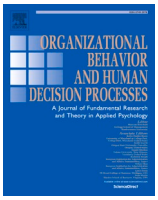
Organizational Behavior and Human Decision Processes 171 (2022) 104150

Contents lists available at ScienceDirect

Organizational Behavior and Human Decision Processes

journal homepage: www.elsevier.com/locate/obhdp



Tangibility bias in investment risk judgments

Özgün Atasoy [a,*], Remi Trudel [b], Theodore J. Noseworthy [c], Patrick J. Kaufmann [b]

[a] Department of Marketing, Faculty of Business and Economics, University of Basel, Switzerland
[b] Department of Marketing, Questrom School of Business, Boston University, United States
[c] Department of Marketing, Schulich School of Business, York University, Canada

ARTICLE INFO

Keywords:
Risk perception
Tangibility
Heuristics
Biases
Permanence
Financial decisions

ABSTRACT

The most popular ways of holding wealth include tangible investments such as real estate and gold, and intangible investments such as stocks and mutual funds. Five experiments revealed a tangibility bias whereby the tangibility of an investment or tangibility cues linked to an investment provides a false sense of financial safety. When focusing on avoiding risk, investors indicated a higher willingness to sell the stocks of companies that invest in intangible versus tangible assets (Study 1). The greater perceived permanence of tangible versus intangible assets appeared to underlie the difference in market risk assessments. Respondents judged the same asset as riskier when it was framed as intangible (Study 2), and differences in perceived permanence mediated this effect. Increasing perceived permanence independently of tangibility led to lower market risk assessments of commodity futures (Study 3). Tangibility prompts that leave asset tangibility unchanged were sufficient to lower risk judgments (studies 4 and 5). The differences in market risk assessments were not due to a general preference for tangible assets (Study 4) or differences in familiarity, complexity, or understanding of the asset types (studies 2 and 5).

As the story goes, billionaire investor Warren Buffett's father bought tangible assets like gold coins, silver flatware, and a farm during the uncertain times following World War II because he perceived them to be less risky (Lowenstein, 2008). This purportedly had a deep influence on Buffett and has contributed to his investment philosophy, which prioritizes investing in businesses with tangible assets such as buildings, machinery, and land (Sao, 2015). Many investors prefer tangible investments. Most Americans consider real estate or gold as the best long-term investment (Gallup, 2020). This belief that long-term security tends to afford a hedge during times of economic uncertainty was evident when the demand for gold increased following the surprise outcome of the UK's vote to leave the EU and when American investors flocked to the Canadian real estate market following the 2016 US presidential election (Kollewe, 2017; Associated Press, 2017). Yet, as a strategy to hedge against uncertainty, not all tangible investments are created equal, and critics are quick to point out that tangible investments in industries such as real estate are some of the most volatile (Quigley, 2006; Case & Shiller, 1989) and complex investments (Shiller, 2008; Smith, Searle, & Cook, 2009).

In this research, we examine the role that tangibility plays in consumers' financial decisions and in particular their perceptions of financial risk. Investigating consumers' perceptions of financial risk is important, given that risk perceptions have consistently predicted the characterization, evaluation, and choice of financial investments (Holtgrave & Weber, 1993). Across five studies we document that people use tangibility as a heuristic for evaluating financial risk and that tangibility signals low risk because it is associated with a sense of permanence. While contributing theoretically by identifying a heuristic process in financial-risk judgments, we also highlight a breadth of possible substantive implications by demonstrating that this tangibility heuristic manifests across a wide range of asset classes, such as stocks, precious metals, commodities, and exchange traded funds (ETF; Gastineau, 2010; Poterba & Shoven, 2002).

1. Asset tangibility as a heuristic for assessing risk

We define tangible assets as physical items of wealth, whereas intangible assets have no physical representation (Veblen, 1908). Real estate and precious metals are examples of tangible assets, while stocks, patents, and copyrights are examples of intangible assets (Veblen, 1908; Hill, 1999). A common stock, for instance, represents an ownership stake in a company, not a physical object (a physical stock certificate, if

* Corresponding author at: University of Basel, Faculty of Business and Economics, Peter Merian-Weg 6, CH-4052 Basel, Switzerland.
E-mail address: ozgun.atasoy@unibas.ch (Ö. Atasoy).

https://doi.org/10.1016/j.obhdp.2022.104150
Received 3 June 2019; Received in revised form 7 March 2022; Accepted 22 March 2022
Available online 28 April 2022

used at all, is a mere receipt). In this research, we focus on people's risk evaluations associated with owning tangible versus intangible assets and show that people find tangible assets to be less risky than intangible ones. We also show that tangibility cues are sufficient to influence an asset's perceived market risk, even though the nature of the asset may stay the same.

