

# **How Causal Focus and Specificity in Risk Factor Disclosures Jointly Affect Investor Judgments**

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## **How Causal Focus and Specificity in Risk Factor Disclosures Jointly Affect Investor Judgments**

We examine how investors' investment judgments are jointly affected by two important linguistic features that vary considerably across firms' risk factor disclosures: namely, causal focus—the extent to which managers' disclosures focus on the causes versus consequences of risk events—and specificity, which refers to specific references to names of objects and quantitative values. Results of controlled experiments show that when the disclosure focus is on risk causes, greater specificity increases investment willingness due to enhanced feelings of knowable uncertainty in a risk event. In contrast, when the focus is on risk consequences, greater specificity reduces investment willingness due to diminished feelings of knowable uncertainty. Contrary to the SEC's positive view of specific risk factor disclosures, our results suggest that specificity can have opposite effects on investors' judgments depending on the causal focus of risk factor disclosures.

*Key words:* risk factor disclosures; causal focus; specificity; the source of uncertainty.

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## 1. Introduction

Risk factor disclosures are an integral part of firms' annual and quarterly reports, and managers devote a considerable portion of annual reports to discussing firms' risks (Dyer et al. 2017; IRRC Institute 2016).<sup>1</sup> Despite their importance, both practitioners and the Securities and Exchange Commission (SEC) have raised concerns about the informativeness of these disclosures (Johnson 2010; SEC 2016). The concerns over risk factor disclosures stem from the fact that the current disclosure rule is not prescriptive, providing managers with discretion over qualitative risk factors to be disclosed; thus, managers are free to use vague and boilerplate language in line with their disclosure styles (Hope et al. 2016; IRRC Institute 2016). In light of these considerations, our study aims to investigate the impact of managers' linguistic choices in risk factor disclosures, especially two key elements: the extent to which disclosures focus on the causes versus consequences of risk events (referred to as "causal focus")<sup>2</sup> and the use of specific references to objects and quantitative values (referred to as "specificity"; Beatty et al. 2019; Hope et al. 2016; IRRC Institute 2016).

Investigating the joint effect of causal focus and specificity is particularly timely given the current landscape of risk factor disclosures. The primary element within these disclosures is a risk event, which is generally presented in conjunction with its causes and/or consequences (ISO 2018; Power 2014). Using a word-counting methodology, our textual analysis finds notable variations in causal focus within the titles and content of these disclosures.<sup>3</sup> Building on Hope et al.'s (2016) findings which document variations in specificity across firms' risk factor disclosures, our study suggests the presence of concurrent variations in both specificity and causal focus. This observation underscores the need for a comprehensive understanding of how these linguistic elements collaboratively influence investor judgments. This need is further emphasized by the SEC's initiatives to improve the quality of risk factor disclosures. Although the SEC has encouraged firms—especially

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<sup>1</sup> Surveys show that risk factor disclosures represent seven percent of the average length of Form 10-K filing by page count (IRRC Institute 2016). In addition, of the 150 individual topics in Form 10-K, risk factor disclosures are one of the top three increasing topics by length over the period from 1996-2013 (Dyer et al. 2017).

<sup>2</sup> In practice, the term "risk cause" is often used interchangeably with risk source, which is defined as an element that, alone or in combination, has the intrinsic potential to give rise to risk (ISO 2018). Throughout this paper, we use the term "risk cause" as it clearly indicates the opposite of risk consequence in terms of a cause-and-consequence relationship.

<sup>3</sup> For example, when describing cybersecurity risk events in risk factor disclosures, Prudential Financial, Inc. places a greater focus on the causes of the events. In contrast, Destination Maternity Corp. gives more emphasis on the consequences. See Appendix A for more details.

those with generic risk disclosures—to be more specific and provide additional details about risk causes and consequences (SEC 2011, 2016, 2018, 2020), limited research exists to evaluate the efficacy of such recommendations. Our study seeks to bridge this gap by exploring how the interaction between causal focus and specificity in disclosures influences both investor perceptions and subsequent investment decisions.

We posit that the manner in which investors perceive the source of uncertainty regarding the potential occurrence of risk events serves as a key cognitive mechanism in their decision-making process.<sup>4</sup> Prior research suggests that when forming judgments under uncertainty, individuals typically categorize the source of uncertainty into one of two types: (1) ‘knowable’ uncertainty, stemming from missing information or incomplete knowledge about an event, and (2) ‘random’ uncertainty, arising from the inherent unpredictability or stochastic nature of events (Fox and Ülkümen 2011; Kiureghian and Ditlevsen 2009).<sup>5</sup> Furthermore, how people perceive these uncertainties—whether as knowable and/or random—affects their judgments (Tannenbaum et al. 2017; Walters et al. 2023).

Our study focuses on ‘knowable’ rather than random uncertainty. Prior research suggests that when investors are informed about risks related to firms, they primarily seek explanations for these events as a means to understand the ‘why’ and ‘how’ of these risks, rather than attributing them to mere chance or random events (Noordman and Vonk 1998; Trabasso et al. 1984; Van den Broek 1990). Hence, knowable uncertainty is closely connected to investors’ understanding of the event’s underlying causes, which explain both the conditions of its occurrence and the causal pathway leading to it. Therefore, we argue that the clarity of the causal link between the causes and the risk event, as

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<sup>4</sup> Uncertainty encompasses both scenarios: those in which the probability distribution is known and those where it is unknown, i.e., ambiguity (Ellsberg 1961; Tversky and Kahneman 1992; Vives and FeldmanHall 2018). Risk is typically characterized by scenarios with known or knowable probabilistic distributions, as it involves defined likelihood of events and their impacts (consequences) within established probability frameworks (ISO 2018). Nevertheless, there remains inherent uncertainty regarding the actual occurrence of the risk event. Our study examines investors’ perceived source of this uncertainty within the context of risk as opposed to ambiguity.

<sup>5</sup> The distinction between ‘knowable’ and ‘random’ uncertainties primarily hinges on the source of the uncertainty related to a particular outcome(s). For example, in a multiple-choice trivia question, the uncertainty regarding the correct answer (i.e., the outcome) is knowable; this uncertainty stems from a lack of knowledge that can be resolved by the acquisition of information. Conversely, the outcome of a coin toss represents random uncertainty, as such uncertainty arises from the inherent unpredictability and randomness of the event itself, regardless of the information or understanding of potential outcomes one may possess.

presented in the risk factor disclosures, plays a critical role in influencing investors' perceived level of 'knowable' uncertainty associated with the risk event.

In our setting, we predict that when managers place a greater focus on the causes of a risk event in their disclosures, increased specificity can help clarify the relationship between these causes and the risk event itself. This heightened clarity, in turn, strengthens investors' belief that the risk event is rooted in specific, identifiable causes rather than random factors. Conversely, less specific disclosures may weaken their belief by introducing multiple interpretations into the causal relationship (Fiske and Taylor 1991; Plous 1993). In essence, a higher level of specificity makes the associated uncertainty feel more knowable, giving investors greater confidence in understanding and anticipating how the risk event may unfold. This increased sense of knowable uncertainty positively influences their willingness to invest.

On the other hand, when disclosures emphasize the consequences of a risk event, we predict that greater specificity will reduce the sense of knowable uncertainty. Unlike causes, which offer explanatory insight into the origins and potential triggers of a risk event, consequences have little explanatory power (Ahn 1998; Ahn et al. 2000; Proctor and Ahn 2007; Tversky and Kahneman 1980). This suggests that a focus on consequences hinders investors' ability to understand the 'why' behind a given risk event. In addition, prior research indicates that when information is highly detailed but not directly relevant to the task at hand, it can overwhelm individuals' cognitive resources, leading to a shift away from understanding the core causes of an issue (Sweller et al. 2011). In our context, greater specificity in disclosures, particularly when focused on consequences, can divert investors' attention away from the causes. This reduces their sense of knowable uncertainty about how the risk event might occur, thereby decreasing their willingness to invest.

We conduct a 2 (causal focus)  $\times$  3 (specificity) between-subjects experiment (Experiment 1), with 295 participants recruited from Prolific serving as non-professional investors. Given the SEC's keen interest in cyber risk disclosure practices (Schwartz 2017; SEC 2011, 2018), we design an experimental setting in which participants receive an excerpt of a company's cybersecurity risk factor disclosure, which consists of two causes and two consequences, and make judgments based on the information provided. We manipulate causal focus by emphasizing either the causes or the

consequences of a cybersecurity risk event. In the *Causes* condition, we add a title highlighting the causes of the risk event, place the causes at the top of the disclosure, and enhance their readability through bulleted sub-headings. Afterward, we present a plain-text paragraph outlining the consequences. Similarly, in the *Consequences* condition, we apply a parallel approach, emphasizing the consequences instead of the causes.

Specificity is manipulated at two levels: *More Specific* versus *Less Specific*. For the *More Specific* condition, we include information referring to names of organizations, activities, and items, and indicate time in numbers, money values in dollars, and quantitative value in percentages. For the *Less Specific* condition, such information is not provided or replaced with less specific terms. We also create a *Less-plus-Footnotes* condition in which participants receive the same information provided in the less specific version and the corresponding more specific information is added in the footnotes.<sup>6</sup> We ask participants to indicate their willingness to invest in the company's stock, followed by their perceived knowable uncertainty with respect to the company's cybersecurity risk event.

Consistent with our predictions, we find that when the disclosures place a greater focus on the causes of a risk event, specific disclosures lead participants to have increased feelings of knowable uncertainty and a greater investment willingness. When the disclosure focus is on the consequences of a risk event, however, our results show that a higher level of specificity triggers diminished feelings of knowable uncertainty and a lower investment willingness. A moderated-mediation analysis demonstrates that causal focus and specificity jointly affect the participants' investment willingness via their perceived degree of knowable uncertainty surrounding a risk event.

We conduct additional experiments to examine whether the results from Experiment 1 might be driven by particular design choices or alternative explanations. In Experiment 2, we rerun the causal focus (*Causes* or *Consequences*) and specificity (*More* or *Less Specific*) conditions. To minimize the difference in informativeness across the conditions, we modify the main body in terms of the company's web-based business and its customer survey and hold it constant across all

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<sup>6</sup> Results show that the responses in the *Less Specific* condition are not significantly different from those in the *Less-plus-Footnotes* condition. For parsimony, we mainly discuss the analysis with the *More Specific* versus *Less Specific* condition. Any different findings from the analysis with the *More Specific* versus *Less-plus-Footnotes* condition are discussed in the footnotes.

conditions. For the causal focus manipulation, we only vary the disclosure title by holding risk information and its layout constant. For specificity, we add the specific names and size of the company's business and its survey. Results are again in support of our hypothesis.

In Experiment 3, we test whether the positive effect in the *Causes/More Specific* condition is due to specific risk management information in the causes-related paragraphs. That is, greater specificity on causes, including risk management information, may lead participants to perceive that risks are well controlled by management. Thus, participants pay less attention to managers' discussion on the consequences of controllable risks, resulting in positive effects on participants' judgments. We perform a  $1 \times 2$  (specificity) between-participants experiment with the focus on causes, where risk management information is replaced by the company's customer membership programs, similar to the approach in Experiment 2. Results do not support these alternative explanations.

Our study makes several contributions. First, it contributes to the literature investigating the impact of specificity in qualitative risk factor disclosures. Although Hope et al. (2016) find that the level of specificity in firms' risk factor disclosures is associated with unsigned abnormal returns and trading volume, they do not examine directional effects of specificity on stock returns "(b)ecause how specific risk factor disclosures affect investors' perceptions of the mean of the variance of cash flows is uncertain." Building on psychological theories, our study advances current understanding of the impact of risk disclosures by showing that specificity can have opposite effects on investors' judgments depending on the causal focus of disclosures. In addition, we identify investors' uncertainty perceptions as a mechanism through which the joint effect of specificity and causal focus influences investment judgments.

From a practical standpoint, our study is likely to be of interest to the SEC, given their emphasis on the importance of risk disclosures being more focused and specific (SEC 2011, 2016, 2018). Contrary to the SEC's generally positive stance on the benefits of specific risk factor disclosures, our findings indicate that the implications of specificity differ based on causal focus. In the broader regulatory landscape, our study highlights that the role of specificity warrants careful consideration due to its varied impact on investor judgments.

In particular, our findings suggest that while specific disclosures are intended to clarify risk information, emphasizing the consequences of risk events may inadvertently lead investors to perceive these events as less knowable or unpredictable. Conversely, firms overly emphasizing the causes of risk events may lead investors to perceive a given risk as more knowable than it truly is, potentially increasing their confidence in how well the risk is understood, thereby boosting their willingness to invest. This misperception could result in a positive bias in their investment judgments. Given these insights, we recommend that regulators not only encourage companies to provide clear and comprehensive risk information but also guide them on how to balance the detailing of risk consequences with the necessary insights into their causes. Furthermore, our research provides managers with valuable insights, indicating that strategic formulation of their required risk factor disclosures can yield advantages.

