-level construals). Conversely, when an event feels psychologically closer, individuals are more likely to construe it in concrete terms (low-level construals). This theory articulates that psychological distance impacts how abstractly or concretely people think about the world around them, influencing not only how they perceive events but also how they make decisions and act in various contexts.

In marketing, CLT has been used to tailor advertising messages that align with the psychological distance of products, effectively influencing consumer decisions (Florence et al., 2022). Environmental communication studies have applied CLT in a different vein, often attempting to use more concrete messaging to make abstract, long-term environmental issues more relatable and actionable to the public (Maiella et al., 2020). CLT has also been applied in accounting (for a discussion, see Weisner, 2015). For instance, Elliott et al. (2017) focused on the interplay between the strategy frame (whether CSR efforts are community-focused or global) and the presentation style (pictorial vs. textual) in CSR reports. They found that congruence in the construals induced by these aspects enhanced investors' willingness to invest. Similarly, congruence between framing features of a corporate climate change strategy disclosure and investment horizon have been shown to enhance willingness to invest as well (Puspitasari et al., 2024).

Narrative framing

In communicating ESG goals over different time horizons, managers can vary the content and framing of their narratives. For example, investors respond favourably to green

investments when managers highlight societal benefits rather than costs (Martin & Moser, 2016). In addition, investors assign higher valuations to firms that implement operational changes to reduce greenhouse gas emissions, as opposed to those that rely on offset strategies (Johnson et al., 2020). Such findings suggest that narratives can significantly influence investor reactions. Building on this, this study focusses on two types of narrative framing: feasibility-focused narratives that present practical or the 'how' aspects of ESG targets, and desirability-focused narratives that emphasise aspirational goals or the 'why'.

More generally, goal-setting theory posits that the specificity of a goal can significantly influence an individual's motivation and performance towards achieving that goal (Hochli et al., 2018). As Young (2023) notes, it follows that such goal attributes could also significantly influence stakeholders. Within the framework of goal-setting, goals are often categorised into superordinate (aspirational, broad outcomes) and subordinate (practical, immediate tasks) goals. Superordinate goals align with desirability-focused narratives by emphasizing the 'why'—the broader, aspirational outcomes of ESG initiatives, such as contributing to a sustainable future or enhancing societal well-being. These goals tap into abstract thinking and are akin to the high-level construals described in CLT, where the focus is on the overarching purpose and long-term vision of ESG efforts. On the other hand, subordinate goals are more aligned with feasibility-focused narratives, concentrating on the 'how'—the specific, actionable steps required to achieve ESG targets. These narratives resonate with concrete thinking and low-level construals, emphasizing the practical aspects and immediate tasks at hand. By drawing on goal-setting theory, this study delineates a theoretical basis for distinguishing between feasibility and desirability in ESG narratives.

Processing fluency and credibility

Drawing from the insights of CLT and guided by prior accounting literature, I expect that congruence between the construals induced by both time horizon and narrative frames can increase investors' processing fluency. Processing fluency, or the ease with which information is processed (Alter & Oppenheimer, 2009), has been shown to significantly influence investor judgments and decision-making in a number of different contexts (e.g., Asay et al., 2017; Elliott et al., 2017; Rennekamp, 2012; Tan et al., 2015; Tan et al., 2014). In this context specifically, narratives that align with the mental construal associated with their time horizon are likely to be processed more fluently, thereby enhancing investors' willingness to invest.

Specifically, I anticipate an increase in processing fluency to strengthen investors' perceptions of a firms' credibility. In a corporate context, credibility is often assessed as a combination of a firms' expertise and trustworthiness (Newell & Goldsmith, 2001). I expect

that enhanced fluency will lead investors to perceive the firm's expertise as high, reflecting a competence in delivering accurate and insightful information on ESG matters. Similarly, improved fluency is expected to bolster the perceived trustworthiness of the firm, showcasing its commitment to ethical integrity and honesty. As a result, these heightened perceptions of expertise and trustworthiness should increase investor trust and reliance on the firm's ESG disclosures, and consequently their willingness to invest.

Furthermore, the time horizon and narrative framing of ESG disclosures could also directly influence investors' perceived credibility. As outlined by Mercer (2004), disclosure characteristics such as the precision, horizon, plausibility, and the extent of supporting information of disclosures significantly shape credibility assessments. Shorter time horizons might be perceived as more credible due to their immediacy and the perceived urgency of action they convey rather than distant promises. Additionally, when narratives are framed to emphasise feasibility—focusing on practical steps and realistic assessments rather than overly aspirational goals—they provide a clearer sense of how ESG goals will be achieved. This can enhance the plausibility of the disclosure, leading to a stronger perception of the firm's competence and sincerity.

Building on these theoretical insights, the following sections present the rationale and formulate hypotheses for two empirical studies designed to test these dynamics.

3.3 Study 1: Time horizon and investors' level of construal

Rationale and hypothesis

In this initial study, my focus was on whether time horizon affects investors' level of construal in the context of environmental reporting. This focus, despite the broader ESG context discussed previously, was specifically chosen due to the typically long-time horizons associated with environmental outcomes, making this an especially pertinent topic.

CLT posits that individuals' psychological distance from an event influences their mental representation of that event—shifting between more abstract or concrete thinking based on perceived temporal distance. Specifically, events or objectives perceived as temporally distant are construed at a higher, more abstract level, while those seen as imminent are interpreted more concretely. The manipulation of time horizon in this study aims to operationalise these theoretical constructs within environmental reporting, leading to the following hypothesis:

H1: *Investors reading environmental reports with short-term (long-term) goals show a preference for concrete (abstract) descriptions of sustainability initiatives.*

Accordingly, this investigation acts as a pilot study to ensure that the manipulation effectively influences the construct it is designed to affect—a step identified as best practice in experimental research for ensuring construct validity, or the degree to which experimental manipulations accurately represent the theoretical constructs they intend to operationalise (Chester & Lasko, 2021; Ejelöv & Luke, 2020; Hauser et al., 2018). In the context of construal level theory (CLT), the importance of this step has been particularly emphasised (Benschop et al., 2020; Trautmann, 2019).

Method[22]

Participants

This study recruited 202 nonprofessional investors from the United States through Prolific. Participants were selected based on three criteria: a history of making investments in company stocks or shares, experience with evaluating a company's financial statements, and a minimum approval rate of 95% on Prolific to ensure reliable responses. Submissions from two participants were excluded because they provided nonsense responses to the open questions, leaving a final sample of 200 participants. Participants spent an average (median) of 22 (18) minutes on the survey and they were compensated at a rate of £9.00 an hour based on the median completion time. The sample was predominantly male (65%) with an average age of 41 years. One participant identified as agender.

Procedure

Upon recruitment, participants were randomly assigned to one of two experimental conditions in a between-subjects design: they were exposed to an environmental report from a fictitious company, XYZ Clothing, which either emphasised a short-term horizon (by 2026) or a long-term horizon (by 2040) for achieving its environmental goals. The choice of these specific years was guided by findings from CLT research. According to a meta-regression analysis, the effect of temporal distance on construal level is influenced by both the difference between near and far time points and the starting point of the near time condition (Soderberg et al., 2015). As the temporal distance manipulation moves further into the future and as the difference between conditions increases, studies tend to produce larger effects on abstraction levels. Thus, selecting 2026 (a short-term horizon) and 2040 (a long-term horizon) maximises the temporal distance between the conditions, thereby amplifying the expected differences in construal levels.

[22] This study was pre-registered on the Open Science Framework (OSF): https://osf.io/zajqf. The pre-registration details the study's hypotheses, experimental design, randomization procedures, blinding, sample size (and rationale), data collection methods, variables (both manipulated and measured), statistical models, inference criteria, and data exclusion criteria. Ethical approval for the experiment was granted by the institution where the online experiment was administered.

Additionally, these years were chosen for their practical relevance. The year 2026 is close enough to be perceived as an immediate target, relevant for current strategic planning and operational adjustments. In contrast, the year 2040 represents a long-term vision, aligning with many global sustainability goals and providing a distant enough timeframe to evoke higher-level, more abstract thinking about the future. By selecting these years, the study not only leverages theoretical insights to enhance the effect size but also situates the environmental goals within a context that is meaningful and impactful for participants, reflecting real-world planning horizons.