The degree to which people perceive a given risk depends on two main factors: feelings of dread and assessments of the extent to which the hazards are unknown (Slovic, 1987). Previous research has demonstrated that risk judgments are highly dependent on feelings (Johnson & Tversky, 1983; Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004), which are often generated from cognition (the appraisal of the situation or the object; Ortony, Clore, & Collins, 1988). Moreover, certain objects may trigger strong or weak feelings of risk based on visual affordance and cognitive schema (e.g., a snake or a spider versus a flower; Öhman, 1986). More closely related to the present paper, research specific to financial investments has shown that investors may be influenced by irrelevant attributes such as how complex the name of a stock is (Alter & Oppenheimer, 2006) or how geographically close the issuer of a stock is to the investor (Coval & Moskowitz, 1999). We build on these lines of research by investigating whether tangibility is an asset attribute that influences feelings of risk.

The relevant risk in purchasing assets is the possibility of financial loss, which usually stems from downward movements in the market value of the asset. However, given that assessing risk is a rather demanding and complex process, most people rely on heuristics—effort-reduction strategies—to simplify the process (Kahneman & Riepe, 1998; Benartzi & Thaler, 2007; Loewenstein et al., 2001; Slovic et al., 2004). We propose that one such heuristic is based on the perceived tangibility of the asset. Thus, we define the *tangibility heuristic* as a simplifying process used when assessing the financial risk of an asset based on whether the asset has a tangible manifestation in the natural world.

2. Tangibility and permanence

We propose that the negative relationship between tangibility and perceived risk stems from associations between the concepts of tangibility and a general sense of permanence. Tangibility refers to the quality of having physical presence. The tangible versus intangible distinction applies to assets (Veblen, 1908; Hill, 1999) as well as to consumer goods (Belk, 2013; Morewedge et al., 2021; Bardhi & Eckhardt, 2017). Physical goods (e.g., cars, clothing) are tangible, and digital or experiential goods (e.g., software, vacations) are intangible (Belk, 2013; Van Boven & Gilovich, 2003).

Permanence, on the other hand, refers to the quality of lasting for a long time. People attribute varying degrees of permanence to consumption objects or consumption modes. For instance, material purchases such as jewelry or watches are generally considered more permanent than experiential purchases such as tickets to concerts or sports events (Tully, Hershfield, & Meyvis, 2015; Goodman, Malkoc, & Stephenson, 2016). Ownership is considered a more permanent consumption mode than renting or access (Watkins, Denegri-Knott, & Molesworth, 2016; Bardhi & Eckhardt, 2012; Morewedge et al., 2021).

Tangibility and permanence are distinct concepts. The distinction is evidenced by the existence of tangible goods or assets with varying degrees of permanence as well as intangible goods or assets with varying degrees of permanence. For instance, among tangible goods, a printed book is usually longer lasting (i.e., more permanent) than a printed newspaper. Commodities are tangible assets with varying degrees of perishability, and thus permanence. For instance, wheat and iron ore are tangible assets, with wheat being more perishable (i.e., less permanent) than iron ore. Intangible goods and assets can also vary in permanence. An expiring digital image (e.g., a social media post that is set to disappear after a predetermined amount of time or number of viewings) is less permanent than a digital image with no expiration. Among intangible assets, a stock option that expires in a week seems less permanent than a regular equity with no expiration.

Even though tangibility and permanence are distinct concepts that can vary independently, we argue that tangibility influences perceptions of permanence. Recent findings from the literature on the materiality of consumer goods suggest that the tangible vs. intangible asset distinction has close conceptual similarities with the distinction between tangible and intangible goods (or physical vs digital goods; McCourt, 2005; Petrelli & Whittaker, 2010; Belk 2013; Atasoy & Morewedge, 2018). Intangible goods such as e-books and intangible assets such as financial securities are similar in that both are virtual objects that have economic value. Intangible goods and assets can be bought, sold, and possessed even though they are not material objects. People's ownership of financial securities typically consists of electronic records rather than the possession of anything physical. It is often difficult to even imagine intangible assets (e.g., company shares) as physical objects. Although research on the perception of digital goods is nascent, it is illuminating regarding what kind of psychological processes might influence the perception of intangible assets.