Our study also adds to the larger literature on how uncertainty affects investors' decision-making. We provide evidence that investment judgments are affected by the perceived nature of uncertainty as more versus less knowable. While many accounting researchers view uncertainty as a singular construct—defined on a simple spectrum from high to low uncertainty, and generally assuming that investors favor firms at the lower end of this spectrum—our findings pose a challenge to this conventional wisdom. We show that investors assess risks based on the degree of knowable uncertainty, highlighting a previously overlooked factor that could have a significant effect on their investment judgments and suggesting a promising avenue for future research.

In terms of the literature on the effect of linguistic features in management disclosures, our study is the first to provide evidence that causal focus and its interaction with specificity play an important role in affecting the way investors view the nature of uncertainty inherent in a risk event, and their subsequent investment willingness.

The rest of this paper is organized as follows. Section 2 reviews the relevant literature and develops the hypotheses. Section 3 describes the experimental design and presents the results of Experiment 1. Section 4 and 5 present the details and results of Experiment 2 and Experiment 3, respectively. Section 6 concludes.

## **2. Literature Review and Hypothesis Development**

### **2.1. Informativeness of Risk Factor Disclosures**

Since 2005, the SEC has mandated that firms include a risk factor section in their annual and quarterly financial reports, known as Item 1a of Form 10-K/Q (SEC 2005). Unlike Item 7a, which provides both quantitative and qualitative disclosure about market risks—such as those associated with foreign exchange rates and interest rates—risk factor disclosures are largely qualitative and describe a state of *uncertainty* involving the possibility of loss (Robbins and Rothenberg 2006; SEC 2004). Given the absence of *ex-post* settling up, however, critics argue that it is difficult to assess completeness and accuracy of risk disclosures (Schrand and Elliott 1998). As a result, they question the decision-usefulness of risk factor disclosures.

The concerns over risk factor disclosures have prompted a surge in research as to whether they are value-relevant to investors (see Elshandidy et al. 2018 for a review). Using keyword-based textual information analysis, the accounting literature has largely focused on the quantitative aspect of uncertainty in firms' narrative risk disclosures. For example, based on the frequency of uncertainty- or risk-related words such as 'uncertainty,' 'uncertain,' 'risk,' and 'risky' in their self-constructed dictionary, prior studies find that firms with greater pre-disclosure financial, litigation, and tax risks convey greater uncertainty in the disclosures (Campbell et al. 2014; Filzen 2015; Kravet and Muslu 2013). They further document that firms with a greater amount of uncertainty are more likely to experience negative abnormal returns, higher stock return volatility, and market-based beta.<sup>7</sup> Overall, archival evidence suggests that risk factor disclosures are informative, and investors appear to incorporate them into their investment decisions.

Nevertheless, practitioners remain skeptical about the informativeness of risk factor disclosures, a sentiment also echoed by the SEC (Hope et al. 2016; Johnson 2010; IRRC Institute 2016). They point out that the current disclosure rule provides managers with much discretion over the content of risk factor disclosures. Thus, managers can exploit this discretion by providing vague and boilerplate risk information to fulfill the disclosure obligation. In response, the SEC has requested

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<sup>7</sup> Beatty et al. (2019) document that the informativeness of risk factor disclosures declined in the post-financial crisis period (2009 – 2014), compared to the pre-crisis period (2006 – 2008). However, it is unknown whether and how the disclosures' informativeness has changed after the sample period.

firms whose risk factor disclosures are deemed to be generic to revise those disclosures to be more focused and specific through their comment letter process (Johnson 2010).

The SEC is currently deliberating over potential changes to risk factor disclosures in order to enhance the disclosure quality. As the first step in the rule-making process, the SEC has published a concept release discussing and seeking public comments on measures to improve the risk factor section such as requiring firms to include the effect on performance for each risk factor and to identify the specific facts, and circumstances that make a given risk material to each company (SEC 2016). More recently, the SEC has mandated firms to disclose risks that qualify as “material” only, and to make their risk disclosure more readable such as providing a summary of risk factors and grouping their risks under relevant headings (SEC 2020).

For cybersecurity risks, the SEC has released the disclosure guidance that managers should discuss aspects of firms’ business or operations that give rise to material risks (i.e., a causal account) and the potential costs and consequences in the light of each firm’s specific facts and circumstances (i.e., specificity with a consequential account) (SEC 2011, 2018). Motivated by this practical issue, we examine how investors’ investment judgments are jointly affected by causal focus and specificity in risk factor disclosures.

## **2.2. Causal Focus in Risk Factor Disclosures**

In this section, we discuss whether and to what extent causal focus varies across firms’ risk factor disclosures. According to *ISO 31000: 2018, Risk management – Guidelines*, a widely used standard for risk management in practice, a risk is the expression of the likelihood and impact of ‘a risk event,’ which is the occurrence of a particular set of circumstances that can have negative effects on objectives (ISO 2018).<sup>8</sup>

Typical risk statements, which include risk factor disclosures, are composed of three distinct parts: (a) causes, (b) focal risk event(s), and (c) consequences (ISO 2018; Power 2014). These elements can be structured as follows: [a focal event] is caused by [cause(s)], resulting in

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<sup>8</sup> The International Organization for Standardization (ISO) has broadened the scope of the risk definition, which involves ‘positive’ consequences of uncertainty as well as negative ones (ISO 2018). In this study, however, we focus on negative aspects of risk consequences following the SEC’s risk definition (Robbins and Rothenberg 2006; SEC 2004).

[consequence(s)]. In this framework, while the core element of risk statements is a risk event, this is presented in conjunction with the combination of its *causes* and/or *consequences*. For example, consider cybersecurity incidents as a risk event for a firm. This could be expressed in the framework as: “Cybersecurity incidents may arise from cyber-attacks by hackers and/or breaches at third-parties (causes). These could result in financial losses and/or damage to the company’s reputation (consequences).”

While there are guidelines on how the format and content of a risk statement should be, such guidelines are not imperative for firms’ risk factor disclosures. Thus, managers likely vary causal focus in line with their disclosure style. For the same risk event, for example, some managers may give more emphasis on its causes, while others highlight more of its consequences (see Appendix A). To provide some evidence on actual disclosure practices, we conduct a textual analysis based on firms’ risk factor disclosures in annual reports released in the most recent year (i.e., 2021 or 2022). In accordance with the SEC’s interest in cyber risk disclosure practices (Schwartz 2017; SEC 2011, 2018), we focus on firms’ cybersecurity risk disclosures, especially for the 91 companies in Fortune 100, after excluding nine non-public companies which do not file the annual report on Form 10-K. We start by searching for the subsection(s) of risk factor disclosures related to online activity, data security, electronic systems and technological networks, and analyze the causal focus of the subsection title and its textual content. All the companies in our sample provide information related to cybersecurity risks in their risk factor disclosures. The total sample size is 136, as some companies issue multiple disclosures related to cybersecurity risks, with the maximum number being four.

In terms of the title of the disclosures, we analyze whether the title contains causes and/or consequences of risk events. We find that 33.82% of the total observations (46 samples) focus on causes only. For example, one such title states, ‘The company is increasingly dependent upon sophisticated software applications and computing infrastructures.’ Meanwhile, 30.88% of the total observations (42 samples) emphasize consequences only, as illustrated by titles like ‘Cyber-attacks could lead to reduced revenue, increased costs, liability claims, or harm to our competitive position.’ 28.68% (39 samples) discuss both consequences and causes. The remaining 6.62% (9 samples) do not specify what gives rise to the risk or what the potential consequences could be; these are classified as

neither causes nor consequences. An example for this category would be a title like ‘Risk related to technology,’ which provides no information about causes or consequences of the technology-related risk.

Next, we use a word-counting approach to examine causal focus of the textual content. We begin by identifying sentences and/or clauses that are relevant to either causes or consequences. Next, we count the number of words appearing in those texts and compute the ratio of the number of cause-related words to the total number of both cause- and consequence-related words; the higher the value, the more managers focus on risk causes versus consequences in their risk factor disclosures. Untabulated analysis shows that the mean and the standard deviation of our causal focus measure are 0.54 and 0.18, respectively; the 10<sup>th</sup> and 90<sup>th</sup> percentiles are 0.31 and 0.73, respectively.

Given the variations in specificity across companies’ risk factor disclosures (Hope et al. 2016), our findings suggest that there are concurrent variations in causal focus and specificity. Thus, the influence of causal focus on investors’ judgments should be considered in tandem with the impact of specificity. In the following section, we discuss a factor that can mediate the joint effect of causal focus and specificity on investors’ investment judgments.

### **2.3. The Role of Investors’ Perceived Source of Uncertainty**

We argue that investors’ perceived source of uncertainty regarding the potential occurrence of firms’ risk events serves as a key cognitive mechanism in their decision-making process. Analytical theories suggest that risk factor disclosures affect investors’ uncertainty about the risks to which a firm is exposed (Heinle and Smith 2017; Heinle et al. 2018; Lyle et al. 2023). In line with this view, prior research shows that risk factor disclosures influence investors’ perceptions of firm risks, indicated by bid-ask spreads, returns volatility, trading volumes, and analyst forecast dispersions (Campbell et al. 2014; Kravet and Muslu 2013).

While these studies indicate that risk factor disclosures can reduce the ‘second moment’ of investors’ uncertainty, commonly understood as the volatility of the return distribution, their impact on ‘first moment,’ such as direct effects on financial outcomes like returns or the cost of capital, remains unclear. This lack of clarity stems from a variety of complex and occasionally conflicting factors that influence the relationship between risk disclosures and investor decisions, including

investors' pre-existing uncertainty about the firm and their individual levels of risk aversion (Heinle and Smith 2017; Heinle et al. 2018; Lyle et al. 2023).

The underlying theories used in these prior studies are largely economics-based. In our current study, we shift our focus to psychological frameworks, which suggest investors' perceived sources of uncertainty as the key underlying mechanism influencing their investment judgments. Prior literature on psychology categorizes the source of uncertainty as either 'knowable uncertainty,' which relates to missing information or gaps in knowledge concerning an event, or 'random uncertainty,' which arises from an assessment of stochastic and fundamentally unpredictable processes (Fox and Ülkümen 2011; Kiureghian and Ditlevsen 2009).<sup>9</sup>

In the context of financial investment, the distinction between knowable and random uncertainty dimensions can provide interesting insights into the mechanism through which investors incorporate firms' risk information into their investment judgments. This is because people's judgments under uncertainty often involve attributing the uncertainty to either knowable and/or random sources (Fox et al. 2021; Tannenbaum et al. 2017; Ülkümen et al. 2016). Supporting this idea, Walters et al. (2023) show that investors' investment strategies differ depending on which type of uncertainty they consider predominant. For example, when investors are prompted to perceive market uncertainty as primarily knowable, they are more likely to seek additional information or consult experts. Conversely, when prompted to view the market as dominated by random uncertainty, they are more likely to opt for asset diversification as a risk-mitigation strategy.

In our context, we focus on 'knowable' rather than random uncertainty because psychology research indicates that individuals inherently seek explanations for events as a means of understanding them (Noordman and Vonk 1998; Trabasso et al. 1984; Van den Broek 1990). This perspective suggests that investors, when presented with information about prospective firm risks,

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<sup>9</sup> Although Fox and Ülkümen (2011) is the first paper that introduces the concept of knowable (also known as epistemic) and random (also known as aleatory) uncertainty dimensions to the judgment and decision-making literature, these concepts are originally founded by probability theory (Hacking 1975) and have been widely applied to engineering modelling for risk and reliability analyses. While the terms "epistemic" versus "aleatory" and "knowable" versus "random" can be used interchangeably, we use the terms "knowable" (rather than epistemic) and "random" (rather than aleatory) as they are more intuitive.

tend to explore the knowable aspects giving rise to the event, instead of simply assuming they result from randomness.