The study commenced with participants engaging with the dynamic Behavior Identification Form (BIF), a tool designed to measure construal levels (Nguyen et al., 2023).[23] In this initial stage, participants were presented with ten predefined environmental initiatives. They were instructed to describe each initiative in terms of 'how' the initiative is performed (aligning with a concrete, low-level construal) and 'why' the initiative is taken (aligning with an abstract, high-level construal).

Following this, participants were presented with the environmental report from XYZ Clothing which detailed the company's environmental goals with a specified time horizon. After reading the report, participants revisited the ten environmental initiatives. In this subsequent stage, utilising their initial descriptions, they rated their preference for describing the ten sustainability initiatives in concrete vs. abstract terms on a 5-point scale.

Additionally, the study incorporated measures of participants' perceptions of the environmental report's time horizon, the future distance of the company's environmental goals, and their evaluations of XYZ Clothing's ambition, achievability, and commitment to improving its environmental impact. These were rated on a 100-point scale for time horizon and future distance, and a 7-point scale for the ambition, achievability, and commitment assessments. Lastly, participants answered demographic questions.

Results

Attention checks

Building upon the qualitative examination of open responses, where only two submissions were removed due to clearly demonstrated low effort (see Participants), this study further implemented two attention checks to ensure participant engagement. The first attention

[23] The dynamic BIF improves upon the original version by Vallacher and Wegner (1989) in several ways. It asks participants to give their own descriptions of actions in concrete and abstract terms, which better captures individual differences in perception. This approach also removes the need for preliminary pilot studies to establish normative responses, making the tool adaptable to various research contexts, including this study. Specifically, this adaptability allowed for the creation of new items focused on environmental sustainability, directly aligning with the context of the study. Additionally, the transition from a binary choice to a 5-point scale reflects the understanding that abstraction exists on a continuum, potentially enhancing the measure's sensitivity.

check queried participants on the primary issue discussed in XYZ Clothing's environmental report, with 67.5% responding correctly. The second attention check involved identifying the target year by which XYZ Clothing aims to achieve its environmental goals, which 88.5% of participants answered accurately. These measures collectively affirm a high level of engagement with the material. Furthermore, the statistical inferences presented below, based on the complete sample, remain unchanged when excluding participants who failed these checks.

Manipulation checks

The data indicate a statistically significant difference in the perceived time horizon of XYZ Clothing's environmental goals between the two conditions. Participants exposed to the short-term horizon condition rated the time horizon of the company's environmental goals as shorter-term ($M = 40.690$, $SD = 27.559$) compared to participants in the long-term horizon condition, who rated them as longer-term ($M = 71.210$, $SD = 21.641$), $t(198) = -8.710$, $p < 0.001$. Similarly, when asked how distant in the future they perceive the company's environmental goals to be, participants in the short-term condition perceived them as nearer ($M = 31.870$, $SD = 21.406$) than participants in the long-term condition ($M = 63.790$, $SD = 23.101$), $t(198) = -10.135$, $p < 0.001$. These results suggest that the manipulation of temporal distance was effective, with the long-term condition being associated with a greater psychological distance from the company's environmental goals.

Level of construal

Construal levels were assessed by averaging participant' responses to the ten initiatives on the dynamic BIF ($\alpha = 0.746$). Participants in the short-term horizon condition demonstrated a higher mean construal level ($M = 3.384$, $SD = 0.829$) compared to those in the long-term condition ($M = 3.158$, $SD = 0.855$). This result is contrary to the original hypothesis, which suggested that a short-term horizon would be associated with a more concrete level of construal, while a long-term horizon would be associated with a more abstract level of construal. The t-test revealed an effect in the opposite direction of the hypothesis, $t(198) = 1.90$, $p = 0.030$, one-tailed, which when adjusted for the hypothesised direction results in a p-value of 0.970, indicating non-significance.

Ambition, achievability, and commitment

In assessing participants' views on XYZ Clothing's environmental ambitions, those in the short-term condition rated the company's target as moderately ambitious ($M = 5.300$, $SD = 1.141$), whereas participants in the long-term condition found the goals slightly less ambitious ($M = 4.780$, $SD = 1.236$), $t(198) = 3.091$, $p = 0.002$. As for the achievability of these goals, participants' ratings were higher in the long-term condition ($M = 5.080$, $SD = 1.089$) compared to the short-term condition ($M = 4.650$, $SD = 1.258$), indicating they found the

long-term goals more achievable, $t(198) = -2.584$, $p = 0.010$. Commitment ratings showed participants in the short-term condition perceived XYZ Clothing as more committed ($M = 5.420$, $SD = 1.174$) compared to those in the long-term condition ($M = 4.950$, $SD = 1.329$), $t(198) = 2.65$, $p = 0.009$.

Discussion

The current study sought to explore how temporal distance influences construal levels among investors reading about a company's environmental initiatives. The findings yielded an intriguing, if counterintuitive, result: investors exposed to a short-term horizon demonstrated higher levels of abstract construal compared to those presented with a long-term horizon. This outcome deviates from traditional CLT expectations, which typically posit that longer temporal distances are associated with more abstract construals.

One potential explanation for this unexpected pattern may relate to the specific context of environmental sustainability and how individuals mentally engage with such content. Prior research has highlighted the challenges in measuring construal levels in environmental contexts, particularly when the Behavior Identification Form (BIF) could equate 'abstract' construals with environmental attributions (Wang et al., 2019). In this study, the dynamic BIF's adaptation to sustainability initiatives may have similarly aligned participants' environmental attributions with their construal level, as evidenced in how initiatives such as 'Engaging in reforestation efforts' could be construed abstractly due to their environmental purpose rather than the more typical abstract reasoning of focusing on the 'why' of an action.

Moreover, the findings may not solely be a methodological artifact but also reflective of a broader phenomenon. Research by Reczek et al. (2018) indicates that individuals inclined towards abstract thinking are more likely to favour eco-friendly products, suggesting that abstract construal levels and environmental attributions might be intrinsically linked within this context.

This link could explain why a short-term focus, which presumably aligns with immediate action and concrete details, paradoxically elicited a more abstract level of construal. Participants might perceive short-term goals as more directly addressing environmental issues, thereby engaging in more abstract, value-driven thinking about the actions' broader implications. This interpretation is supported by the higher perception of commitment observed in the short-term condition, suggesting that participants may associate immediate action with a stronger dedication to environmental responsibility. Consequently, they may construe such actions at a higher level of abstraction as being more meaningful and impactful. Conversely, long-term goals, while inherently abstract in nature, might prompt investors to be sceptical and be more considerate of the steps

required to achieve these outcomes, leading to a lower-level, more concrete construal. Thus, in the context of sustainability initiatives, the typical temporal framing associated with CLT may be overridden by the immediacy of action and perceived commitment.

3.4 Study 2: Time horizon, narrative framing, and investors' willingness to invest

Rationale and hypotheses

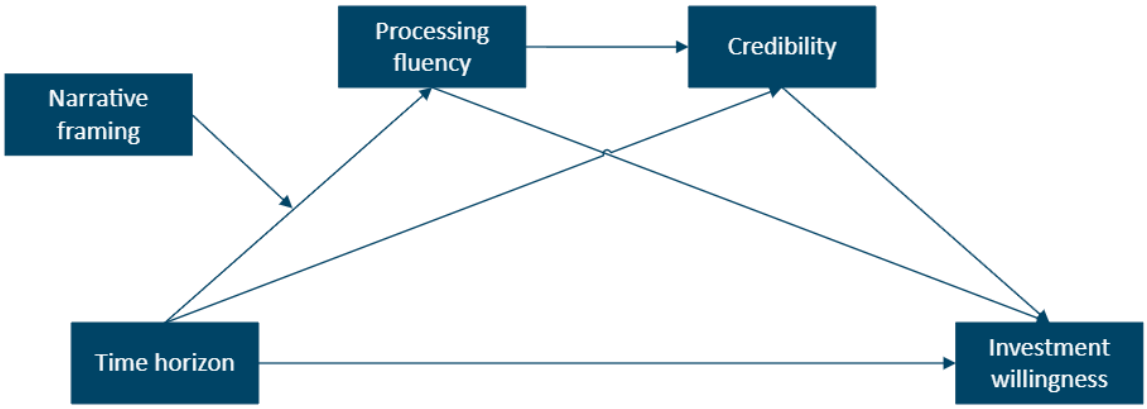
Building on the exploration of time horizon and investors' construal levels, this second study examines the dynamics between time horizon, narrative framing, and their collective influence on investors' willingness to invest. The findings from the initial study challenge traditional CLT expectations, revealing that short-term environmental goals elicited more abstract construals, likely due to the perceived commitment to environmental responsibility. This unexpected outcome underscores the complexity of applying CLT in the sustainability context, where perceived company commitment, along with the ambition and achievability of goals, could significantly influence investor perceptions.