Scholars have compared people's feelings toward their digital possessions (e.g., digital photographs, music, video collections) to their feelings toward their physical or material possessions. The presence or absence of materiality seems to make a specific difference in people's feelings. That is, people often describe digital possessions as ephemeral, tenuous (Belk, 2013; Petrelli & Whittaker, 2010), transient, likely to disappear (McCourt, 2005; Petrelli & Whittaker, 2010), unstable, things that will not last, and fragile (Petrelli & Whittaker, 2010). In contrast, physical possessions are often described as things that are destined to last (Petrelli & Whittaker, 2010). People associate persistence and a sense of security with physical goods (Petrelli & Whittaker, 2010). These impressions are generated even though digital goods are less subject to degradation and loss (Atasoy & Morewedge, 2018). While some people genuinely fear technological change rendering current digital possessions inaccessible in the future (Belk, 2013), there are indications that perceptions of impermanence or transience might be based on feelings more than on judgments. Digital possessions are "largely invisible and immaterial until we choose to call them forth" (Belk, 2013, p. 478), and they seem to "disappear into a black hole" (Petrelli & Whittaker 2010, p. 162)—impressions that might contribute to feelings of transience and ephemerality. Recent experimental evidence confirmed that people find the digital format of e-books and downloaded movies less permanent, stable, durable, and lasting than the physical format of print books and DVDs (Atasoy & Morewedge, 2018).

Based on the findings distinguishing the sense of permanence between tangible and intangible goods (e.g., Petrelli & Whittaker, 2010), we propose that because of their immateriality, intangible assets generate impressions of impermanence, which contribute to higher risk perception than that for tangible assets. We propose that a sense of general impermanence (i.e., impending failure to persist or endure) leads to feelings of apprehension for intangible assets. In objective terms, the physical permanence of an asset should be unrelated to fluctuations in its market value. However, we propose that thinking about the risk of investing in intangible assets evokes stronger feelings of apprehension than does thinking about the risk of investing in tangible assets. Coupled with the fact that objective financial risk judgments are complicated (Eisenberger, Lieberman, & Williams, 2003; Kahneman & Frederick, 2002; Kahneman, 2003), these perceptions may be influential in decisions regarding financial risk. In short, we hypothesize the following:

H1: People view intangible assets as more risky than tangible assets.
H2: A weaker impression of permanence underlies the assessments of higher risk for intangible than for tangible assets.

Study 1 tests H1, Studies 2 and 3 test H2. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the studies. Data and materials are posted on the

Open Science Framework (https://osf.io/9t485/).

3. Study 1: Investing in tangible versus intangible assets

The main objective of this study was to test whether people view intangible assets as more risky than tangible assets (H1). One of our aims was to test this effect using a type of financial decision that investors often make. In many instances stock market investors change their positions (i.e., buy or sell a stock) in response to new information such as quarterly earnings statements or some other news about the company or the markets (De Bondt & Thaler, 1985; Chan, 2003). This study used an experimental paradigm that mirrored such situations, with respondents reacting to the news that a publicly traded company recently invested in tangible or intangible assets. Because we also wanted to test our hypothesis on people with investment experience, we recruited participants who invest in the stock market.

3.1. Method

We preregistered the sample size, prediction, data-exclusion criteria, and analysis strategy (https://aspredicted.org/9na25.pdf). We opened the study on CloudResearch to 500 US residents who personally invest in the stock market.[1]

Participants were randomly assigned to one of two conditions (company investment focused on tangible vs. intangible assets) and instructed to *Imagine that as an investment you bought a company's shares in the stock market. Today you read the following in a news report about the company*. Participants in the tangible investment condition then read: *During the last quarter, the company invested in tangible assets. The company now owns more buildings and land than before*. Participants in the intangible investment condition read: *During the last quarter, the company invested in intangible assets. The company now owns more patents and copyrights than before*. All participants then read: *Imagine that your priority is to avoid risk,* and answered the question *How likely would you be to sell your shares considering this news?* (anchored: 1 = *very unlikely*; 6 = *very likely*). An open-ended question on the reasons for their response, an attention check, a guess about the purpose of the study, and questions on demographics followed.