However, it is important to note that there is another causal link between the risk event and its consequences. While this link is an essential element of such disclosures, it is not the focus of our analysis. Consequences represent the end state of risks, describing potential negative outcomes such as financial losses and decline in sales, regardless of whether the events arise from knowable factors (e.g., product life cycle issues, seasonal weather events) or less knowable ones (e.g., natural disasters, sudden pandemics). As a result, from investors' perspective, the nature of these consequences, though varied, is typically knowable and foreseeable: the occurrence of risk events will inevitably lead to harm for firms and investors. Therefore, understanding consequences does not offer the same level of insight as understanding the root causes, which provide the necessary context for investors to know how and why those risk events arise.<sup>10</sup>

In sum, knowable uncertainty is closely linked to investors' understanding of the event's causes,<sup>11</sup> which can offer insights into the reasons behind its possible occurrence (Noordman and Vonk 1998; Trabasso et al. 1984; Van den Broek 1990). Therefore, providing greater clarity about these causes can enhance investors' perception of 'knowable uncertainty' regarding the potential occurrence of the event. In the next section, we delve into the psychological theories that explain how causal focus and specificity jointly influence investors' knowable uncertainty and their willingness to invest.

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<sup>10</sup> For the link between the risk event and its consequences, once an event has occurred (e.g., a company has been hacked), investors' attention may shift from understanding the causes to assessing the consequences—such as the impact on the company's data security, potential legal liabilities from affected customers, and the financial losses that may follow. This shift arises because, after an event, hindsight bias can make the occurrence of the risk event more apparent and inevitable than it actually was (e.g., Roese and Vohs 2012). Such perceived inevitability can reduce attention to the link between causes and the event. However, in the context of risk factor disclosures, which pertain to hypothetical events (e.g., the potential for a company to be hacked), we argue that investors are more likely to seek out root causes to better understand and assess why the event might occur and how it can be prevented.

<sup>11</sup> To corroborate our argument, we conduct an out-of-sample test using 100 participants from Prolific and administer a simplified version of our experimental setting, in which participants read the definition of risk events, followed by examples adapted from cybersecurity guidelines issued by IBM and government agencies. We ask participants to indicate whether they think more about the causes or consequences when considering (1) the risk events and (2) knowable uncertainty associated with the events, using 11-point Likert scales (1 = primarily the causes; 11 = primarily the consequences). The mean values for each question are 3.26 and 4.37, respectively, significantly below the scale's midpoint (i.e., 6) ( $p < 0.001$ ), supporting our argument that causes, rather than consequences, play a key role in investors' inferences of risk events and the events' knowable uncertainty.

## **2.4. Joint Effect of Causal Focus and Specificity on Investors' Perceived Knowable Uncertainty and Investment Willingness**

Theory on causal reasoning suggests that when people make inferences about an event, they rely on *cues-to-causality* to assess the plausibility and robustness of a potential cause-consequence relationship (Einhorn and Hogarth 1986; Koonce et al. 2011).<sup>12</sup> In the context of the risk factor disclosures, we predict that causal focus can serve as a cue that guides investors' judgments because more prominent information has a greater influence on investors' decision-making (e.g., Hirst and Hopkins 1998; Hodder et al. 2008; Maines and McDaniel 2000). That is, a greater focus on the causes of a risk event can enhance the weight of underlying importance or relevance of causes at the expense of consequences in the mind of perceivers, while focusing on the consequences might have the opposite effect. Moreover, research in causal reasoning indicates that people often use multiple cues to reduce potential errors in causal inferences, particularly when reliance on a single cue could be misleading (Einhorn and Hogarth 1986). In this context, the level of specificity in the disclosures could serve as another cue, helping investors make more informed judgments under conditions of uncertainty.

Relevant to our context, we predict that when managers focus more on the causes of a risk event in the disclosure, enhanced specificity serves to clarify the causal relationship between causes and the risk event.<sup>13</sup> To elaborate, specific disclosures, particularly those focused on the causes, reduce the susceptibility to multiple interpretations of the relationship between the causes and the subsequent risk event (Fiske and Taylor 1991; Plous 1993). The increased clarity about the causes leading to the event enhances investor confidence that the risk event is rooted in these particular, disclosed causes. Conversely, when information is less specific, it leaves room for multiple interpretations of the causal relationship between those causes and the risk event. For instance, if managers generically state that 'certain aspects of operations are vulnerable to cyber-attacks' without

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<sup>12</sup> Prior literature suggests that cues-to-causality can be covariation, temporal order, similarity, congruity (i.e., similarity of length and strength of causes and consequences), and contiguity (i.e., the proximity in location or time in which causes lead to consequences) (Einhorn and Hogarth 1986; Greville and Buehner 2007; Koonce et al. 2011, 2019).

<sup>13</sup> Specificity is conceptually distinct from the idea of concreteness (versus abstractness). Concreteness refers to 'actual' or 'existing in reality' that can be perceived using the senses (Friedlander 2004; Houghton Mifflin 2011); examples of concrete words are spoon, table, green, hot, and walking, while examples of abstract or non-concrete words are love, freedom, good, moral, and democracy.

specifying which areas are at risk, investors might infer that the scope of the cyber threat could be broad, or that the actual targets are indeterminate.

To summarize, when disclosures focus on causes, greater specificity enhances investors' perceptions of knowable uncertainty regarding the occurrence of a risk event. Importantly, while a greater level of knowable uncertainty reflects clarity about how specific causes lead to a risk event, it remains independent of the risk's probability or potential loss—key components of overall riskiness. For example, if a company discloses a specific cause, such as inadequate encryption of customer data servers, investors gain a clearer understanding of where vulnerabilities lie, making cyber-attacks (i.e., the risk event) appear more knowable. Although this added specificity does not change the likelihood or severity of the attacks, it can alter investors' perception of knowable uncertainty regarding the occurrence of the risk event.

We posit that greater knowable uncertainty provides investors with the confidence to understand and predict how the risk event might unfold, thereby positively affecting their investment judgments. In the context of the example above, a disclosure that inadequate encryption could cause cyber-attacks will lead investors to feel more assured about how such risk events might arise and materialize should they occur. Conversely, risks with lower knowable uncertainty may be perceived as less predictable or harder to understand, reducing investors' willingness to invest. In sum, greater knowable uncertainty increases investors' willingness to invest.

On the other hand, when disclosures emphasize the consequences of a risk event, increased specificity may not necessarily enhance investors' perception of knowable uncertainty. Instead, we argue that such detailed disclosures could diminish their sense of knowable uncertainty. Psychological research suggests that causes provide explanatory insights into the origins and potential triggers of a risk event; conversely, consequences hold less explanatory power. This is because consequences are generally less informative and considered peripheral rather than central to an object's representation (Ahn 1998 Ahn et al. 2000; Proctor and Ahn 2007; Tversky and Kahneman 1980). Thus, focusing on consequences may hinder investors' comprehension of the conditions that give rise to a risk event and the causal pathways through which it materializes.

Additionally, theory indicates that when information is highly detailed but not directly relevant to the task at hand, it can lead to a shift away from understanding the core causes of an issue. This occurs because cognitive resources may become overwhelmed or distracted by such detailed but irrelevant information (Sweller et al. 2011). Thus, heightened specificity in disclosures, especially those that focus on the consequences of the event, could divert attention away from the event's causes, undermining investors' understanding of the factors that could lead to the event's potential occurrence. As a result, investors will perceive a lower degree of knowable uncertainty regarding the risk event's occurrence, thereby decreasing their willingness to invest. In sum, our hypotheses are as follows:

*HYPOTHESIS 1: When managers have a greater focus on the causes in their risk disclosures, more versus less specific risk factor disclosures increase investors' feelings of knowable uncertainty surrounding a risk event. In contrast, when managers have a greater focus on the consequences in the disclosures, more versus less specific risk factor disclosures decrease investors' feelings of knowable uncertainty.*

*HYPOTHESIS 2: When managers have a greater focus on the causes in their risk factor disclosures, more versus less specific risk factor disclosures increase investors' investment willingness. In contrast, when managers have a greater focus on the consequences in the disclosures, more versus less specific risk factor disclosures decrease investment willingness.*

*HYPOTHESIS 3: Investors' perceptions of knowable uncertainty mediate the joint effect of causal focus and specificity on investment willingness.*

### **3. Experiment 1**

#### **3.1. Participants**

For Experiment 1, participants are recruited from Prolific, a web-based crowdsourcing marketplace.<sup>14</sup> Prior studies find that online workers (i.e., Amazon Mechanical Turkers) are not different from traditional MBA subject pools in terms of exerted efforts and numerical skills for accounting-related tasks (Farrell et al. 2017; Krische 2019). In addition, given our experimental instrument requires a basic knowledge of accounting and investment, a reliable screening is critical to the use of online workers as a proxy for non-professional investors. One advantage of Prolific is that participants can be pre-screened based on their pre-registered profiles so that participants' moral

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<sup>14</sup> All data collected in this paper have the approval of the Institutional Review Boards at one of the authors' university.

hazard problems can be better addressed, compared to using blatant screening questions (i.e., simple yes/no questions) (Goodman and Paolacci 2017). Using pre-screening filters provided by Prolific, we restrict our subject pool to people who are native English speaker, have lived in the United States, and are experienced in stock investment, with a previous approval rating of 95 percent or above. The prescreening process results in 2,051 potential eligible participants, who are then invited via email.

A total of 300 participants take part in Experiment 1 in exchange for £1.3. We exclude three participants who do not complete the experiment and two participants who show suspicious patterns in their responses.<sup>15</sup> This exclusion results in a final sample of 295 participants. The average participant in our study is 35.33 years old with 13.77 years of full-time working experiences. On average, participants have taken 3.28 accounting and 3.57 finance courses. Participants report a moderate level of frequency in terms of their stock investment (the mean rating = 5.27, on an 11-point scale where “0” = “never” and “10” = “very frequently”). Of participants, 92.5 percent have referred to a company’s annual report to aid their investment, and 97.3 percent indicate that they plan on investing in a company in the future. These participant characteristics are similar to the average profiles of actual retail investors (Elliott et al. 2007)<sup>16</sup> and those in previous AMT-based studies (e.g., Rennekamp 2012), suggesting that our participants are a legitimate surrogate for non-professional investors.

### **3.2. Experimental Design and Procedure**

To test our hypotheses, we conduct a  $2 \times 3$  between-subjects design with causal focus (Focusing on *Causes* versus *Consequences*) and specificity (*More Specific* versus *Less Specific* versus *Less-plus-Footnotes*) as the independent variables. Participants are randomly assigned into one of these six conditions by the Qualtrics platform.

The experimental materials begin by instructing participants to assume the role of an investor. As an investor, participants are asked to consider an investment in *ABC Resorts*, a fictitious company

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<sup>15</sup> Specifically, they choose the highest value on all of our 11-point scales (i.e., choosing “5” on a scale of “-5” and “5” or “10” on a scale of “0” and “10”) and complete our experiment within three minutes. Thus, it is less likely that they are fully attentive to our study. Inferences do not change if we include those participants in our analysis.

<sup>16</sup> Elliott et al. (2007) report that actual retail investors have taken an average of 3.7 accounting and finance courses and 77 percent of them have evaluated a company’s performance using its financial statements more than five times.

in the hospitality industry.<sup>17</sup> Before viewing the risk factor disclosure, all participants read the background information of the company. Next, participants are provided with an excerpt of ABC's risk factor disclosure, which describes the company's cybersecurity risk.<sup>18</sup> In this phase of the experiment, we manipulate causal focus and specificity. After reading the disclosure, participants indicate their investment willingness, followed by perceived knowable uncertainty with respect to the company's cybersecurity risk (i.e., whether the company's cybersecurity risk is knowable in advance). Participants then respond to manipulation check questions and provide demographic information.

Below, we discuss how we manipulate specificity and causal focus.

### **3.3. Manipulation of Specificity**

We first create a more specific version of a risk factor disclosure by adapting actual risk factor disclosures of several companies operating in the hospitality and retail industries. The disclosure contains two risk causes (cyber-attack by hackers and breaches at third-parties) and two consequences (financial losses and damages to the company's reputation). All participants are provided with the same two causes and two consequences, with the level of specificity being different depending on the specificity manipulation. This design biases against our hypotheses because specificity applies to both causes and consequences; when the causes are specific, the consequences are also specific, potentially dampening our ability to find an effect.

After preparing the more specific version, we develop a less specific version. Following the definition of specificity in risk factor disclosures by the prior studies (Beatty et al. 2019; Hope et al. 2016; IRRC Institute 2016), we manipulate specificity in terms of references to names of organizations, activities, and items, identification of time in numbers, money values in dollars, and quantitative value in percentages. Thus, for the *Less Specific* condition, we delete or replace such

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<sup>17</sup> According to the survey on cybersecurity risks, the hospitality industry is at about the 50<sup>th</sup> percentile in rank among industries in terms of the frequency of cyber incidents (SecurityScorecard 2016). We choose the median-ranked industry for this study because if we choose the top-ranked industries (e.g., the financial services industry), participants may feel that cybersecurity risks are presumably knowable as cyber incidents in those industries are often the case. In this case, causal focus and specificity may have little incremental effects on investors' perceived knowable uncertainty relating to cybersecurity risks. For a similar reason, we do not choose the low-ranked industries (e.g., the construction industry) because cybersecurity risks in those industries could be regarded as less knowable due to the infrequency of cyber incidents, even before viewing our manipulation.