Specifically, the combination of ambition, achievability, and commitment can play a role in shaping the perceived credibility of a company's sustainability efforts. Credibility, which is fundamentally based on trust and expertise (Newell & Goldsmith, 2001), can influence investor decisions. When investors perceive that a company's goals are ambitious yet achievable, and that the company is genuinely committed to these goals, it enhances their trust in the company. Moreover, a clear demonstration of expertise in setting and achieving these goals further solidifies the company's credibility.

Given the heightened abstraction and perceived commitment associated with short-term sustainability goals, it is conceivable that such immediacy could bolster a firm's credibility in the eyes of investors by reinforcing both trust and expertise, potentially enhancing their willingness to invest. This study seeks to further investigate this premise, particularly examining how narrative framing may moderate this relationship. Building on the insights gained, I posit that short time horizons, which lead to higher-level construals, would be most effectively complemented by desirability framing that underscores the broader, value-driven implications of the sustainability efforts. Conversely, long time horizons may be better suited to feasibility framing, emphasizing the practical steps and tangible outcomes of the sustainability initiatives. These congruent matches between the time horizon and narrative framing are hypothesised to increase processing fluency, enhancing the perceived credibility of the firm's efforts and, ultimately, leading to a higher investment willingness.

Given these considerations, this study is designed to systematically examine the effects of narrative framing as a moderator in the relationship between time horizon and investors' willingness to invest, with a particular focus on the mediating roles of processing fluency and credibility. A conceptual model illustrating these proposed relationships is depicted in Figure 3.1. Based on this model, I articulate the following hypotheses to explore the dynamics among the key variables:

Figure 3.1 Conceptual model



This figure presents a graphical depiction of the proposed conceptual model underlying the hypotheses.

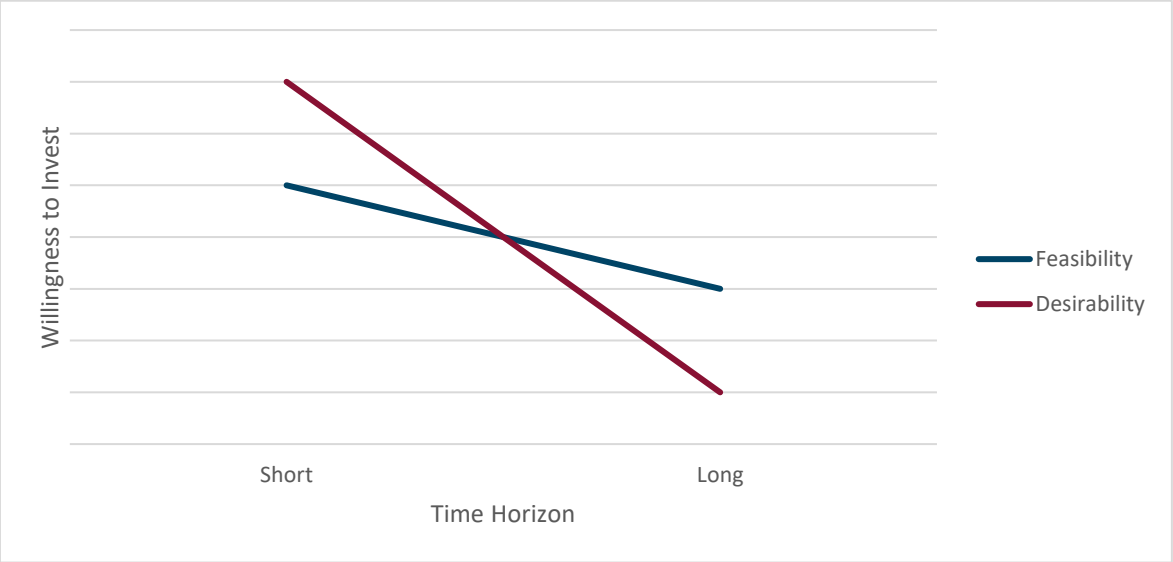
H1: *The time horizon of environmental goals influences investors' perceived credibility of the firm's efforts, with short-term goals being perceived as more credible than long-term goals and leading to a higher willingness to invest.*

Following the unexpected findings from the initial study, this hypothesis aims to further explore the link between time horizon and perceived credibility. Despite CLT suggesting nearer events are processed more concretely, results showed short-term goals led to more abstract construals, possibly due to perceived immediate commitment to sustainability. H1 seeks to validate and extend these findings, examining if short-term goals indeed increase credibility and contribute to a higher willingness to invest.

H2: *Narrative framing (desirability vs. feasibility) moderates the relationship between the time horizon of environmental goals (short-term vs. long-term) and investors' perceived credibility of the firm's efforts, subsequently affecting their willingness to invest. Specifically, desirability framing enhances the perceived credibility and investment willingness for short-term goals, and feasibility framing does the same for long-term goals.*

This hypothesis adapts CLT to this study's specific context, focusing on the strategic match of construal levels with narrative framing to optimise communication effectiveness. It posits that matching the level of construal induced by time horizon with the appropriate level of construal in narrative framing can enhance message effectiveness. Both H1 and H2 are depicted graphically in Figure 3.2.

Figure 3.2 Predicted relationships in H1 and H2



This figure graphically depicts the relationships predicted in H1 and H2. H1 posits that the time horizon of environmental goals influences investors' perceived credibility of the firm's efforts, with short-term goals being perceived as more credible than long-term goals and leading to a higher willingness to invest. It thus predicts a main effect of time horizon. H2 further refines this hypothesis predicting an interaction and states that desirability framing enhances the perceived credibility and investment willingness for short-term goals, and feasibility framing does the same for long-term goals.

H3: *Processing fluency mediates the moderated relationship between time horizon, narrative framing, and perceived credibility, ultimately affecting investors' willingness to invest. A congruent match between time horizon and narrative framing (desirability with short-term, feasibility with long-term) facilitates processing fluency, thereby increasing the credibility of the firm's sustainability efforts, and leading to a higher willingness to invest.*

Lastly, this hypothesis explores the cognitive mechanism that may underlie the relationships posited in H2, integrating CLT with additional psychological insights to provide a comprehensive model of how strategic communication influences investor behaviour.

Method[24]

Participants

This study drew from the same population as the first, recruiting 522 nonprofessional investors from the United States through Prolific. Participants were selected based on three criteria: a history of making investments in company stocks or shares, experience

[24] This study was pre-registered on the Open Science Framework (OSF): https://osf.io/uka5n.The pre-registration details the study's hypotheses, experimental design, randomization procedures, blinding, sample size (and rationale), data collection methods, variables (both manipulated and measured), statistical models, inference criteria, data exclusion criteria, and plans for exploratory analyses. Ethical approval for the experiment was granted by the institution where the online experiment was administered.

with evaluating a company's financial statements, and a minimum approval rate of 95% on Prolific to ensure reliable responses. After excluding 13 participants for failing both attention checks, the final sample consisted of 509 participants. Participants spent an average (median) of 10 (7) minutes on the survey and they were compensated at a rate of £9.00 an hour based on the median completion time. The demographic composition of this sample was similar to that of the first study, predominantly male (64.4%), with females representing 34.2% and those identifying as other genders comprising 1.4%. The average age was 43 years.

Procedure

The procedure for this experiment closely followed the methodology of the first study with adjustments to explore new variables and hypotheses. Upon recruitment, participants were randomly assigned to one of four experimental conditions, reflecting a 2x2 between-subjects design based on time horizon (short-term vs. long-term) and narrative framing (desirability vs. feasibility) of the environmental goals set forth by a fictitious company, XYZ Clothing.

Participants began by familiarizing themselves with XYZ Clothing, provided through a background briefing that outlines the company's industry position, financial health, and market presence. This foundational knowledge ensured that all participants had a uniform starting point for evaluating the environmental disclosure.