3.2. Results and discussion

Among the 500 participants who completed the study ($M_{age} = 39.83$, $SD = 13.17$; 36% female), seven were excluded for failing the attention check (including these participants does not alter the results). Consistent with our prediction, participants indicated a higher likelihood of selling their shares of a company that invested in intangible assets ($M = 2.66$, $SD = 1.16$) than selling their shares of a company that invested in tangible assets ($M = 2.40$, $SD = 1.13$; $t(491) = 2.54$, $p = .01$, $d = 0.23$, 95% CI_{diff} [0.06, 0.46]). Given that respondents made these judgments when their priority was to avoid risk, the results are consistent with assessments of higher risk for intangible than for tangible assets.

Despite preliminary support for our hypotheses, Study 1 is subject to an alternative explanation: risk perceptions may have been influenced by aspects other than tangibility, particularly given that the tangible and intangible assets were from different asset classes (i.e., buildings and land versus patents and copyright). Our next study was designed to address this issue, and notably, to test whether our proposed account of permanence explains any such influence on risk perceptions. Specifically, Study 2 addresses the issue of distinct asset classes by using a single underlying asset and framing it as either tangible or intangible. In addition to variations in asset class, Study 1 also might have suffered differences in perceived investment amount. In other words, the company that buys tangible assets might be perceived as having invested more or less than the company that buys intangible assets. Study 2 addresses this issue by explicitly setting a constant investment amount across experimental conditions.

4. Study 2: Tangible gold bars versus gold securities

In this experiment, we contrast people's risk assessments of a common tangible asset with their risk assessments of a securitized, intangible version of the same asset class. This paradigm allows us to attribute any difference in financial risk assessments to asset framing by keeping actual levels of risk objectively similar across tangible and intangible conditions. In addition to providing support for the tangibility heuristic in risk judgments, this experiment sets out to provide process evidence for the effect. We argue that intangible items are perceived as less permanent than tangible items and that this distinction will correspond with perceptions of market risk (H2). We directly test our process measure through direct elicitation of permanence and predict that measured permanence will mediate the effect of tangibility on risk perception.

4.1. Method

We opened the study on Amazon Mechanical Turk to 200 residents of the United States. Participants were randomly assigned to either a tangible investment condition or an intangible investment condition. The study began with explicit instructions that participants would be required to estimate how risky a certain investment is. Participants were further instructed to imagine that there is no management risk and that the only source of financial risk is the possibility that the market value of the asset might fall. In the tangible investment condition, participants then read the following: *Buying gold is a common investment option. Many people buy gold bars or coins and store them as an investment. Consider buying $100,000 worth of gold bars.* In the intangible investment condition, participants instead read: *Buying financial securities is a common investment option. Company shares and government bonds are examples of financial securities. Consider a security that tracks gold prices. That is, at any time the value of the security is equal to the market price of gold at that time. Consider buying $100,000 worth of this security*. (The latter is a commercially available security usually referred to as a Gold Exchange Traded Fund. In the subsequent discussion, we refer to this asset as Gold ETF for brevity even though the term did not appear in the study instructions.)

The questionnaire commenced with the main dependent measure of risk perception: *How financially risky is this investment?* (anchored: 1 = *very safe*; 7 = *very risky*). Next, participants were asked to state the extent to which they agreed with the following statements: *This asset is* [… *tangible, solid, real, concrete, physical*] and [… *permanent, stable, lasting, durable, imperishable, indestructible*] (anchored: 1 = *completely disagree*; 7 = *completely agree*). The first five items served as a manipulation check for inferences of tangibility, whereas the latter six items constituted the measure of our proposed mediator (Atasoy & Morewedge, 2018; Pena-Marin & Bhargave, 2016). To statistically control for the possible effect of differences in familiarity, complexity, and understanding of the asset on risk assessments (Song & Schwarz, 2009; Kent & Allen, 1994; Mukherjee & Hoyer, 2001; Long, Fernbach, & De Langhe, 2018), participants responded to a three-item measure of familiarity: *How* [*familiar, well-informed, knowledgeable*] *are you with this asset?* (anchored: 1 = *not at all*; 7 = *very*), a single-item measure of complexity (anchored 1 = *highly complex*; 7 = *not at all complex*), and a single-item measure of understanding of the asset class (anchored 1 = *very low*; 7 = *very high*). The questionnaire concluded with basic demographic questions.