<sup>18</sup> For a reason similar to that discussed in Footnote 17, we use cybersecurity risks as the experimental setting since general perceptions of cybersecurity risks are a grey area as to whether they are presumably knowable or random. For example, Patel (2018) argues that "a cyber threat is random and malicious and doesn't happen in a predictable statistical fashion." In contrast, Robertson and Warr (2016) claim that "the [cyber security] events are targeted and malicious not random."

information with less specific one, while holding its meaning and context constant between the two specificity conditions (See Appendix B for the details of the manipulation of causal focus and specificity).<sup>19</sup>

Nevertheless, the manipulation of specificity does involve a change in information to participants (i.e., specific names of objects only appear in the *More Specific* condition), possibly making it less clear whether the effect of the specificity manipulation is driven by the level of specificity or the difference in information, or both.<sup>20</sup> To address this concern, we create a *Less-plus-Footnotes* condition in which participants receive the same information provided in the *Less Specific* condition and the corresponding more specific version of information is added in the footnotes. Prior literature finds that investors react more strongly to the information reported in the face than in the footnotes (e.g., Davis-Friday et al. 2004; Frederickson et al. 2006). Thus, we expect that doing so can keep information constant across the *More Specific* condition and the *Less-plus-Footnotes* condition, while making the effect of specificity less pronounced for the *Less-plus-Footnotes*. The footnotes are in a smaller font size and placed at the bottom of the disclosure.<sup>21</sup>

### 3.4. Manipulation of Causal Focus

Causal focus is manipulated in two ways: (1) title and (2) the layout of the main paragraphs.<sup>22</sup> Consistent with common disclosure practices, the title contains either causes or consequences only and the main body includes both causes and consequences, with the layout being different for each

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<sup>19</sup> For instance, the text “revenues through our website at www.ABC.com with 398,700 online bookings” in the *More Specific* condition is replaced by “revenues through our website with approximately four hundred thousand online bookings in the *Less Specific* condition.

<sup>20</sup> It is also likely that greater specificity makes information less readable because it is lengthy and includes technical terms. Thus, we check whether the specificity manipulation influences participants’ perceived readability. We construct a readability measure by taking an average of participants’ responses to the difficulty to read/understand/ process the company’s risk factor disclosures (on 11-point scales where “0” = “not at all difficult” and “10” = “extremely difficult;” Cronbach’s alpha of 0.95). Results indicate that there is no difference in readability measure across specificity conditions (2.63 for *More Specific* versus 2.70 for *Less Specific* versus 2.49 for *Less-plus-Footnotes* condition;  $F = 0.19$ ,  $p = 0.831$ ), suggesting that participants’ perceived readability is not affected by the specificity manipulation.

<sup>21</sup> In the *Less-plus-Footnotes* condition, specific information is disclosed rather than recognized, suggesting that participants might not pay the same level of attention to this condition compared to others. To address this concern, we analyze the time participants spend, which is tracked using a Qualtrics-embedded timer. Our findings show no significant differences in time spent across conditions (smallest  $p = 0.204$ ), alleviating concerns about differing levels of attention as an alternative explanation. Considering our hypothesis testing results, which show significant differences in knowability and investment willingness (as reported in the Test of Hypotheses sections), this suggests that while participants across all conditions pay similar attention, they integrate the information from each specificity manipulation differently.

<sup>22</sup> We do not vary the quantity of information for our causal focus manipulation (e.g., more information about risk causes for the *Causes* versus *Consequences* condition). If there were a difference in the quantity of information between the experimental conditions, it would be difficult to disentangle the effect of causal focus from that of more versus less information.

causal focus condition. In the *Causes* condition, the title is “(H)ackers’ cyber-attack and breaches at third parties may expose our company to cybersecurity risks.” In the *Consequences* condition, it is “(O)ur performance and reputation could be adversely affected by cybersecurity risks.” The title is presented with bold and italic typeface. For the main body, we manipulate the placement of causes and consequences as whichever attribute is shown first is likely to be more attentive. Thus, in the *Causes* condition, we place the two causes at the top of the disclosure, add bulleted sub-headings for each causal account, and put a space between them. This makes the causes more readable, thus making participants pay more attention to them. Following the causes, we put a paragraph including the two consequences in plain text.

Conversely, in the *Consequences* condition, we place the two consequences at the top, along with bulleted sub-headings and a space between them. Following the consequences is a paragraph containing the causes in plain text.

### **3.5. Manipulation Checks**

To assess the effectiveness of the causal focus manipulation, we ask the following question: “To what extent do you think the risk disclosure in the ABC’s annual report mainly focuses on risk causes or risk consequences?” Participants respond on an 11-point scale from “0” = “completely focusing on risk causes” to “10” = “completely focusing on risk consequences.” The mean rating for the *Causes* condition is significantly lower than that for the *Consequences* condition (4.93 versus 6.74;  $t = 6.03$ ,  $p < 0.001$ ), suggesting that the manipulation of causal focus is successful.

Next, to check whether the manipulation of specificity is successful, we ask the following question: “How specific was the risk disclosure provided in the ABC’s annual report?” Participants respond on an 11-point scale, where “0” = “not specific at all” and “10” = “very specific.” The results show that the mean rating for the *More Specific* conditions is significantly higher than that for the *Less Specific* condition (6.20 versus 5.20;  $t = 2.80$ ,  $p = 0.006$ ), suggesting that the specificity manipulation is successful.<sup>23</sup>

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<sup>23</sup> We find that the mean rating for the *More Specific* condition is higher than that for the *Less-plus-Footnotes* condition (6.20 versus 5.44;  $t = 2.27$ ,  $p = 0.024$ ). However, the mean rating for the *Less Specific* condition is not significantly different from that for the *Less-plus-Footnotes* condition (5.20 versus 5.44;  $t = 0.66$ ,  $p = 0.509$ ).

### **3.6. Test of Hypothesis 1**

Our prediction for H1 is that when managers place a greater focus on the causes of a risk event in their risk factor disclosures, greater specificity will lead to enhanced feelings of knowable uncertainty; however, when managers have a greater focus on the consequences of a risk event in the disclosures, more specific disclosures will result in lower feelings of knowable uncertainty. To capture participants' perceived nature of uncertainty, we employ the Epistemic (knowable)-Aleatory (random) Rating Scales (EARS), a measure recently developed and validated in various decision-making settings (Fox et al. 2021; Walters et al. 2023). We selectively adapt questions from the prior studies and modify them for the risk factor disclosures context. We ask participants to indicate: (1) the extent they feel that ABC's cybersecurity risk events are in principle knowable in advance on an 11-point scale, with endpoints from “-5” = “not at all knowable in advance” to “5” = “completely knowable in advance;” (2) the extent they agree that ABC's cybersecurity risk events are something that has been determined in advance on an 11-point scale, with endpoints from “-5” = “strongly disagree” to “5” = “strongly agree;” and (3) the extent they agree that ABC's cybersecurity risk events are predictable in advance, given enough information on an 11-point scale, with endpoints from “-5” = “strongly disagree” to “5” = “strongly agree.”<sup>24</sup> Cronbach's alpha of 0.86 indicates that the three items capture a single construct. In addition, a factor analysis confirms that all the three questions load as a single factor. Hence, we average all three items to form a single measure to capture participants' perceived knowable uncertainty (hereafter, knowability), with a higher value indicating relatively more knowable uncertainty, and a lower value indicating relatively less knowable uncertainty.<sup>25</sup>

The descriptive statistics of knowability are presented in Table 1, Panel A, and graphically illustrated in Figure 1, Panel A. To test H1, we conduct an ANOVA with causal focus and specificity as the independent variables, and knowability as the dependent variable, results of which are presented in Table 1, Panel B. We find a significant interaction effect of causal focus and specificity

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<sup>24</sup> In the out-of-sample test referenced in Footnote 11, we also show participants the three knowability-related questions used in our experiments and ask them to rate whether the questions make them think more about causes or consequences of the company's cybersecurity risk events, using 11-point Likert scales (1 = primarily the causes; 11 = primarily the consequences). The mean value is 4.7, which is significantly lower than 6 ( $p < 0.001$ ), indicating their attribution to causes for knowable uncertainty associated with risk events.

<sup>25</sup> Inferences do not change when we perform the analysis with each individual item.

( $F = 7.74$ ,  $p = 0.003$ , one-tailed equivalent). Neither the main effect of causal focus nor the main effect of specificity is significant ( $F = 0.40$ ,  $p = 0.530$ , and  $F = 0.01$ ,  $p = 0.918$ , respectively).

[Insert Table 1 and Figure 1 about here]

To check whether the pattern of the interaction is in line with H1, we also conduct simple effects tests, results of which are reported in Table 1, Panel C. We find that when the focus is on causes, participants in the *More Specific* condition exhibit higher knowability than those in the *Less Specific* condition (0.71 versus -0.25;  $F = 3.97$ ,  $p = 0.025$ , one-tailed). In contrast, when the focus is on consequences, knowability in the *More Specific* condition is significantly lower than that in the *Less Specific* condition, (-0.01 versus 0.89;  $F = 3.78$ ,  $p = 0.027$ , one-tailed).<sup>26</sup> These results support H1.

### 3.7. Test of Hypothesis 2

Our prediction for H2 is that when managers place a greater focus on the causes of a risk event, greater specificity will lead to higher investment willingness; in contrast, when the focus is on risk consequences, greater specificity decreases investment willingness. To measure investment willingness, we ask participants the following questions: (1) “How willing are you invest in ABC’s stock?” on an 11-point scale with endpoints from “-5” = “absolutely not willing to invest” to “5” = “absolutely willing to invest;” (2) “Please assess the attractiveness of ABC’s stock” on an 11-point scale with the endpoints from “-5” = “not at all attractive” to “5” = “absolutely attractive;” and (3) “Suppose you hold ABC’s stock. How will you change your holdings of ABC’s stock?” on an 11-point scale, with “-5” = “significantly decrease,” “0” = “no change,” and “5” = “significantly increase.” Given that these three questions capture the same underlying construct (Cronbach’s alpha of 0.90) and load onto one factor, we use the average of them as a single measure, which we label as

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<sup>26</sup> Results of simple effects tests with *More Specific* versus *Less-plus-Footnotes* condition (Table 1, Table E) show that when the focus is on consequences, specificity has no significant effect on knowability ( $F = 0.86$ ,  $p = 0.178$ , one-tailed), although cell means are directionally consistent with our prediction (-0.01 for *More Specific* versus 0.40 for *Less-plus-Footnotes*).

investment willingness, with a higher (lower) value indicating greater (lower) investment willingness.<sup>27</sup>

The descriptive statistics of investment willingness are presented in Table 2, Panel A, and represented graphically in Figure 1, Panel B. Table 2, Panel B shows results of an ANOVA where causal focus and specificity are the independent variables, and investment willingness is the dependent variable. We find that there is a significant interaction effect of causal focus and specificity on investment willingness ( $F = 7.71$ ,  $p = 0.003$ , one-tailed equivalent). We also find a significant main effect of causal focus ( $F = 5.55$ ,  $p = 0.020$ ) and an insignificant main effect of specificity ( $F = 0.02$ ,  $p = 0.889$ ).

[Insert Table 2 about here]

To examine whether the interaction is consistent with H2, we conduct simple effects tests. As presented in Table 2, Panel C, results demonstrate that when the causal focus of the disclosure is on causes, participants in the *More Specific* condition report higher investment willingness than those in the *Less Specific* condition (1.59 versus 0.79;  $F = 3.39$ ,  $p = 0.034$ , one-tailed). In contrast, when the focus is on consequences, participants in the *More Specific* condition exhibit lower investment willingness than those in the *Less Specific* condition (0.03 versus 0.92;  $F = 4.36$ ,  $p = 0.020$ , one-tailed). Therefore, H2 is supported.

### 3.8. Test of Hypothesis 3

Our prediction for H3 is that knowability will mediate the joint impact of causal focus and specificity on investment willingness. Using the biased-corrected bootstrapping method (Hayes 2022; Preacher and Hayes 2008), we conduct a moderated-mediation analysis where causal focus moderates the effect of specificity on knowability, which then influences investment willingness. Following the procedures described by Hayes (2022), we use the SPSS PROCESS macro (Model 8) to estimate the path coefficients through 5,000 bootstrapped sample with a 95 percent confidence level.