Following this introduction, participants were presented with an environmental disclosure tailored to their assigned condition. The environmental disclosures were crafted to vary both in the time horizon of the sustainability goals (either by 2026 for short-term or by 2040 for long-term) and in the narrative framing employed (emphasizing either the desirability of the sustainability outcomes or the feasibility of achieving these outcomes). Details of these manipulations are provided in the Appendix C.

After reviewing the environmental disclosure, participants engaged with a series of measures (see Table 3.1 for the details). Drawing from Asay et al. (2023), the primary dependent variable assessed investors' holistic perceptions of XYZ Clothing through a set of three questions evaluating their willingness to invest, overall feelings towards the investment, and general perceptions of the company's stock, measured on a 7-point scale ranging from 'Very unwilling' or 'Significantly negative' to 'Very willing' or 'Significantly positive'.

Processing fluency was captured through a single-item measure asking participants to rate the ease of reading the environmental disclosure, on a scale from 'Difficult' (1) to 'Easy' (101), adapted from Graf et al. (2018). This measure aims to quantify the cognitive ease or

difficulty experienced by participants, reflecting the hypothesised impact of narrative framing and time horizon congruence on information processing.

Table 3.1 Variable definitions

Variable	Source	Items and calculation
Willingness to Invest	Asay et al. (2023)	Average of responses to: • How willing are you to invest in XYZ Clothing's stock? (1 = Very unwilling, 7 = Very willing) • Are your feelings towards XYZ Clothing's stock as a potential investment generally more positive or more negative? (1 = Significantly negative, 7 = Significantly positive) • What are your general perceptions of XYZ Clothing's stock as a potential investment? (1 = Significantly negative, 7 = Significantly positive)
Corporate Credibility	Newell and Goldsmith (2001)	Average of responses to: • XYZ Clothing has a great amount of experience. • XYZ Clothing is skilled in what they do. • XYZ Clothing has great expertise. • XYZ Clothing does *not* have much experience. • I trust XYZ Clothing. • XYZ Clothing makes truthful claims. • XYZ Clothing is honest. • I do *not* believe what XYZ Clothing tells me. (1 = Strongly disagree, 7 = Strongly agree)
Processing Fluency	Graf et al. (2018)	Response to: • The process of reading XYZ Clothing's environmental report was... (1 = Difficult, 101 = Easy)

Environmental Concern	Schultz (2001)	Average of responses to:
		• I am concerned about environmental problems because of the consequences for
		  ○ Plants
		  ○ Marine life
		  ○ Bird
		  ○ Animals
		  ○ Me
		  ○ My lifestyle
		  ○ My health
		  ○ My future
		  ○ People in my country
		  ○ All people
		  ○ Children
		  ○ My children
		(1 = Not important, 7 = Supreme importance)

This table presents the variables and scales used in Study 2. For each variable, the source of the scale used is indicated as well as the individual items and the calculation of the variable.

Following the assessment of processing fluency, participants' perceptions of XYZ Clothing's corporate credibility were measured using an 8-item scale focusing on two dimensions of credibility: expertise and trustworthiness. This validated scale includes items assessing the company's experience, skill, expertise, trustworthiness, and honesty, alongside participants' trust and belief in the company's claims (Newell & Goldsmith, 2001).

To control for potential confounding factors and ensure the robustness of the findings, the study also measured participants' environmental concerns using the Schultz (2001) Environmental Concern Scale, alongside collecting demographic information.

Results

Manipulation and attention checks

This study replicated the manipulation checks of the first study to ascertain the effectiveness of the temporal distance manipulation concerning XYZ Clothing's environmental goals. Consistent with the initial findings, participants differentiated significantly between short-term and long-term horizons, indicating a successful replication of the manipulation. Detailed results from these manipulation checks are documented in Study 1.

Additionally, this second study introduced a manipulation check to test the narrative framing (feasibility vs. desirability) manipulation. Participants were asked to evaluate the extent to which XYZ Clothing's environmental report focused on the specific actions they plan to take. Results indicated a statistically significant difference between the feasibility framing ($M = 4.819$, $SD = 1.255$) and desirability framing ($M = 4.120$, $SD = 1.540$), $t(507) = -5.619$, $p < 0.001$. This difference corroborates the effectiveness of the narrative framing manipulation, thus affirming that participants perceived the environmental report to be more action-specific under the feasibility condition as opposed to the desirability condition.

To further ensure the reliability of the data, two attention checks were incorporated into the study design. The first attention check asked participants, 'Which of the following best describes the primary issue discussed in XYZ Clothing's environmental report?' A total of 75.4% of participants answered this question correctly, demonstrating a high level of engagement with the material. The second attention check queried, 'By which year does XYZ Clothing aim to achieve its environmental goal?' with 80.4% of participants providing the correct answer. These results suggest that a substantial majority of the study participants paid careful attention to the details presented in XYZ Clothing's environmental report, thereby supporting the integrity of the responses collected. To

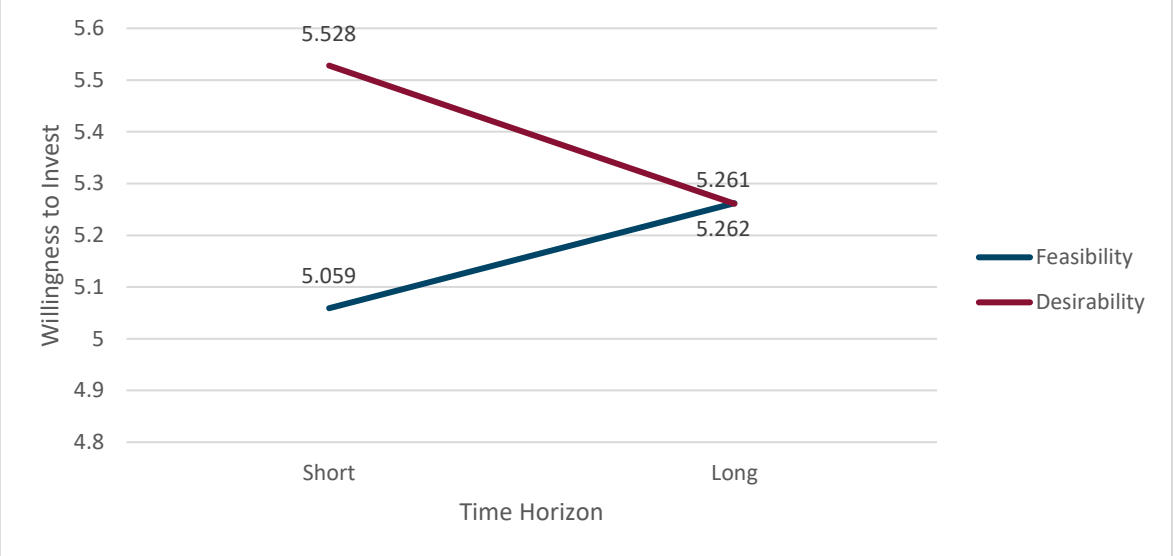
uphold pre-registration commitments, this study reports findings based on the entire sample. Furthermore, to ensure the robustness of the findings, sensitivity analyses were also conducted to examine the impact of excluding participants who failed the attention checks. Where these sensitivity analyses revealed differences in the findings, such deviations are explicitly noted.

Time horizon, narrative framing, and willingness to invest

This study set out to explore how the time horizon of environmental goals and narrative framing affect investors' perceptions of a firm's credibility and their willingness to invest. I proposed two hypotheses: H1 suggested that short-term goals would be seen as more credible than long-term goals, thus increasing willingness to invest. H2 posited that the effect of time horizon on perceived credibility and investment willingness would be moderated by narrative framing, predicting that desirability framing would enhance short-term goals' appeal, while feasibility framing would do the same for long-term goals. In this first section, I investigate the effects of time horizon and narrative framing on investors' willingness to invest.

Panel A of Table 3.2 presents the mean willingness to invest under the various conditions and Figure 3.3 depicts this graphically. Most notably, for short-term goals, desirability framing (M = 5.528, SD = 0.898) showed a clear advantage over feasibility framing (M = 5.059, SD = 1.315), suggesting that narrative framing's impact is most significant when goals are short-term.

Figure 3.3 Plot of participants' mean willingness to invest



This figure illustrates participants' mean willingness to invest by condition.