[1] The CloudResearch platform profiles Amazon Mechanical Turk workers on demographic characteristics including financial behavior. We requested CloudResearch to recruit people who answered *Yes* to the question *Do you personally invest in the stock market?*

4.2. Results and discussion

Two hundred participants (M_{age} = 33.54, SD = 10.99; 45% female) completed the study. Tangibility and permanence refer to potentially related but different concepts—that is, physical existence versus being lasting or unchanging through time—which are positively correlated in our data (Table 1). We first conducted exploratory and confirmatory factor analyses to test whether tangibility and permanence are indeed two separate and distinct constructs. The results confirmed this (see Web Appendix). Therefore, we proceeded with our planned mediation analyses below.

The tangibility (α = 0.94), permanence (α = 0.94), and familiarity (α = 0.91) scales were highly reliable and thus the scale items were averaged. A manipulation check confirmed that physical gold (M = 6.11, SD = 0.94) was perceived as more tangible than the Gold ETF (M = 4.74, SD = 1.52; $t(198)$ = 7.68, p < .001, d = 1.09).

Consistent with our core prediction, and despite being told that the value of the Gold ETF is equal to the market price of gold at all times, participants rated an investment in physical gold (M = 3.83, SD = 1.74) as lower in risk than a Gold ETF (M = 4.59, SD = 1.49; $t(198)$ = 3.33, p = .001, d = 0.47, 95% CI_{diff} [0.31, 1.21]).

As participants rated physical gold (M = 5.63, SD = 1.08) as more permanent than the Gold ETF (M = 4.39, SD = 1.40; $t(198)$ = 7.00, p < .001, d = 0.99, 95% CI_{diff} [0.89, 1.59]), we ran a mediation analysis to test whether perceived permanence of the asset mediated the effect of asset type on market risk assessment. As recommended by Hayes (2013; Model 4), we examined confidence intervals (CI) using 5,000 bootstrap iterations. The indirect effect of asset type on risk assessment through permanence (β = −0.76; 95% CI [−1.08, −0.49]) was significant, whereas the direct effect was not significant (β = 0.001; 95% CI [−0.44, 0.44]), indicating indirect-only mediation. The direction of the regression coefficients revealed that physical gold was perceived as more permanent, and that higher perceived permanence led to lower risk assessment (Fig. 1A).

Next, we added familiarity, complexity, and understanding of the asset as covariates in the above mediation analysis to statistically account for their effects as people rated the Gold ETF as less familiar (M_{Gold} = 4.16, SD = 1.33 vs. $M_{Security}$ = 3.46, SD = 1.38; $t(198)$ = 3.66, p < .001, d = 0.52, 95% CI_{diff} [0.32, 1.08]), more complex (higher numbers indicate less complexity; M_{Gold} = 4.71, SD = 1.31 vs. $M_{Security}$ = 4.06, SD = 1.32; $t(198)$ = 3.50, p = .001, d = 0.49, 95% CI_{diff} [0.28, 1.02]), and indicated less understanding of the Gold ETF (M_{Gold} = 3.99, SD = 1.40 vs. $M_{Security}$ = 3.50, SD = 1.26; $t(198)$ = 2.60, p = .01, d = 0.37, 95% CI_{diff} [0.12, 0.86]).

The results were similar with familiarity, complexity, and understanding included in our process model (Fig. 1B). The indirect effect of asset type on risk assessment through permanence (β = −0.48; 95% CI [−0.76, −0.28]) was significant, whereas the direct effect was not significant (β = 0.04; 95% CI [−0.40, 0.49]), indicating indirect-only mediation, whereby physical gold was perceived as more permanent, and higher perceived permanence led to lower risk assessment (Fig. 1B). Among the covariates, complexity accounted for some of the variation in perceived permanence (β = 0.34; 95% CI [0.21, 0.47]), whereas other effects were not significant. Namely, familiarity (95% CI [−0.14, 0.28]) and understanding (95% CI [−0.10, 0.32]) did not predict permanence; familiarity (95% CI [−0.36, 0.17]), complexity (95% CI [−0.30, 0.05]), and understanding (95% CI [−0.27, 0.26]) did not predict risk[2].

Table 1
Intercorrelations for the Measures in Study 2.