Results from the moderated-mediation analysis support H3. As graphically represented in Figure 2, we find a significant indirect effect of the interaction of causal focus and specificity on

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<sup>27</sup> Inferences do not change when we use each investment willingness measure for the hypothesis test.

investment willingness via knowability (index = 0.356, SE = 0.211, CI [0.044, 0.846]). We also find that both the path between the interaction of causal focus and specificity on knowability (Path 1) and the path between knowability and investment willingness (Path 2) are significant (coefficient = 1.861, p = 0.003, and coefficient = 0.191, p = 0.002, one-tailed equivalent, respectively). However, the direct path between the interaction of causal focus and specificity on investment willingness (Path 3) is still significant (coefficient = 1.325, p = 0.015, one-tailed equivalent), indicating a partial mediation. Overall, these findings suggest that knowability helps explain the joint impact of causal focus and specificity on investment willingness, though some of the effect may be attributed to factors beyond knowability.

[Insert Figure 2 about here]

### **3.9. Additional Analysis**

#### **3.9.1. Investors' Perceived Random Uncertainty**

As discussed above, our knowability measures are adapted from the EARS, the Epistemic (knowable)-Aleatory (random) Rating Scales items in prior research, which also assess one's perceived random uncertainty. To provide a more comprehensive view of investors' risk perceptions, we measure investors' perceived random uncertainty related to the cybersecurity risk events. We adapt another three questions from the EARS by asking whether they believe the company's cybersecurity risk events: (4) have an element of randomness, (5) can be determined by chance factors, and (6) could play out differently on similar occasions (for the three knowability items, please refer to Section 3.6, 'Test of Hypothesis 1').

Conceptually, knowable uncertainty and random uncertainty are distinct constructs. Thus, we cannot reverse code Questions (4) to (6) and consider them to be measures of knowable uncertainty—more knowable uncertainty (e.g., due to greater specificity in causes) does not necessarily imply less random uncertainty associated with the realization of risk events. Prior literature also shows that measures of knowable uncertainty are distinct from measures of random uncertainty, and predict different dependent variables and load into two separate factors (Ülkümen et al. 2016; Walters et al.

2023). Consistent with theory and prior research, when we attempt to incorporate reverse-coded responses from these additional items into the knowability measure, the Cronbach's alpha drops to 0.72 (from 0.86). In addition, using random uncertainty measures in place of knowable uncertainty measures, combining all six measures (with Questions (4) to (6) reverse coded), or including just one or two of these questions in the knowability items, results in insignificant effects (smallest  $p = 0.121$ ). In sum, we decide against using them for our hypothesis testing.

### **3.9.2. Robustness Checks**

In addition to our primary focus on the construct 'knowability,' we also conduct several robustness checks to substantiate the validity of our main findings. For brevity, all variables discussed in this section are measured on an 11-point scale, and results are untabulated. Firstly, we conduct tests to confirm that knowability and the level of uncertainty are distinct constructs. Participants are asked to gauge their perception of the level of uncertainty related to the cybersecurity risk event. A low Cronbach's Alpha of 0.19 for a composite measure combining knowability and the level of uncertainty suggests that these constructs are not measuring the same underlying variable. Moreover, ANOVA tests show no significant interactions between causal focus and specificity on uncertainty ( $F = 0.09, p = 0.759$ ) and insignificant main effects ( $F = 0.04, p = 0.851$  for causal focus;  $F = 1.68, p = 0.099$  for specificity, one-tailed). Importantly, regression analysis shows that investment willingness is significantly influenced by knowability ( $p = 0.002$ ), but not by the perceived level of uncertainty ( $p = 0.536$ ). Overall, these findings support the notion that the dimension of perceived knowable uncertainty is distinct from that of high versus low uncertainty (Fox and Ülkümen 2011; Ülkümen et al. 2016; Walters et al. 2023).

Second, our experimental design varies the presentation order of causes and consequences, prompting the question of whether the natural versus inverse temporal order of causes and consequences could influence participants' judgments. We find no significant differences in participants' subjective difficulty with reading, understanding, or processing the information (smallest  $p = 0.668$ ), suggesting that order effects are unlikely to influence participants' judgments.

Third, we explore whether the salience of negative outcomes, inherently emphasized by risk consequences, could impact investment decisions. Given that consequences directly relate to loss

outcomes, a negative cue, while causes do not, it is possible that the different salience of negativity can influence investors' judgments via its impact on their perceived investment riskiness. Mediation analysis reveals a marginally significant relationship between the combined effects of causal focus and specificity on perceived riskiness (one-tailed  $p = 0.085$ ), but the indirect effect on investment willingness through their perceived investment riskiness is not significant at the one-tailed  $p = 0.05$ , indicating that negative outcome salience is not the primary driver of our findings. This aligns with our earlier discussion where we clarify that knowability is distinct from perceived riskiness, which concerns probability and potential loss rather than the underlying source of uncertainty.

Lastly, we confirm that our findings are robust, even when accounting for control variables such as participants' years of work experience, the number of accounting/finance courses taken, age, and gender.<sup>28</sup>

#### 4. Experiment 2

In Experiment 1, we utilize a case closely aligned with real-world risk factor disclosures, such as those provided in Appendix 1. This design incorporates specific guidelines and principles from recognized risk management standards such as the National Institute of Standards and Technology (NIST) Cybersecurity Framework and the American National Standards Institute (ANSI)'s encryption standards. While this approach enhances the realism and generalizability of our findings, the wordings in the risk disclosures can sound authoritative, possibly leading to a positive bias in participants' judgments. This is especially true when cause-related information appears early in the text, as is the case in the *Causes/More Specific* condition.

To address these limitations, we design a follow-up experiment, Experiment 2, to provide a more internally valid test of our hypotheses. Although this second experiment is stylized and may be

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<sup>28</sup> To evaluate whether management credibility acts as a mediating factor (Mercer 2005), we included it as an additional mediator in our moderated-mediation model. In Experiment 1, our results indicate that both knowability and credibility fully mediate the combined effect of causal focus and specificity on investment willingness. However, in Experiment 2, while the pathway through knowability remains significant, the pathway through credibility becomes insignificant. These findings suggest that investors' perceived management credibility likely stems from the prominence of managerial attributes in the disclosure, rather than the interaction of causal focus and specificity. For instance, in Experiment 1, phrases such as "we maintain a cyber risk management program (CyRiM)" and the frequent use of first-person pronouns like 'we' and 'ours' are present, whereas these managerial attributes are absent in Experiment 2. In sum, we do not find any clear evidence supporting the mediating role of credibility with respect to the primary variables of interest in our study.

less reflective of real-world complexities, it offers greater internal validity as it allows us to more precisely isolate the specific effects related to causal focus and specificity, thereby lending additional robustness to our overall conclusions. Given the complementary strengths and weaknesses of Experiments 1 and 2, taken together, they offer a comprehensive understanding of how specificity and causal focus in risk factor disclosures impact investor judgments.

To ensure consistency across conditions and thereby enhance the robustness of our findings, we keep constant the main text which contains two paragraphs, one for the description of company's web-based operations and the other for a consumer report regarding its web-based operations. To manipulate the focus on causes or consequences, we alter only the title of each risk disclosure. For the *Causes* condition, the title reads 'Cybersecurity risks could arise from web-based operations.' In contrast, for the *Consequences* condition, the title is 'Cybersecurity risks could result in financial losses.'

Unlike in Experiment 1, we do not modify the disclosure layout such as the use of bullet points and the order of paragraphs, ensuring that the title alone serves as a priming mechanism to guide investors' interpretation of the risk in terms of its cause or consequence. Both the *Causes* and *Consequences* conditions mention the risk arising from web-based operations and the potential financial loss. Specifically, the title in the *Causes* condition emphasizes the cause ('arise from') and its associated factor (web-based operations), while the title in the *Consequences* condition highlights the consequence ('result in') and its associated effect (customer attrition), which implies financial losses. This design ensures that the priming effect is isolated to the framing in the title, with all other aspects of the disclosure, including the body text, remaining identical across conditions.

For the specificity manipulation, like Experiment 1, we vary the details of the names and size of the company's operations and its survey. However, we do not include any authoritative-sounding words in the *More Specific* condition (see Appendix C for the details of the manipulation).

We recruit 201 subjects from Prolific, who receive \$1.5 in exchange for their participation. Our experimental case deals with a hospitality company, which has been largely affected by the COVID-19 pandemic. Therefore, after the investment willingness items, we add an open-ended question asking whether participants make investment judgments based on the current COVID-19

pandemic situations, rather than the information presented.<sup>29</sup> One of the authors and one graduate student who are unaware of our study independently analyze their responses. The inter-rater agreement is 91.54% and any discrepancies between the coders are reconciled by discussion. We find that 27 participants make judgments based on COVID-19-related reasons or do not make judgments based on the information provided.<sup>30</sup> After excluding them, we have a sample of 174 subjects.<sup>31</sup>

We perform three two-way ANOVAs where causal focus and specificity are the independent variables, and knowability and investment willingness are each dependent variable.<sup>32</sup> Untabulated results show that when the focus is on causes, greater specificity increases knowability (1.79 versus 0.36;  $F = 8.34$ , one-tailed  $p = 0.003$ ) and investment willingness (1.57 versus 0.95;  $F = 2.66$ , one-tailed  $p = 0.053$ ).<sup>33</sup> In contrast, when the focus is on consequences, specificity decreases knowability (0.40 versus 1.48;  $F = 3.18$ , one-tailed  $p = 0.039$ ) and investment willingness (0.91 versus 1.67;  $F = 3.37$ , one-tailed  $p = 0.035$ ). We also repeat the mediation analysis employed in Experiment 1. Untabulated results indicate that there is a significant indirect effect of specificity on investment willingness through knowability such that the confidence interval does not contain zero (index = 0.359, SE = 0.198, CI [0.053, 0.778]). Overall, these results suggest that the difference in information across the conditions does not drive our results.

## 5. Experiment 3

We conduct another experiment (Experiment 3) to test whether participants' perceived risk controllability drives the positive effects in the *Causes/More Specific* versus *Causes/Less Specific* condition. As discussed above, in Experiment 1, the causes-related paragraphs largely deal with the

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<sup>29</sup> We do not include this question in Experiments 1 and 3 as they are conducted before the COVID-19 outbreak.

<sup>30</sup> Particularly, nine of them indicate that they make decisions due to diversification reasons, eight of them state that they do not want to invest in the hospitality industry, five of them do not like stock investments, and five of them make nonsense or no responses.

<sup>31</sup> The excluded subjects are evenly distributed across the conditions as follows: seven in the *Causes/More Specific* condition, nine in the *Causes/Less Specific* condition, six in the *Consequences/More Specific* condition, and five in the *Consequences/Less Specific* condition. When we include them in our analysis, results become marginal or insignificant but directionally consistent with results without them.

<sup>32</sup> In Experiment 2, we replace one of the investment willingness items "Suppose you hold ABC's stock. How will you change your holdings of ABC's stock?" with "Given ABC's risk factor disclosures, what common stock valuation do you think a potential investor would place on ABC" on an 11-point scale, with "-5" = "low valuation" and "5" = "high valuation."

<sup>33</sup> We also add a question to indicate how much participants would allocate their \$10,000 cash to an investment in ABC's stock. However, we do not find any significant results (smallest  $p = 0.40$ ), potentially due to participants' different sensitivity to dollar values for their stock investment.

company's infrastructures regarding its risk management. Thus, greater specificity on causes (i.e., specific risk management information) may lead to participants' perception that risks are well controlled by management. As well-controlled risks are less likely to occur, participants may pay less attention to managers' discussion on risk consequences, which involve future potential losses, thereby resulting in positive effects on participants' judgments. Thus, we run a  $1 \times 2$  (specificity) between-participants experiment where we use the experimental case in Experiment 1, but replace all information related to risk management with the company's customer membership programs (as in Experiment 2), with the level of specificity varying depending on each condition.

We recruit 124 subjects through Prolific, who receive £1.3 in exchange for their participation. Consistent with our hypotheses, untabulated results show that when the disclosure places a greater focus on causes, specificity increases knowability (0.89 versus 0.19;  $F = 3.18$ ,  $p = 0.039$ , one-tailed) and investment willingness (1.05 versus 0.46;  $F = 2.48$ ,  $p = 0.059$ , one-tailed). To measure participants' perceptions about risk controllability, we ask them to indicate the extent to which the company's risk events are controllable by management, on an 11-point scale with "0" indicating "not at all controllable" and "10" indicating "completely controllable" (hereafter, controllability). Next, we conduct an ANOVA with specificity as the independent variable, and controllability as the dependent variable. We find that greater specificity marginally increases controllability (5.85 for *More Specific* versus 5.29 for *Less Specific*;  $F = 1.74$ ,  $p = 0.095$ , one-tailed).