A two-way ANOVA (Panel B of Table 3.2) examined the main and interaction effects of time horizon and narrative framing on willingness to invest. The analysis showed no statistically significant main effect for time horizon, t(505) = -0.313, p = 0.623, one-tailed, indicating that H1, which predicted a differential impact of short- vs. long-term goals on investment willingness, was not supported. Conversely, a statistically significant main effect of narrative framing was observed, F(1, 505) = 5.176, p = 0.023, supporting part of H2 by demonstrating that narrative framing significantly influences investors' willingness to invest. The interaction between time horizon and narrative framing was also statistically significant, t(505) = -2.275, p = 0.012, one-tailed, further supporting H2 by suggesting that the effectiveness of narrative framing on investment willingness is contingent upon the goal's time horizon.

Table 3.2 Descriptive statistics and ANOVA: How time horizon and narrative framing affect willingness to invest – tests of H1 and H2

Panel A: Descriptive Statistics, Mean (Standard Deviation), n = 509			
	Narrative Framing		
Time Horizon	*Feasibility*	*Desirability*	*Overall*
Short	5.059 (1.315) n = 129	5.528 (.898) n = 125	5.290 (1.151) n = 254
Long	5.262 (1.206) n = 130	5.261 (1.177) n = 125	5.261 (1.190) n = 255
Overall	5.161 (1.263) n = 259	5.395 (1.053) n = 250	5.276 (1.169) n = 509

Panel B: Two-Way ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**t**	**p-value**
Time Horizon	0.133	1	.133	0.098	0.313	0.623[a]
Narrative Framing	6.976	1	6.976	5.176	-2.275	0.023
Time Horizon x Narrative Framing	6.989	1	6.989	5.185	-2.277	0.012[a]
Error	680.712	505	1.348			

Panel C: Simple Effects Tests				
Comparisons	**df**	**F**	**t**	**p-value**
Effect of *Narrative Framing* given *Short Time Horizon*	1	10.340	-3.216	<0.001[a]
Effect of *Narrative Framing* given *Long Time Horizon*	1	<0.001	-0.001	0.500[a]
Effect of *Time Horizon* given *Feasibility*	1	1.289	-1.135	0.162
Effect of *Time Horizon* given *Desirability*	1	3.297	1.816	0.070

Panel A presents the mean investment willingness by condition. Panel B presents the results of a two-way between-subjects ANOVA with Time Horizon (Long = 0 and Short = 1) and Narrative Framing (Desirability = 0 and Feasibility = 1) as factors and investment willingness as the dependent variable. Panel C presents the results of simple effects tests following a significant interaction. [a] One-tailed p-values for directional predictions based on the signed t-tests.

Simple effects tests (Panel C of Table 3.2) revealed that the impact of narrative framing was statistically significant within short-term goals, $t(505) = 3.216$, $p = <0.001$, one-tailed, supporting H2 that desirability framing increases investment willingness compared to feasibility framing for short-term objectives. However, for long-term goals, narrative framing did not statistically significantly affect investment willingness, $t(505) = -0.001$, $p = 0.500$, one-tailed, suggesting that the persuasive power of narrative framing diminishes over longer time horizons.

Moreover, the influence of the time horizon within the feasibility framing context was not statistically significant, $F(1, 505) = 1.289$, $p = .162$. This indicates that for feasibility-focused narratives, the length of the goal's time horizon does not sway investors' willingness to invest. In contrast, within desirability framing, short-term goals were marginally statistically significantly more effective in garnering investor support than long-term goals, $F(1, 505) = 3.297$, $p = .070$, reinforcing the claim of H2 regarding the strategic match between narrative framing and time horizon.

Corporate credibility and processing fluency

This section examines corporate credibility and processing fluency as mechanisms potentially underlying the impact of time horizon and narrative framing on an investor's willingness to invest. Credibility, identified in H1 and H2, is considered a mediator that may sway investors' perceptions. Additionally, processing fluency, the ease with which information is understood and introduced in H3, is assessed for its role in this relationship.

Table 3.3 details the descriptive statistics for these proposed mediators. For corporate credibility (Panel A), a pattern parallel to that of investment willingness manifests. For short-term goals, desirability framing results in a higher mean credibility score ($M = 5.482$, $SD = 0.813$) compared to feasibility framing ($M = 5.199$, $SD = 0.980$). This trend is less pronounced for long-term goals, where the means are 5.346 ($SD = 0.894$) for feasibility and 5.281 ($SD = 0.940$) for desirability. These findings suggest that the congruence between the time horizon of environmental goals and the type of narrative framing may be influential for the perceived credibility of the firm's efforts.

Conversely, the descriptive statistics for processing fluency (Panel B) do not demonstrate large differences between conditions, with all groups reporting similarly high levels of fluency. This lack of variance implies that the narrative framing and time horizon do not substantially affect the ease with which investors process the firm's environmental reports. An ANOVA supports this conclusion, showing no statistically significant effects ($F(3, 505) = 0.020$, $p = 0.996$, untabulated). Consequently, processing fluency was not considered further as a potential mediator in the study.

To further investigate the mediating role of corporate credibility, a moderated mediation analysis, utilizing Model 7 from Hayes' (2017) PROCESS macro, was conducted. As depicted in Figure 3.4, Panel A, the analysis revealed a statistically significant moderation effect of narrative framing on the impact of time horizon on credibility ($F(1, 505) = 4.674$, $p = 0.016$, untabulated), indicating that the type of narrative framing used significantly alters how the time horizon of environmental goals affects perceived corporate credibility. Specifically, desirability framing in conjunction with a short-term goal statistically significantly enhanced credibility ($\beta = 0.201$, $p = 0.041$, one-tailed), whereas feasibility framing did not produce a statistically significant effect ($\beta = -0.148$, $p = 0.096$, one-tailed).

Table 3.3 Descriptive statistics for mediating variables

Panel A: Descriptive Statistics for *Corporate Credibility*, Mean (Standard Deviation)			
	Narrative Framing		
Time Horizon	*Feasibility*	*Desirability*	*Overall*
Short	5.199 (.980) n = 129	5.482 (.813) n = 125	5.338 (1.190) n = 255
Long	5.346 (.894) n = 130	5.281 (.940) n = 125	5.314 (.911) n = 254
Overall	5.273 (.939) n = 259	5.382 (.882) n = 250	5.326 (.912) n = 509
Panel B: Descriptive Statistics for *Processing Fluency*, Mean (Standard Deviation)			
	Narrative Framing		
Time Horizon	*Feasibility*	*Desirability*	*Overall*
Short	77.194 (21.176) n = 129	76.736 (21.218) n = 125	76.969 (21.156) n = 255
Long	77.285 (24.425) n = 130	76.824 (19.895) n = 125	77.059 (22.277) n = 254
Overall	77.239 (22.821) n = 259	76.780 (20.526) n = 250	77.014 (21.704) n = 509

Panel A presents the mean corporate credibility by condition and Panel B presents the mean processing fluency by condition.

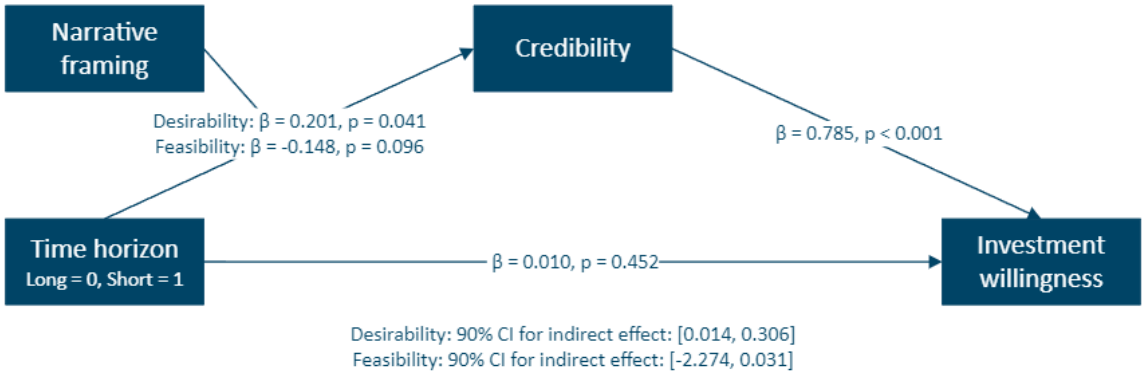
The analysis further demonstrated the influential role of corporate credibility in the investment decision-making process. Credibility emerged as a strong predictor of investment willingness ($\beta = 0.785$, $p < 0.001$, one-tailed), signifying its central importance as a mediator in the model. Furthermore, the indirect effect of a short time horizon on investment willingness was statistically significantly positive in the desirability condition,

with the 90% confidence interval excluding zero [0.014, 0.306]. In line with H2, this finding suggests that the combined effect of a short time horizon and desirability framing significantly bolsters corporate credibility, which in turn positively affects investors' willingness to invest.