Measure	1	2	3	4	5	6
1. Risk	–					
2. Tangibility	−0.32	–				
3. Permanence	−0.52	0.66	–			
4. Familiarity	−0.29	0.38	0.38	–		
5. Complexity	−0.35	0.34	0.48	0.42	–	
6. Understanding	−0.25	0.23	0.34	0.83	0.35	–

Note. All correlations are significant at p < .01.

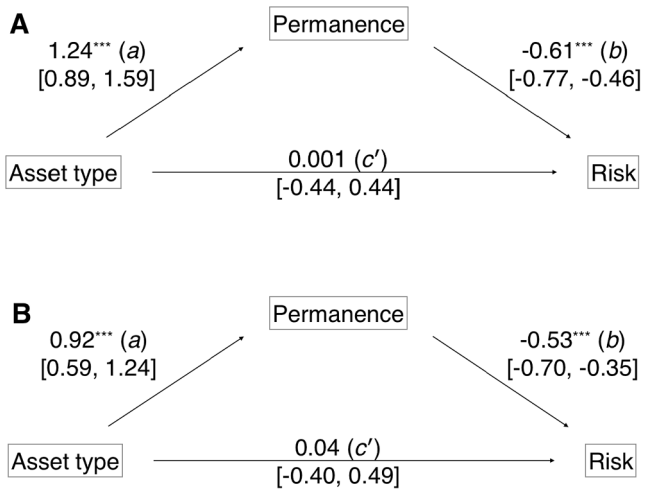


Fig. 1. Permanence mediated the effect of asset type (Gold ETF coded 0, physical gold coded 1) on risk assessment (A) in Study 2. The relationship held even after controlling for the effects of familiarity, complexity, and understanding of the asset (B). Bracketed numbers indicate 95% confidence intervals. *** p < .001.

In this study the use of a commercially available asset (i.e., a Gold ETF) created an intangibility frame for a tangible investment (i.e., physical gold). The values of the two assets were, by design, the same at any point in time, and thus the possibility of value loss was the same for both assets. Consequently, the difference in risk assessment seems to be the result of the tangibility frame and not potential differences in losses from each investment.

5. Study 3: Permanence and commodity market risk

Study 2 indicated that higher perceived tangibility leads to higher perceived permanence, which in turn leads to lower perceived financial risk. The objective of Study 3 was to further test our proposed permanence mechanism by manipulating our process variable while keeping perceptions of tangibility constant. In Study 2, permanence moved with tangibility—a design subject to unmeasured confounds. Study 3 isolates the role of permanence on risk perception. In other words, this study seeks further evidence (i.e., in addition to the mediation analysis in Study 2) that perceived permanence is causally effective in reducing perceived market risk. Study 3 also uses real-world commodities and demonstrates additional practical relevance of our tangibility bias effects. Moreover, as a stronger test of our theory, using commodity futures allowed us to choose investments with actual financial risk levels that worked against our proposed hypothesis.

For this study, we used tangible asset classes that varied in subjective assessments of permanence. Basic goods such as agricultural products and industrial metals are traded in the commodity futures markets (Hull, 2009). Agricultural commodities are less risky than are metals, as agricultural commodity prices are more predictable because production is diversified throughout the world (Füss, Adams, & Kaiser, 2010). Our permanence hypothesis, however, predicts that agricultural commodities will be judged as riskier because they presumably feel less permanent than metals. Study 3 tested this prediction and provided an

[2] A model that tests familiarity, complexity, and understanding as parallel mediators instead of covariates does not alter these results (i.e., reveals a significant indirect effect only through permanence); neither does combining the highly correlated familiarity and understanding measures into a single index in a model with covariates or parallel mediators.

alternative test of the permanence account. Moreover, our theory predicts risk assessment that is opposite to the actual risk of the commodities selected. A pretest confirmed that among the commodities we used in this study (Fig. 2), the agricultural commodities are perceived as similarly tangible as metals and lumber ($t(415) = 0.54$, $p = .59$). The main study revealed, however, that the agricultural commodities are perceived as less permanent than the other commodities used ($ts > 10$, $ps < 0.001$).