To investigate participants' attention to information about risk consequences, we record participants' time spent on the company's risk factor disclosure using a timer embedded in Qualtrics. In addition, we separate the paragraph related to consequences from the risk factor disclosure (which then contains the title and the paragraph related to causes only), and present the consequence-related paragraph on the following screen. Participants are allowed to move back and forth within the two separate screens. Untabulated results show that there is no significant difference in participants' time spent on consequences ( $p = 0.256$ ), or the ratio of the amount of time they spent on consequences relative to their total time spent on both causes and consequences (i.e., participants' relative attention to consequences versus causes;  $p = 0.293$ ). These results suggest that reduced attention to risk

consequences is unlikely to serve as an alternative explanation for the more positive investor judgments in the *Causes/More Specific* versus *Causes/Less Specific* condition..

Next, to conduct the mediation analysis, we use the SPSS PROCESS macro to run 5000 bootstrapped samples with a 95 percent confidence level, with specificity as the independent variable, controllability as the mediator, and participants' relative attention to risk consequences versus causes as the dependent variable. Results show that the bootstrapped confidence interval includes zero (effect = 0.629, SE = 0.568, CI [-0.365, 1.890]), suggesting that investors' perceived risk controllability does not mediate the effect of specificity on their attention to information about risk consequences. In sum, we replicate the results from Experiment 1 in the two follow-up experiments, providing assurance that our results are not driven by particular design choices and/or alternative explanations.

## 6. Conclusion

In this study, we investigate whether investors' investment judgments are jointly affected by causal focus and specificity, which are two important features that vary considerably across firms' qualitative risk factor disclosures. Results of controlled experiments reveal that, when managers focus more on the causes of a risk event in their disclosure, a higher level of specificity increases participants' investment willingness due to enhanced feelings of knowable uncertainty in a risk. In contrast, when disclosures place a greater focus on the consequences of a risk event, greater specificity decreases investment willingness due to diminished feelings of knowable uncertainty.

In addition to identifying causal focus as an important attribute in risk factor disclosures, our study contributes to the accounting literature by showing that investors' perceptions of risk uncertainty play an important role in mediating the effect of risk factor disclosures on investment willingness. Our findings suggest that when investors make investment judgments under uncertainty, they consider the qualitative aspects of uncertainty, which have not been explored in prior studies. Further, our study complements Hope et al. (2016) by showing the directional effect of specificity in risk factor disclosures. Contrary to their contention that specific risk factor disclosures are beneficial, evidence of which is based on increased trading volume and unsigned stock returns, our results

suggest that the positive effect of specificity is conditional, with the directional effects varying depending on causal focus.

Our study is subject to limitations, although we believe these can be opportunities for future research. First, we study investor judgments only in the presence of a qualitative risk factor disclosure with little financial information. We make such a design choice to provide a stronger test of our theory. For instance, greater financial information may increase knowability as it enables participants to quantify the impact of risks by extrapolating numerical information. However, additional financial information could produce additive or interactive effects, an issue that future research could explore.

Second, we examine the effects of risk factor disclosure only in the context of a company's cybersecurity risk. While such a design choice is largely motivated by the SEC's interest in cyber risk disclosures (Schwartz 2017; SEC 2011, 2018), examining one facet of risk factor disclosures may limit the generalizability of our findings. Future research could examine whether the results we find would be different for other types of risk or for multi-faceted risks. For example, for a risk in which random uncertainty is presumably salient (e.g., a manager's sudden resignation due to personal reasons), would a prompt to consider knowable uncertainty (e.g., specific risk factor disclosures with a greater focus on causes) result in a positive effect on investors' investment judgments or backfire because they do not believe that such a risk is unlikely to be knowable?

Third, our study focuses on investigating investor judgments within the disclosed risk information setting. While Campbell et al. (2014) argue that managers provide risk factor disclosures that meaningfully reflect the risk they face, and the SEC has required firms to provide material risk factors in the disclosure (SEC 2020), it is possible that they still withhold or omit some material risk factors. Future research could examine whether investors consider possible non-disclosed risks and how they take such a possibility into account in making investment judgments.

Finally, this study examines a setting in which the information contained in risk factor disclosures is new to investors. However, a recent textual analysis shows that firms' risk factor disclosures tend to be sticky (Dyer et al. 2017), meaning that managers are likely to copy and paste the same risk information from a prior period. Repeated risk information can be perceived as greater knowable uncertainty as people can keep seeing it repeatedly. Future research could explore how

investors' perceived uncertainty and investment judgments are affected when there is repeated verbatim in risk factor disclosures in terms of a multi-period setting.

## **Appendix A Examples of Variations in Causal Focus in Risk Factor Disclosures**

### Example 1: Focusing on Causes

*An excerpt from risk factor disclosures in Prudential Financial, Inc.'s SEC 10-K filing for fiscal year ended December 31, 2021*

#### **We may not adequately maintain information security.**

There continues to be significant and organized cyber-attack activity against western organizations, including but not limited to the financial services sector, and no organization is fully immune to cyber-attacks. Risks related to cyber-attack arise in the following areas:

- Protecting both “structured” and “unstructured” sensitive information is a constant need. However, some risks cannot be fully mitigated using technology or otherwise.
- Unsuspecting employees represent a primary avenue for external parties to gain access to our network and systems. Many attacks, even from sophisticated actors, include rudimentary techniques such as coaxing an internal user to click on a malicious attachment or link to introduce malware or steal their username and password (i.e., phishing).
- The risk associated with wrongdoers encrypting data (i.e., ransomware) or disrupting communications (i.e., denial of service) for the purposes of extortion persists.
- Financial services companies are increasingly being targeted by hackers and fraudulent actors seeking to monetize personally identifiable information or extort money.
- Nation-state sponsored organizations are engaged in cyber-attacks but not only for monetization purposes. Nation states appear to be motivated by the desire to gain information about foreign citizens and governments or to influence or cause disruptions in commerce or political affairs.
- We have also seen continued non-technical attempts to commit fraud or solicit information via call centers and interactive voice response systems.
- We rely on third-parties to provide services as described further below. While we maintain certain standards for all vendors that provide us services, our vendors, and in turn, their own service providers, may become subject to a security breach, including as a result of their failure to perform in accordance with contractual arrangements.

## Example 2: Focusing on Consequences

*An excerpt from risk factor disclosures in Destination Maternity Corporation's SEC 10-K filing for fiscal year ended January 31, 2018*

### **A cybersecurity incident could have a negative impact on our business and results of operations.**

A cyber-attack may bypass the security for our IT Systems causing an IT System security breach and lead to a material disruption of our IT Systems and/or the loss of business information and/or Internet sales. Such a cyber-attack could result in any of the following:

- theft, destruction, loss, misappropriation or release of confidential data or intellectual property;
- operational or business delays resulting from the disruption of IT Systems and subsequent clean-up and mitigation activities;
- negative publicity resulting in reputation or brand damage with our customers, partners or industry peers; and
- loss of sales generated through our Internet websites through which we sell merchandise to customers, to the extent these websites are affected by a cyber-attack.

As a result, our business and results of operations could be materially and adversely affected.

## Appendix B Manipulations of Causal Focus and Specificity in Experiment 1

Example 1: *Causes/More Specific* Condition

### ITEM 1.A. Risk Factors

**Hackers' cyber attack and breaches at third parties may expose our company to cybersecurity risks**

Our business is subject to cybersecurity risks such as loss of data, system disruption and security breach. The cybersecurity risks could arise from the followings:

- **Cyber attacks by hackers:** As certain aspects of our operations [(i.e., electronic data processing and digital marketing)] depend on web-based programs, hackers' cyber attack has become a threat to our organization. Hackers, acting individually or in a group [(i.e., criminal organizations and/or extremist parties)]<sup>a</sup> may penetrate our computer systems or our website [at [www.ABC.com](http://www.ABC.com)] and, if successful, this may subject us to cybersecurity risks. Although we maintain a cyber risk management program [(CyRiM)] based on the criteria set forth by certain cybersecurity frameworks, [including the National Institute of Standards and Technology (NIST) Cybersecurity Framework], there is no guarantee that this measure can provide absolute security.<sup>b</sup>
- **Breaches at third-parties:** Also, we heavily rely on third parties, [including *SaveData. Inc.*], for electronic payment processing. [In 2016], debit and credit card transactions accounted for the vast majority [(87%)] of our revenues. In addition, we also generated [\$248.5 million of] revenues through [[www.ABC.com](http://www.ABC.com)] with [398,700] online bookings. While we comply with information security standards, [such as the American National Standards Institute (ANSI)'s encryption standards and the Payment Card Industry Data Security Standard (PCI DSS)], breaches at third-parties could be a source of cyber incidents.

The financial costs related to cybersecurity risks could be significant. According to [the Cost of Data Breach Survey by Ponemon Institute], the average total organizational cost due to data breaches reached [\$7.01 million in 2014 – 2016], which include both direct (the direct expense outlays to accomplish given activities, [i.e., engaging forensic experts]) and indirect (the amount spent in time, effort and other organizational resources for relevant activities, [i.e., in-house investigation]) costs. Under [the FTC Act (15 U.S.C. §§41-58)], the cybersecurity events can also result in monetary penalties by relevant regulators, [including the US Federal Trade Commission (FTC)]. In addition, even if we may fully restore customer data that might be impaired due to a cybersecurity event, our reputation can be significantly damaged, possibly resulting in customer dissatisfaction and/or customer turnover. In [the 2015 Consumer Review survey by Deloitte], for instance, more than two-thirds [(73%)] of customers would reconsider using a company if it failed to keep their data safe, and almost half [(36%)] of them actually closed their accounts and stopped dealing with the business they felt was responsible for cybersecurity events.

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<sup>a</sup> [Words in square brackets] are present in the *More Specific* condition only.

<sup>b</sup> Such an expression is pervasive in actual risk factor disclosure practice, providing support for the validity of our manipulation. As an illustration, in its recent risk factor disclosures, Choice Hotels International states that “(w)e seek to minimize the impact of these [cyber] attacks through various technologies, processes and practices designed to help protect our networks, systems, computers and data from attack, damage or unauthorized access. However, there are no guarantees that our cyber-security practices will be sufficient to thwart all attacks.” Similarly, La Quinta Holdings note that “(e)ven if we are fully compliant with such legal standards, we may not be able to prevent security breaches involving guest transaction data and identity theft.”

Example 2: *Consequences/Less Specific* Condition

### ITEM 1.A. Risk Factors

#### ***Our performance and reputation could be adversely affected by cybersecurity risks***

Our business is subject to cybersecurity risks such as loss of data, system disruption and security breach. The cybersecurity risks could result in the followings:

- **Financial losses:** The financial costs related to cybersecurity risks could be significant. According to {a data breach survey by a research institute}<sup>c</sup>, the average total organizational cost due to data breaches reached {approximately seven million dollars in recent years}, which include both direct (the direct expense outlays to accomplish given activities) and indirect (the amount spent in time, effort and other organizational resources for relevant activities) costs. Under {the federal privacy law}, the cybersecurity events can also result in monetary penalties by relevant regulators.
- **Damages to the company's reputation:** In addition, even if we may fully restore customer data that might be impaired due to a cybersecurity event, our reputation can be significantly damaged, possibly resulting in customer dissatisfaction and/or customer turnover. In {a recent survey by a professional services firm}, for instance, more than two-thirds of consumers would reconsider using a company if it failed to keep their data safe, and among those consumers, almost half of them actually closed their accounts and stopped dealing with the business they felt was responsible for cybersecurity events.

As certain aspects of our operations depend on web-based programs, hackers' cyber attack has become a threat to our organization. Hackers, acting individually or in a group, may penetrate our computer systems or our website and, if successful, this may subject us to cybersecurity risks. Although we maintain a cyber risk management program based on the criteria set forth by certain cybersecurity frameworks, there is no guarantee that this measure can provide absolute security. Also, we heavily rely on third-parties for electronic payment processing. {Last year}, debit and credit card transactions accounted for the vast majority of our revenues. In addition, we also generated {almost half of our total revenues}<sup>d</sup> through {our website} with {approximately four hundred thousand} online bookings. While we comply with information security standards, breaches at third-parties could be a source of cyber incidents.

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<sup>c</sup> {Words in curly brackets} are present in the *Less Specific* condition only.

<sup>d</sup> To make this information consistent between the *More Specific* and *Less Specific* conditions, prior to viewing ABC's risk factor disclosures, all participants are informed that ABC had revenue of \$500 million last year.