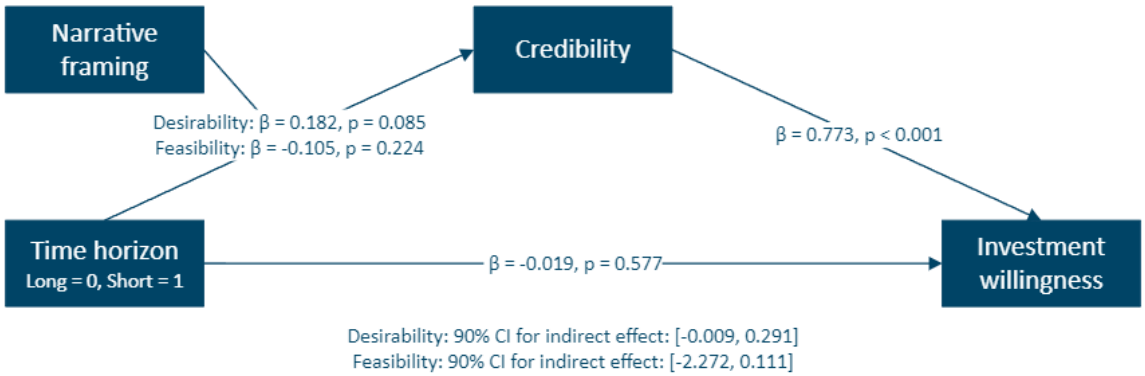
Conversely, the indirect effect under the feasibility condition did not reach statistical significance, with a 90% confidence interval that spans zero [-2.274, 0.031]. Furthermore, the index of moderated moderation indicates a statistically significant difference between these two indirect effects, with the 90% confidence interval excluding zero [-0.493, -0.065]. This contrast underscores the specificity of the conditions under which time horizon influences the perceived corporate credibility and, consequently, investment willingness.

Figure 3.4 Results from the process analysis

Panel A Full sample



Panel B Reduced sample



Panel A presents the results from a process analysis utilizing Model 7 from Hayes' (2017) PROCESS macro utilizing the full sample (N = 509). This analysis tested for conditional indirect effects using a bootstrapping procedure for each Narrative framing condition and significant indirect effects are indicated by a 90% confidence interval that does not include zero. Panel B present the results for the same analysis using a reduced sample (N = 337). For this sample, participants who failed one of the attention checks (see Manipulation and attention checks) were removed. All p-values are one-tailed for directional predictions.

Panel B in Figure 3.4 extends the analysis to a reduced sample, excluding participants who failed one or more attention checks (see Manipulation and attention checks), to assess the robustness of the findings. While the direction of the effects observed in this reduced sample remains consistent with those from the full sample, their failure to reach statistical significance underscores the inherent trade-off encountered when improving data quality by excluding inattentive responses: a reduction in noise comes at the cost of decreased statistical power (Abbey & Meloy, 2017). This outcome suggests that, although the effects are directionally consistent, they are relatively small in magnitude.

Environmental concern

To enhance the robustness of the main findings, I explored the role of investors' environmental concern. Recognizing that investors' environmental attitudes could influence their reactions to environmental communications, this addition seeks to explore how such attitudes might interact with the main variables of interest: time horizon and narrative framing. Utilizing a model comparison approach as outlined by Piercey (2023), I assess both the direct and interactive effects of environmental concern on investment willingness.

First, environmental concern was introduced as a covariate in an analysis of covariance (ANCOVA), alongside time horizon and narrative framing, with investment willingness as the dependent variable. This inclusion revealed environmental concern as a significant predictor ($F(1, 504) = 52.929$, $p < 0.001$, untabulated), affirming its importance in investment decision-making. Crucially, accounting for environmental concern did not change the results for the other variables from the original ANOVA, preserving the integrity of those inferences.

Next, I investigated whether environmental concern interacts with any of the variables of interest. To this end, I compared the model including these interactions to the model previously discussed. Results from a semiomnibus F-test revealed the interactions in this expanded model were not statistically significant ($F(3, 501) = 1.161$, $p = 0.324$, untabulated). Therefore, the primary findings regarding the effects of time horizon and narrative framing on investment willingness remain robust and unaffected by the level of environmental concern.

Discussion

Contrary to conventional CLT expectations, which typically associate nearer events with lower-level, more concrete construals, the initial study found that short-term environmental goals elicited more abstract construals. This suggested that investors may interpret short-term goals as a marker of immediate commitment to sustainability,

enhancing the perceived dedication of a firm to environmental responsibility. The present study was designed to dissect these dynamics further, and especially to examine the moderating role of narrative framing on the relationship between time horizon and investment willingness.

The results yielded no support for H1, which posited that short-term environmental goals would be inherently perceived as more credible than long-term goals, thus increasing investment willingness. However, there was partial support for H2, suggesting that narrative framing does indeed moderate the relationship between the time horizon of environmental goals and investors' perceived credibility, subsequently affecting their willingness to invest. Specifically, desirability framing appeared to enhance the perceived credibility and investment willingness for short-term goals. Conversely, H3, which proposed processing fluency as a mediator in the moderated relationship, did not find empirical support in the data.

The empirical evidence obtained thus partially corroborates the proposed theory: short time horizons coupled with desirability framing significantly improve the perceived credibility of the firm, which in turn positively sways investors' willingness to invest. In doing so, this study not only replicates the initial investigation's insights into investors' preferences for higher-level construals in short-term sustainability initiatives but also significantly extends them by establishing a direct link between these construal preferences and investment willingness.

3.5 Discussion and conclusion

This research explored how the time horizon of environmental goals and narrative framing interact to influence investors' perceptions and their subsequent willingness to invest. Through two carefully designed studies, I examine the application of CLT within the context of environmental sustainability reporting. The findings present a nuanced picture, challenging traditional expectations derived from CLT and contributing novel insights into the dynamics of investor engagement with environmental communications.

The first study revealed that short-term environmental goals elicit more abstract construals among investors than long-term goals, a counterintuitive finding that contradicts conventional CLT predictions. This suggests that immediate, actionable sustainability efforts might resonate more deeply with investors, possibly due to a perception of direct impact and commitment to environmental stewardship. The subsequent experiment built on these insights, examining the combined effect of narrative framing and time horizon on perceived firm credibility and investment willingness. While the anticipated mediating role of processing fluency was not supported, the study found

partial support for the moderating role of narrative framing, underscoring the importance of matching the narrative to the time horizon of environmental goals.

This research contributes to a growing body of literature on environmental communication strategies, highlighting the critical role of narrative framing and time horizon in shaping investor responses. By demonstrating that short-term goals framed in terms of their desirability can significantly enhance a firm's perceived credibility and attractiveness to investors, this study offers practical guidance for firms looking to communicate their environmental commitments more effectively. These findings also suggest a need for firms to carefully consider how they present their environmental initiatives, potentially requiring a strategic re-evaluation of communication practices to better align with investor expectations and psychological predispositions.

Moreover, this study enriches the theoretical discourse on CLT, suggesting that the theory's application may have unique considerations within the realm of environmental communication. The observed divergence in how short-term versus long-term environmental goals are construed by investors calls for a deeper investigation into the psychological underpinnings of sustainability-related decision-making.

Given the complex interplay between narrative framing, time horizon, and investor perceptions identified in this study, future research could further explore how these factors interact across different contexts and types of environmental, social, and governance (ESG) initiatives. Additionally, the role of processing fluency and its influence on investor decision-making warrants further exploration, particularly in relation to other potential mediators and moderators of investment behaviour. Investigating these dynamics across diverse investor demographics and varying levels of ESG commitment could provide richer insights into how to tailor ESG communication strategies effectively.