5.1. Method

We opened the study on Amazon Mechanical Turk to 200 residents of the United States. The study commenced with the following instructions: *Producers of basic goods such as copper and coffee often sell their goods to be delivered in the future, say six months from now. For example, if on January 1, the June futures price of coffee is $120, coffee producers can sell coffee for June delivery at this price. This is called commodity futures trading. Buying commodity futures is risky because prices may fall. Investors who buy June coffee futures for $120 should pay this price even if the market price of coffee drops to $80 in June. In the following part of the survey, you will see a list of commodities that are traded on the futures markets. Your task is to assess how risky they are.*

Next, participants rated their risk perception and perception of permanence for each commodity, using the same items described in Study 2. Risk and permanence questions were counterbalanced, and results were similar. Commodities were shown in random order.

5.2. Results and discussion

The study was completed by 201 participants ($M_{age} = 35.47$, $SD = 9.71$; 49% female). The data were first analyzed by collapsing the ratings for the two groups of commodities (i.e., agricultural commodities as the less permanent group and metals and lumber as the more permanent group) into a composite score and conducting paired-samples *t*-test analyses on each variable as a function of commodity permanence.

The results confirmed that participants indeed perceived agricultural commodities as representing something less permanent ($M = 2.80$, $SD = 1.78$) than metals and lumber ($M = 5.09$, $SD = 0.92$; $t(200) = 20.85$, $p < .001$, $d = 1.47$, 95% CI_{diff} [2.07, 2.50]), suggesting that our choice of commodities functioned as intended. Furthermore, and in support of our core hypothesis, participants perceived buying agricultural commodities

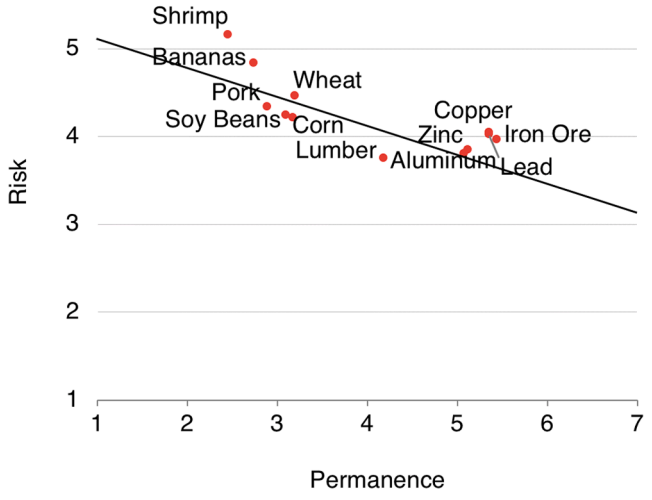


Fig. 2. Commodity futures received lower market risk ratings in Study 3 when the underlying commodity was perceived as more permanent. The dots represent the average risk and permanence ratings for each commodity. The downward-sloping line indicates the predicted risk ratings by permanence ratings from the regression analysis.

to be riskier ($M = 4.52$, $SD = 1.22$) than buying metals and lumber ($M = 3.73$, SD = 1.17; $t(200) = 6.83$, $p < .001$, $d = 0.48$, 95% CI_{diff} [0.56, 1.02]).

Next, to accommodate the variation in perceived permanence between individual respondents, we ran a regression analysis that tested the effect of perceived permanence on perceived financial risk. The permanence scale was highly reliable ($\alpha > 0.84$ for each commodity); thus the scale items (*permanent, stable, lasting, durable, imperishable, indestructible*) were averaged. A plot of average risk and permanence ratings for each commodity suggests a negative relationship between the two variables (Fig. 2).

We tested a multilevel model where the ratings of commodities are nested within individual respondents. The model allows for variation in the effect of perceived permanence on perceived risk across individual respondents. Specifically, we tested the following model.

$$Risk_{ij} = \beta_{0j} + \beta_{1j}(Permanence)_{ij} + r_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

Index i denotes commodities (level-1 variable), and j denotes individual respondents (level-2 variable). The model uses a single level-1 predictor (i.e., permanence), and no level-2 predictor, although it allows the level-1 intercept and slopes to vary across individual respondents.

Permanence significantly and negatively predicted market risk, $F(1, 259.21) = 228.86$, $p < .001$ (parameter information in Table 2). In other words, as the perceived permanence of a commodity increased, perceptions of market risk decreased.

Even though permanence is measured using the same scale, the operationalization of permanence in this study is more direct than in Study 2. Agricultural commodities (e.g., bananas) are less durable and have less longevity than metals and lumber. The perceptions of impermanence for intangible assets (e.g., financial securities) are more figurative or metaphorical. We found a negative relationship between permanence and risk in both cases.