### Example 3: *Consequences/Less-plus-Footnotes* Condition

[Same with the *Consequences/Less Specific* Condition, with additional footnotes below]

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<sup>1</sup> The Cost of Data Breach Survey by Ponemon Institute; <sup>2</sup> \$7.01 million in 2014 – 2016; <sup>3</sup> i.e., engaging forensic experts; <sup>4</sup> i.e., in-house investigation; <sup>5</sup> The FTC Act (15 U.S.C. §§41-58); <sup>6</sup> including the US Federal Trade Commission; <sup>7</sup> The 2015 Consumer Review survey by Deloitte; <sup>8, 9</sup> 73% and 36%, respectively; <sup>10</sup> i.e., electronic data processing and digital marketing; <sup>11</sup> i.e., criminal organizations and/or extremist parties; <sup>12</sup> CyRIM; <sup>13</sup> including the National Institute of Standards and Technology (NIST) Cybersecurity Framework; <sup>14</sup> including SaveData. Inc.; <sup>15</sup> 87%; <sup>16</sup> \$248.5 million; <sup>17</sup> 398,700; <sup>18</sup> such as the American National Standards Institute (ANSI)'s encryption standards and the Payment Card Industry Data Security Standard (PCI DSS)

## **Appendix C Manipulation of Causal Focus and Specificity in Experiment 2**

Example 1: *Causes/More Specific Condition*

### **ITEM 1.A. Risk Factors**

*Cybersecurity risks could arise from web-based operations*

- Certain aspects of our operations (i.e., electronic data processing, including hotel reservation systems and membership programs such as *ABC® Rewards* and *ABC® Family Club*)<sup>e</sup> depend on web-based programs. We generated \$248.5 million of revenues through our website ([www.ABC.com](http://www.ABC.com)) with 398,700 online bookings.
- In the *2019 ABC Consumer Survey*, more than two-thirds (73%) of the *ABC® Family Club* members would reconsider using our website ([www.ABC.com](http://www.ABC.com)) for bookings, and almost half (46%) of them would consider switching to different hotels or resorts if we failed to keep their data safe.

Example 2: *Consequences/More Specific Condition*

### **ITEM 1.A. Risk Factors**

*Cybersecurity risks could result in financial losses*

[The above paragraphs are followed by the title]

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<sup>e</sup> [Words in square brackets] are present in the *More Specific* condition only.

## References

- Ahn WK (1998) Why are different features central for natural kinds and artifacts? The role of causal status in determining feature centrality. *Cognition* 69(2): 135-178.
- Ahn WK, Kim NS, Lassaline ME, Dennis MJ (2000) Causal status as a determinant of feature centrality. *Cogn. Psychol.* 41: 1-55.
- Beatty A, Cheng L, Zhang H (2019) Are risk factor disclosures still relevant? Evidence from market reactions to risk factor disclosures before and after the financial crisis. *Contemp. Account. Res.* 36(2): 805-838.
- Camerer C, Weber M (1992) Recent developments in modeling preferences: Uncertainty and ambiguity. *J. Risk Uncertain.* 5(4): 325-370.
- Campbell JL, Chen H, Dhaliwal DS, Lu H, Steele LB (2014) The information content of mandatory risk factor disclosures in corporate filings. *Rev. Account. Stud.* 19(1): 396-455.
- Davis-Friday PY, Liu C, Mittelstaedt HF (2004) Recognition and disclosure reliability: Evidence from SFAS No. 106. *Contemp. Account. Res.* 21(2): 399-429.
- Dyer T, Lang M, Stice-Lawrence L (2017) The evolution of 10-K textual disclosures: Evidence from latent dirichlet allocation. *J. Account. Res.* 64(2-3): 221-245.
- Einhorn HJ, Hogarth RM (1986) Judging probable cause. *Psychol. Bull.* 99(1): 3-19.
- Elliott WB, Hodge FD, Kennedy JJ, Pronk M (2007) Are M.B.A students a good proxy for nonprofessional investors? *Account. Rev.* 82(1): 139-168.
- Ellsberg D (1961) Risk, ambiguity, and the savage axioms. *Q. J. Econ.* 75(4): 643-669.
- Elshandidy T, Shrives PJ, Bamber M, Abraham S (2018) Risk reporting: A review of the literature and implications for future research. *J. Account. Lit.* 40: 54-82.
- Farrell AM, Grenier JH, Leiby J (2017) Scoundrels or stars? Theory and evidence on the quality of workers in online labor markets. *Account. Rev.* 92(1): 93-114.
- Filzen JJ (2015) The information content of risk factor disclosures in quarterly report. *Account. Horiz.* 29(4): 887-916.
- Fiske ST, Taylor SE (1991) *Social Cognition*, 2nd ed. (McGraw Hill, New York).
- Fox CR, Ülkümen G (2011) Distinguishing two dimensions of uncertainty. In: Brun W, Karen G, Kirkebøen G, Montgomery H, eds. *Perspective on Thinking, Judging, and Decision Making*, (Universitetsforlaget, Oslo), 21-35.
- Fox CR, Goedde-Menke M, Tannenbaum D (2021) Ambiguity aversion is aversion to epistemic uncertainty. Working paper, UCLA Anderson School of Management, Los Angeles.
- Frederickson JR, Hodge FD, Pratt JH (2006) The evolution of stock option accounting: Disclosure, voluntary recognition, mandated recognition, and managerial disavowals. *Account. Rev.* 81(5): 1073-1093.
- Friedlander J (2004) Abstract, Concrete, General, and Specific Terms. Retrieved February 7, 2023, [https://www.ftf.lth.se/fileadmin/ftf/Course\\_pages/Faff15/Filer/Friedlander\\_Abstract\\_Concrete\\_General\\_and\\_Specific\\_Terms.pdf](https://www.ftf.lth.se/fileadmin/ftf/Course_pages/Faff15/Filer/Friedlander_Abstract_Concrete_General_and_Specific_Terms.pdf)

- Goodman JK, Paolacci G (2017) Crowdsourcing consumer research. *J. Consum. Res.* 44(1): 196-210.
- Greville WJ, Buehner MJ (2007) The influence of temporal distributions on causal induction from tabular data. *Mem. Cogn.* 35(3): 444-453.
- Hacking I (1975) *The Emergency of Probability: A Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference*, 1st ed. (Cambridge University Press, New York).
- Hayes AF (2022) *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 3rd ed. (The Guilford Press, New York).
- Heinle M, Smith K (2017) A theory of risk disclosure. *Rev. Account. Stud.* 22(4): 1459-1491.
- Heinle M, Smith K, Verrecchia R (2018) Risk-factor disclosure and asset prices. *Account. Rev.* 93(2): 191-208.
- Hirst DE, Hopkins PE (1998) Comprehensive income reporting and analysts' valuation judgments. *J. Account. Res.* 36(3): 47-75.
- Hodder L, Hopkins PE, Wood DA (2008) The effects of financial statement and information complexity on analysts' cash flow forecasts. *Account. Rev.* 83(4): 915-956.
- Houghton Mifflin (2011) *American Heritage Dictionary of the English Language*, 5th ed. (Houghton Mifflin Harcourt, Boston)
- Hope OK, Hu D, Lu H (2016) The benefits of specific risk-factor disclosures. *Rev. Account. Stud.* 21(4): 1005-1045.
- International Organization for Standardization (ISO) (2018) ISO 31000:2018, Risk Management – Guidelines. ISO, Geneva.
- IRRC Institute (2016) The Corporate Risk Factor Disclosure Landscape. IRRC Institute, New York.
- Johnson S (2010) SEC Pushes Companies for More Risk Information. *CFO* (August 10), <https://www.cfo.com/risk-compliance/2010/08/sec-pushes-companies-for-more-risk-information/>.
- Konce L, Leitter Z, White BJ (2019) Linked balance sheet presentation. *J. Account. Econ.* 68(1): 1-16.
- Konce L, Seybert N, Smith J (2011) Causal reasoning in financial reporting and voluntary disclosures. *Account. Organ. Soc.* 36(4-5): 209-225.
- Kravet TD, Muslu V (2013) Textual risk disclosures and investors' risk perceptions. *Rev. Account. Stud.* 18(4): 1088-1122.
- Krische S (2019) Investment experience, financial literacy, and investment-related judgments. *Contemp. Account. Res.* 26(3): 1634-1668.
- Lyle MR, Riedl EJ, Siano F (2023) Changes in risk factor disclosures and the variance risk premium. *Account. Rev.*, forthcoming.
- Maines LA, McDaniel LS (2000) Effects of comprehensive-income characteristics on nonprofessional investors' judgments: The role of financial-statement presentation format. *Account. Rev.* 75 (2): 179-207.

- Mercer M (2005) The fleeting effects of disclosure forthcomingness on management's reporting credibility. *Account. Rev.* 80(2): 723-744.
- Noordman LG, Vonk W (1998) Memory-based processing in understanding causal information. *Discourse Process.* 26(2-3): 191-212.
- Paolacci G, Chandler J, Ipeirotis PG (2010) Running experiments on amazon mechanical turk. *Judgm. Decis. Mak.* 5(5): 411-419.
- Patel B (2018) Risks of Misunderstanding Cyber Security. *Finextra Research* (January 19), <https://www.finextra.com/blogposting/14946/risk-of-misunderstanding-cyber-security>
- Plous S (1993) *The Psychology of Judgment and Decision Making*, 1st ed. (McGraw Hill, New York).
- Power B (2014) Writing good risk statements. *ISACA J.* 3: 42-44.
- Preacher KJ, Hayes AF (2008) Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav. Res. Methods.* 40(3): 879-891.
- Proctor C, Ahn WK (2007) The effects of causal likelihood on judgments of the likelihood of unknown features. *Psychon. Bull. Rev.* 14(4): 635-639.
- Rennekamp K (2012) Processing fluency and investors' reactions to disclosure readability. *J. Account. Res.* 50(5): 1319-1354.
- Robbins RB, Rothenberg PL (2006) Writing risk factor disclosure in exchange act report. *Insights. Corp. Sec. Law. Adv.* 19(5): 9-16.
- Robertson I, Warr A (2016) Why We Need a New Approach to Cyber-security and Risk Assessment. Accessed April 27, 2016, <https://warwick.ac.uk/research/priorities/cyber/blogs/?newsItem=094d4345545364160154580bc4622c40>.
- Roese NJ, Vohs KD (2012) Hindsight bias. *Perspect. Psychol. Sci.* 7(5): 411-426.
- Schrand LM, Elliott JM (1998) Risk and financial reporting: A summary of the discussion at the 1997 AAA/FASB Conference. *Account. Horiz.* 12(3): 271-282.
- Schwartz MJ (2017) SEC Chairman seeks more cyber risk disclosure. Available at <https://www.bankinfosecurity.com/sec-chairman-seeks-more-cyber-risk-disclosure-a-10261>.
- Securities and Exchange Commission (SEC) (2004) Securities Offering Reform. Release No. 33-8501, 34-50624, SEC, Washington, DC.
- Securities and Exchange Commission (SEC) (2005) Securities Offering Reform. Release No. 33-8591, 34-52056, SEC, Washington, DC.
- Securities and Exchange Commission (SEC) (2011) CF Disclosure Guidance Topics: Topic No. 2. Cybersecurity, SEC, Washington, DC.
- Securities and Exchange Commission (SEC) (2016) SEC Concept Releases: Business and Financial Disclosure Required by Regulation S-K. Release No. 33-10064, 34-77599, SEC, Washington, DC.
- Securities and Exchange Commission (SEC) (2018) Commission Statement and Guidance on Public Company Cybersecurity Disclosures. Release No. 33-10409, 34-82746, SEC, Washington, DC.

Securities and Exchange Commission (SEC) (2020) Modernization of Regulation S-K Items 101, 103, and 105. Release No. 33-10825, 34-89670, SEC, Washington, DC.

SecurityScorecard (2016) 2016 Financial Industry Cybersecurity Report. SecurityScorecard, New York.

Sweller J (2011) Cognitive load theory. In Mestre JP, Ross BH, eds. Psychology of Learning and Motivation, (Academic Press, Cambridge, MA), 37-76.

Tannenbaum D, Fox CR, Ülkümen G (2017) Judgment extremity and accuracy under epistemic vs. aleatory uncertainty. *Manag. Sci.* 63(2): 497-518.

Trabasso T, Secco T, Van den Broek PW (1984) Causal cohesion and story coherence. In Mandl H, Stein NL, Trabasso T, eds. Learning and the Comprehension of Text, (Lawrence Erlbaum Associates, Mahwah, NJ), 83-111.

Tversky A, Kahneman D (1980) Causal schemas in judgments under uncertainty. In: Fishbein M, eds. *Progress in Social Psychology*, (Erlbaum, Hillsdale), 49-72.