In conclusion, this research sheds light on the intricate dynamics that shape investor engagement with environmental sustainability initiatives, challenging conventional wisdom and opening new avenues for exploration. By highlighting the significance of narrative framing and time horizon in environmental communication, this study not only contributes to academic discourse but also offers valuable practical implications for firms seeking to enhance their sustainability reporting practices. As the demand for transparency and accountability in corporate ESG efforts continues to grow, understanding the nuances of investor psychology and communication strategies becomes increasingly vital. This research represents a step forward in meeting this challenge, providing a foundation for future inquiries into the effective communication of sustainability initiatives within the corporate sphere.

General Discussion and Conclusion

This thesis comprehensively examines how visualisations, language, and temporal framing influence investor decision-making through a series of three experiments. Each experiment contributes to our understanding of how different elements of corporate disclosures impact the cognitive and emotional processes underlying investor behaviours, offering insights into more effective communication strategies in financial reporting.

The first study's findings suggest that visualisations in corporate disclosures significantly increase investment willingness across different investors. This increase is driven largely by enhanced processing fluency rather than an improvement in actual understanding. The second study highlights the moderating role of language in processing CSR disclosures. Investors show less emotional and more analytical responses when disclosures are presented in a foreign language, regardless of the ethical intensity of the content. The third study challenges existing assumptions about the impact of temporal framing on investor perceptions, as dictated by CLT. It reveals that short-term environmental goals framed in terms of desirability significantly enhance perceptions of corporate credibility and investor willingness to invest.

Collectively, these findings underline the necessity for accounting standards and corporate practices to not only focus on the content but also consider how information is presented. This thesis bridges the gap between psychological research and accounting practices by integrating psychological theories such as the Cognitive Theory of Multimedia Learning, the Foreign Language Effect, and Construal Level Theory, offering new perspectives on enhancing transparency and investor engagement. The practical implications of this research are significant, suggesting that corporations can enhance investor relations and communication effectiveness by adapting disclosure strategies to account for psychological biases and processing needs.

While the findings contribute valuable insights, the research is not without limitations. The experimental approach employed in this thesis offers several benefits, including controlled environments that allow for the precise manipulation of variables and the isolation of specific effects on investor decision-making. This methodological rigor ensures that the insights gained are directly attributable to the interventions tested, providing clear evidence of causality. However, the reliance on experimental settings also introduces limitations and opportunities for future research.

For instance, the first study utilised a specific set of visualisations based on the CTML. Future research could further explore this theory by examining its principles in diverse communication formats, such as during investor conference calls, where both spoken

information and visual aids are used. This could shed light on how auditory and visual integrations influence investor decisions. Additionally, applying CTML principles in scenarios involving complex financial information might reveal more about the benefits of visualisations. It is possible that in contexts where information complexity is higher, the advantages of using visual aids to enhance understanding are more apparent in influencing investor decisions. Such investigations could help clarify the conditions under which visualisations are most effective, aiding in the development of more precise guidelines for their use in corporate disclosures.

Similarly, the second study's focus on language effects within CSR disclosures could be expanded to test different languages or varying levels of language proficiency among participants to see if these factors influence the strength and nuances of the FLE. An interesting area for future research is to explore the interaction between the company's native language and the language used in disclosures. For instance, investors might react differently to a U.S. company issuing CSR disclosures in Spanish compared to a Mexican company doing so. Such research could unveil whether investors' perceptions of authenticity, transparency, and trust are influenced by the congruence between the company's origin and the language of its communications. This exploration could significantly enhance our understanding of cultural and linguistic congruency in global financial markets, providing valuable insights into how multinational companies can better tailor their communication strategies to diverse investor bases.

Additionally, the third study's exploration of temporal distance and narrative framing in environmental disclosures presents a unique opportunity to investigate how different ESG goals, or combinations of long and short-term goals, might impact investor responses. Investors' expectations of time horizons might differ across ESG contexts and future research could explore the boundary conditions of the current findings. Such research would not only clarify how temporal framing influences investor behaviour in diverse settings but also contribute to more tailored communication strategies that align with investor expectations and enhance engagement.

Such extensions of the current research would not only enhance our understanding of how these elements affect investor behaviour but also contribute to the robustness and applicability of the theoretical frameworks established in this thesis. By exploring these varied applications, subsequent studies can build upon the initial findings, testing their generalisability and refining their practical implications in diverse settings.

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Appendices

Appendix A: Chapter 1 additional materials

Table A.1 Principles for promoting multimedia learning. Adapted from Multimedia Learning (pp. 267-268), by R. Mayer, 2009, Cambridge University Press

Panel A: Principles for Reducing Extraneous Processing	
Principle	**Explanation**
Coherence Principle	People learn better when extraneous words, pictures, and sounds are excluded rather than included.
Signalling Principle	People learn better when cues that highlight the organization of the essential material are added.
Redundancy Principle	People learn better from graphics and narration than from graphics, narration, and on-screen text.
Spatial Contiguity Principle	People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.
Temporal Contiguity Principle	People learn better when corresponding words and pictures are presented simultaneously rather than successively.
Panel B: Principles for Managing Essential Processing	
Principle	**Explanation**
Segmenting Principle	People learn better when a multimedia lesson is presented in user-paced segments rather than as a continuous unit.
Pre-training Principle	People learn better from a multimedia lesson when they know the names and characteristics of the main concepts.
Modality Principle	People learn better from graphics and narration than from animation and on-screen text.

Panel C: Principles for Fostering Generative Processing	
Principle	**Explanation**
Multimedia Principle	People learn better from words and pictures than from words alone.
Personalization Principle	People learn better from multimedia lessons when words are in conversational style rather than formal style.
Voice Principle	People learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice.
Image Principle	People do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen.

Figure A.1 Textual condition

Geography

Where are we active?

Enzymo is active worldwide. Our sales can be divided across four regions: North America, Latin America, Asia Pacific, and Europe, Middle East and Africa. 36% of sales took place in North America, 24% in the Europe, Middle East and Africa region, 23% in the Asia Pacific region and 6% in Latin America.

Performance across the regions

In 2020, sales increased in all regions, led by an sales growth of 4% for both North America and Latin America. followed by a growth of 3% for Asia Pacific and 2% for Europe, the Middle East & Africa.

Businesses

Household Care

Sales from the Household Care business increased by 4% compared with 2019. The division has made good progress on the key strategic initiatives throughout 2020. Market interest in new enzyme technology is very strong. 43% of all sales came from the Household Care business.

Food & Beverages

Sales from the Food & Beverages business increased by 3% compared with 2019. In 2020, sales to the starch and beverage industries were the main contributors to sales growth. 19% of all sales came from the Food & Beverages business.

Bioenergy

Sales from the Bioenergy business increased by 2% compared with 2019. The good performance in 2020 was driven by Enzymo's broader product portfolio and strong focus on tailoring process-specific solutions to individual customer needs. 17% of all sales came from the Bioenergy business.

Agriculture & Feed

Sales from the Agriculture & Feed business increased by 3% compared with 2019. Sales growth in 2020 was driven by solid sales growth in Feed and moderate sales growth in biological solutions for Agriculture. 16% of all sales came from the Agriculture & Feed business.

Technical & Pharma

Sales from the Technical & Pharma business increased by 4% compared with 2019. The strong growth in 2020 was mainly driven by sales of enzymes for pharmaceutical production and sales of hyaluronic acid. 5% of all sales came from the Technical & Pharma business.