Tversky A, Kahneman D (1992) Advances in prospect theory: Cumulative representation of uncertainty. *J. Risk Uncertain.* 5: 297-323.

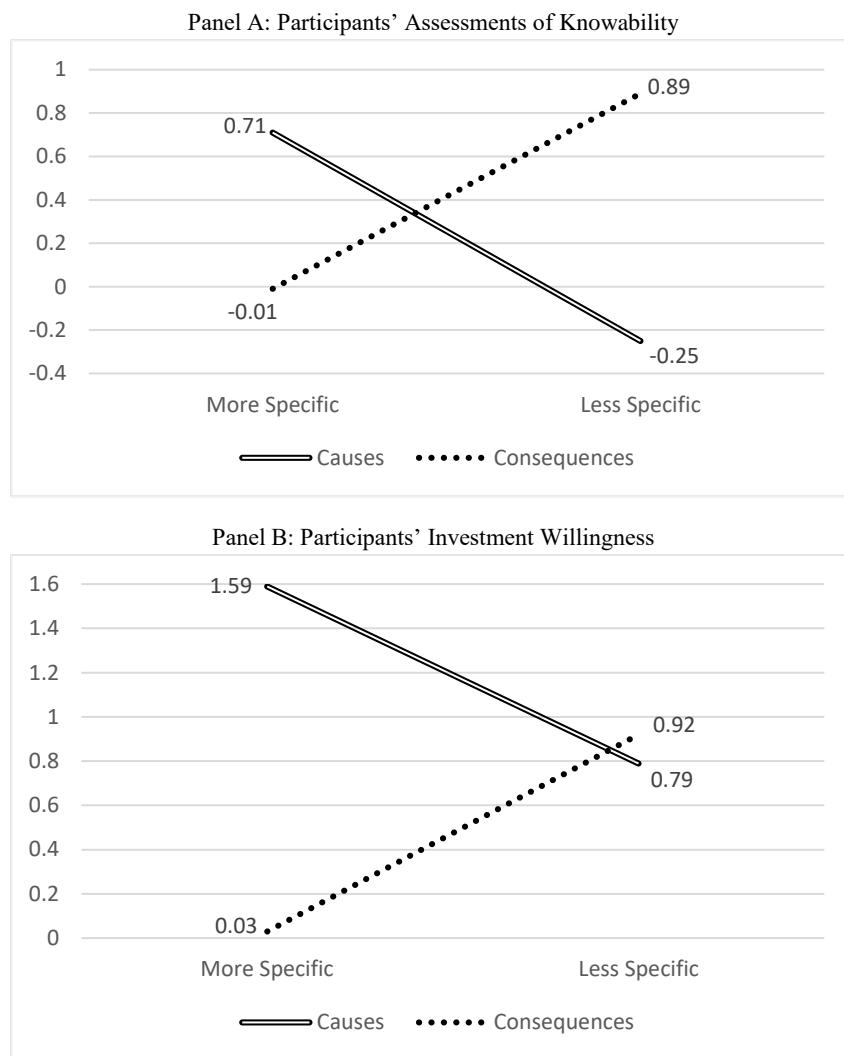
Ülkümen G, Fox CR, Malle BF (2016) Two dimensions of subjective uncertainty: Clues from natural language. *J. Exp. Psychol. Gen.* 145(10): 1280-1297.

Van den Broek P (1990) Causal inferences and the comprehension of narrative texts. In Graesser AC, Bower GH, eds. Psychology of Learning and Motivation, (Academic Press, Cambridge, MA), 175-196.

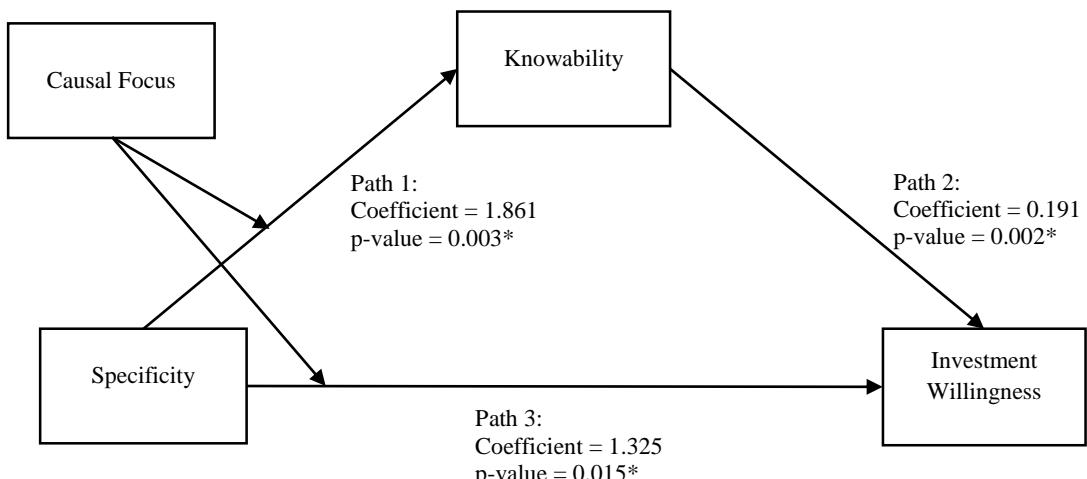
Vives ML, FeldmanHall O (2018) Tolerance to ambiguous uncertainty predicts prosocial behavior. *Nat. Commun.* 9(1): 1-9.

Walters DJ, Ülkümen G, Tannenbaum D, Erner C, Fox CR (2023) Investor behavior under epistemic vs. aleatory uncertainty. *Manag. Sci.* 69(5): 2547-3155.

**Figure 1 Graphical Representation of Participants' Judgments**



**Figure 2 The Moderated-Mediation model**



*Notes.* The interaction effect of causal focus and specificity on investment willingness through knowability: Index = 0.356, SE = 0.211, CI [0.044, 0.846]. \* denotes one-tailed equivalent p-values given the directional predictions.

**Table 1 Participants' Assessments of Knowability across Treatment Conditions**

Panel A: Descriptive Statistics – Mean (Standard Deviation) [Sample Size]

Causal Focus	Specificity			
	<i>More</i>	<i>Less</i>	Overall	<i>Less-plus-Footnotes</i>
<u>Causes</u>	0.71 (2.54) [50]	-0.25 (2.26) [49]	0.24 (2.45) [99]	-0.19 (2.43) [49]
	-0.01 (2.18) [49]	0.89 (2.35) [48]	0.44 (2.30) [97]	0.40 (2.19) [50]
	0.36 (2.39) [99]	0.31 (2.37) [97]	0.34 (2.37) [196]	
Overall				

Panel B: Two-Way ANOVA of Between-Subjects Effects – *More* versus *Less Specific*

Source	Sum of Squares	df	Mean Square	F	p-value
Causal Focus	2.17	1	2.17	0.40	0.530
Specificity	0.06	1	0.06	0.01	0.918
Causal Focus × Specificity	42.40	1	42.40	7.74	0.003*
Error	1052.08	192	5.48		

Panel C: Simple Effects – *More* versus *Less Specific*

Source	Sum of Squares	df	Mean Square	F	p-value
Effect of Specificity when the focus is on Causes	23.05	1	23.05	3.97	0.025*
Effect of Specificity when the focus is on Consequences	19.45	1	19.45	3.78	0.027*
Effect of Causal Focus when the disclosure is More specific	12.83	1	12.83	2.28	0.134
Effect of Causal Focus when the disclosure is Less specific	31.54	1	31.54	5.93	0.017

Panel D: Two-Way ANOVA of Between-Subjects Effects – *More Specific* versus *Less-plus-Footnotes*

Source	Sum of Squares	df	Mean Square	F	p-value
Causal Focus	0.21	1	0.21	0.04	0.846
Specificity	3.06	1	3.06	0.56	0.456
Causal Focus × Specificity	21.25	1	21.25	3.87	0.025*
Error	1064.11	194	5.49		

Panel E: Simple Effects – *More Specific* versus *Less-plus-Footnotes*

Source	Sum of Squares	df	Mean Square	F	p-value
Effect of Specificity when the focus is on Causes	20.22	1	20.22	3.26	0.037*
Effect of Specificity when the focus is on Consequences	4.10	1	4.10	0.86	0.178*
Effect of Causal Focus when the disclosure is More specific	12.83	1	12.83	2.28	0.134
Effect of Causal Focus when the disclosure is Less specific	8.63	1	8.63	1.62	0.207

Notes. Panel A reports the descriptive statistics of participants' perceptions of knowable uncertainty inherent in a risk event (hereafter, knowability). Panel B presents results of an ANOVA with causal focus and specificity as the independent variables, and knowability as the dependent variable in the sub-sample of the *Causes/More Specific*, *Causes/Less Specific*, *Consequences/More Specific* and *Consequences /Less Specific* conditions. Panel C shows results of simple effects tests. Panel D presents results of an ANOVA with causal focus and specificity as the independent variables, and knowability as the dependent variable in the sub-sample of the *Causes/More Specific*, *Causes/Less-plus-Footnotes*, *Consequences/More Specific* and *Consequences / Less-plus-Footnotes* conditions. Panel E shows results of simple effects tests. \* denotes one-tailed equivalent p-values given the directional predictions. All other p-values are two-tailed.

**Table 2 Participants' Investment Willingness across Treatment Conditions**

Panel A: Descriptive Statistics – Mean (Standard Deviation) [Sample Size]

Causal Focus	Specificity			
	<u>More</u>	<u>Less</u>	Overall	<u>Less-plus Footnotes</u>
<u>Causes</u>	1.59	0.79	1.19	1.04
	(1.99)	(2.31)	(2.18)	(1.75)
	[50]	[49]	[99]	[49]
<u>Consequences</u>	0.03	0.92	0.47	0.81
	(2.09)	(2.07)	(2.11)	(1.93)
	[49]	[48]	[97]	[50]
Overall	0.82	0.85	0.84	
	(2.17)	(2.18)	(2.17)	
	[99]	[97]	[196]	

Panel B: Two-Way ANOVA of Between-Subjects Effects – *More* versus *Less Specific*

Source	Sum of Squares	df	Mean Square	F	p-value
Causal Focus	24.87	1	24.87	5.55	0.020
Specificity	0.09	1	0.09	0.02	0.889
Causal Focus × Specificity	34.58	1	34.58	7.71	0.003*
Error	861.11	192	4.48		

Panel C: Simple Effects – *More* versus *Less Specific*

Source	Sum of Squares	df	Mean Square	F	p-value
Effect of Specificity when the focus is on Causes	15.74	1	15.74	3.39	0.034*
Effect of Specificity when the focus is on Consequences	18.89	1	18.89	4.36	0.020*
Effect of Causal Focus when the disclosure is More specific	59.66	1	59.66	14.35	<0.001
Effect of Causal Focus when the disclosure is Less specific	0.39	1	0.39	0.08	0.775

Panel D: Two-Way ANOVA of Between-Subjects Effects – *More Specific* versus *Less-plus- Footnotes*

Source	Sum of Squares	df	Mean Square	F	p-value
Causal Focus	39.21	1	39.21	10.36	0.002
Specificity	0.67	1	0.67	0.18	0.673
Causal Focus × Specificity	21.73	1	21.73	5.74	0.009*
Error	734.36	194	3.79		

Panel E: Simple Effects – *More Specific* versus *Less-plus-Footnotes*

Source	Sum of Squares	df	Mean Square	F	p-value
Effect of Specificity when the focus is on Causes	7.37	1	7.37	2.10	0.076*
Effect of Specificity when the focus is on Consequences	15.03	1	15.03	3.71	0.029*
Effect of Causal Focus when the disclosure is More specific	59.66	1	59.66	14.35	<0.001
Effect of Causal Focus when the disclosure is Less specific	1.28	1	1.28	0.38	0.542

*Notes.* Panel A reports the descriptive statistics of participants' investment willingness. Panel B presents results of an ANOVA with causal focus and specificity as the independent variables, and investment willingness as the dependent variable in the sub-sample of the *Causes/More Specific*, *Causes/Less Specific*, *Consequences/More Specific* and *Consequences /Less Specific* conditions. Panel C shows results of simple effects tests. Panel D presents results of an ANOVA with causal focus and specificity as the independent variables, and investment willingness as the dependent variable in the sub-sample of the *Causes/More Specific*, *Causes/Less-plus-Footnotes*, *Consequences/More Specific* and *Consequences / Less-plus-Footnotes* conditions. Panel E shows results of simple effects tests. \* denotes one-tailed equivalent p-values given the directional predictions. All other p-values are two-tailed.