Figure A.2 Visual condition

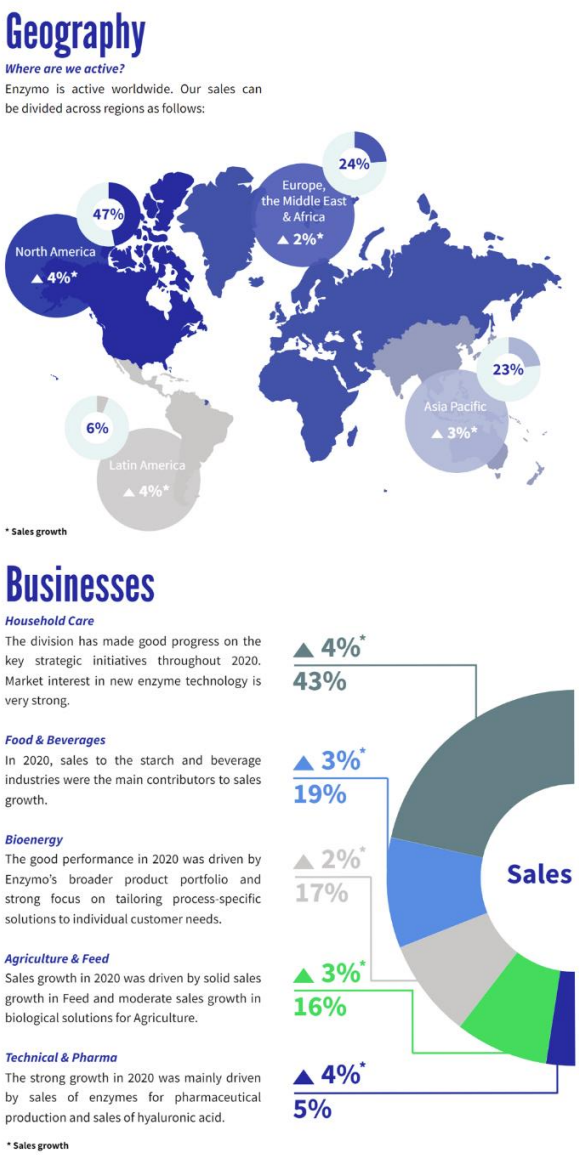

Figure A.3 Visual combined with textual condition

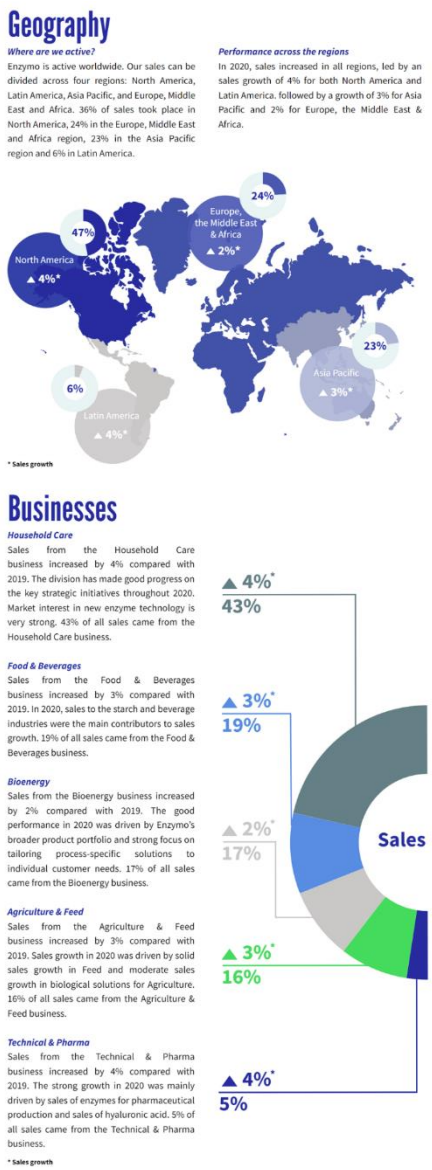

Figure A.4 Short investment position condition

Bonus compensation instructions

In addition to the flat fee of £1.25, you can earn a **bonus payment** of £0.25.

Whether you receive this bonus depends on the **stock price movement** of Enzymo. If the stock price of Enzymo **decreases** over the fiscal year 2021, you **will** receive the bonus payment. If the stock price of Enzymo **increases** over the fiscal year 2021, you **will not** receive the bonus payment.

Consequently, your stake in the firm is similar to that of an investor holding a **short position** in the firm, so that the **worse the firm's stock performance, the better off you are.**

Figure A.5 Long investment position condition

Bonus compensation instructions

In addition to the flat fee of £1.25, you can earn a **bonus payment** of £0.25.

Whether you receive this bonus depends on the **stock price movement** of Enzymo. If the stock price of Enzymo **increases** over the fiscal year 2021, you **will** receive the bonus payment. If the stock price of Enzymo **decreases** over the fiscal year 2021, you **will not** receive the bonus payment.

Consequently, your stake in the firm is similar to that of an investor holding a **long position** in the firm, so that the **better the firm's stock performance, the better off you are**.

Figure A.6 High information impact manipulation

Please consider the following excerpt from Enzymo's 2021 annual report.

In North America, sales for the Household Care business grew by 6% compared to last year. Growth in this region was driven by increased enzyme penetration across detergent tiers to enhance wash performance, enable low-temperature washing and replace traditional chemicals in detergent formulations.

Figure A.7 Low information impact manipulation

Please consider the following excerpt from Enzymo's 2021 annual report.

In Latin America, sales for the Technical & Pharma business grew by 6% compared to last year. Growth in this region was driven by sales of enzyme solutions and albumin for the manufacture and formulation of pharmaceutical ingredients.

Appendix B: Chapter 2 additional materials

CSR report

[Higher ethicality CSR disclosure]

For the past several years, alarming reports have emerged regarding XYZ Clothing's labor practices in their overseas production facilities. Multiple exhaustive and independent investigations have unveiled a shocking pattern of human rights violations. Workers, a distressing number of whom are children, are subjected to long hours, often stretching beyond the limits set by international labor standards. These minors, some as young as ten, are forced to work in dimly lit and poorly ventilated sweatshops that are barely fit for human occupancy. An overwhelming number of these child workers have been diagnosed with severe health conditions, ranging from debilitating respiratory ailments to chronic stress disorders, directly attributable to their working environment. Witnesses and whistleblowers recount harrowing stories of intimidation, where young workers endure daily verbal assaults, physical threats, and an unrelenting pressure from merciless supervisors. These findings point to deep-rooted labor issues within XYZ's production processes.

[Lower ethicality CSR disclosure]

For the past several years, environmental watchdogs have expressed growing concern regarding XYZ Clothing's ecological stewardship. Detailed evaluations and assessments from third-party agencies reveal that the company consistently lags behind industry sustainability benchmarks. A recurring theme in these assessments is XYZ Clothing's continuous reliance on suppliers that prioritize non-renewable energy sources, such as coal. This dependency has resulted in the company's carbon footprint being significantly above the industry norm. Furthermore, a significant portion of XYZ's product range leans heavily on materials with prolonged decomposition cycles. These materials, resistant to easy breakdown, contribute to escalating waste disposal challenges, compounding the strain on already overburdened landfill sites. External experts have also pointed out the company's hesitance in adopting widely accepted sustainable practices, making XYZ's commitment to environmental conservation a topic of debate among industry peers and observers.

Appendix C: Chapter 3 additional materials

Environmental report

Climate change poses a critical challenge across the global clothing industry, presenting both risks and opportunities for companies striving for sustainability. XYZ Company recognizes the substantial impact of these environmental changes on its operations and stakeholders. In response, the company has set a strategic objective to enhance its carbon emissions efficiency.

[Short time horizon]

Our 2026 target

We aim to elevate our current 5th place industry ranking to 1st in carbon emissions efficiency by our **target year 2026**. We've chosen industry ranking as our benchmark for its adaptability, ensuring our targets remain both challenging and directly comparable to industry advances. This approach, coupled with our proven history of meeting ambitious sustainability goals, underscores our confidence in the achievability of our new target.

[Long time horizon]

Our 2040 target

We aim to elevate our current 5th place industry ranking to 1st in carbon emissions efficiency by our **target year 2040**. We've chosen industry ranking as our benchmark for its adaptability, ensuring our targets remain both challenging and directly comparable to industry advances. This approach, coupled with our proven history of meeting ambitious sustainability goals, underscores our confidence in the achievability of our new target.

[Feasibility narrative framing]

How are we striving towards our target?

Our strategy is built on **concrete, actionable steps** that ensure our climb to the top of the industry rankings for carbon emissions efficiency:

- **Investing in advanced renewable technologies:** Incorporating the latest in solar and wind energy solutions to power our operations.
- **Enhancing energy efficiency:** Streamlining our processes to minimize energy consumption and reduce waste.
- **Forming strategic sustainability partnerships:** Collaborating with leading environmental organizations to implement best practices in sustainability.

[Desirability narrative framing]

Why are we striving towards our target?

Our strategy is driven by our **vision and values** that guide our climb to the top of the industry rankings for carbon emissions efficiency:

- **Promoting environmental stewardship:** Demonstrating our role as a leader in the fight against climate change.
- **Contributing to a sustainable future:** Ensuring that our operations support long-term ecological balance.
- **Upholding our corporate responsibility:** Reflecting our dedication to ethical business practices and reducing our environmental footprint.