Our results so far appear to rely more on perceptions and feelings than on beliefs and reasoning. Our remaining studies attempt to isolate the role of feelings in driving the relationship between tangibility and risk perception. We suggest that there is a highly automatic component in the relationship between tangibility and risk, which stems from low-level processes that associate intangibility with impermanence and thus risk. Accordingly, studies 4 and 5 test the following hypothesis:

H3: Automatically triggered feelings drive the effect of tangibility on risk perceptions.

We set up the following studies in such a way that the tangibility and intangibility cues provided no information about the assets. This allowed us to ascribe any difference in perceived risk to feelings because the studies contain no information on which one can build financial reasoning. We exclusively used stocks and provided tangibility and intangibility cues by manipulating the logos of the companies that issue those stocks. If tangibility intuitively generates perceptions of low risk, then we should expect incidental tangibility cues (e.g., company logos), although unrelated to financial risk, to nevertheless affect risk judgments and choice. This is in line with evidence that incidental stimuli

Table 2
Mixed model parameter estimates in Study 3. The outcome variable is perceived market risk; −2 Log Likelihood for the model is 8541.28; *** p < .001.

	Coefficient	*Standard Error*	*95% CI*
Intercept (γ_{00})	5.44***	0.10	5.25, 5.63
Permanence (γ_{10})	−0.33***	0.02	−0.38, −0.29

can activate semantically linked concepts, which in turn influence unrelated judgments (Eisenberger, Lieberman, & Williams, 2003). While our stimuli in studies 4 and 5 may seem stylized, they allowed us to isolate the effect of tangibility on risk perception without introducing confounds such as prior beliefs about the companies or other financial information.

6. Study 4: Portfolio choice under low-risk and high-return objectives

Investors prefer low risk and high expected returns (Markowitz 1952; Ganzach, 2000); however, at a given moment or under certain circumstances they may be motivated to avoid risk more strongly than to seek returns, and vice versa (Zhou & Pham, 2004). In this study, we made use of this possibility and contrasted people's choices under these two motivational states to investigate the tangibility-risk relationship. If tangibility is associated with low risk, then people's interest in tangibility should be higher when they seek low risk than when they pursue another goal (e.g., seek high returns).

Additionally, contrasting different goals allowed us to test an alternative account: that people prefer tangibility in general, and low-risk assessments are one manifestation of that preference. If that is the case, people's preference for tangibility should be insensitive to whether they pursue a risk or a return goal.

6.1. Method

We opened the study on Amazon Mechanical Turk to 120 residents of the United States. Participants were randomly assigned to one of two conditions. In both conditions, the participants' task was to build a portfolio of stocks. Participants saw a list of 28 fictitious logos from the updated list of Unicode characters released in 2014 by The Unicode Consortium—with14 logos depicting objects and 14 depicting abstract figures (Fig. 3); participants then built their portfolios by selecting four of the 28 logos, which appeared in randomized order. In one condition (the low-risk-objective condition), participants were told that they would receive a fixed amount of bonus payment if the value of their portfolio *a week from today is not lower than its value today*. This incentive scheme is consistent with a financial safety objective as it encourages minimizing risk (i.e., the possibility of loss). In the other condition (the high-return-objective condition), participants read that they would receive a bonus payment if, in a week, their portfolio performed *better than the average of the whole list of stocks.* We explained that they would still receive the bonus if they lost money but the average value of the entire list of stocks dropped even more. This is similar to how portfolio managers are generally incentivized: receiving rewards for returns that are better than the market (Basak, Pavlova, & Shapiro, 2008).

Finally, participants performed an attention check and reported demographic information. Since the stocks were fictitious, all participants received the bonus payment the following week.

6.2. Results and discussion

The study was completed by 120 participants (M_{age} = 32.92, SD = 11.12; 37% female). We predicted that stocks with tangibility cues would be more attractive to those with a safety objective (low-risk condition). Our dependent measure was the number of stocks with tangible logos in each participant's portfolio. As we anticipated, the number of stocks with tangible logos in the safety-objective condition was higher (M = 3.07, SD = 1.05) than the number of stocks with tangible logos in the performance-objective condition (M = 2.52, SD = 1.31; $t(118)$ = 2.50, p = .01, d = 0.46, 95% CI_{diff} [0.11, 0.97]). The results highlight how the effect of tangibility cues on investment choices is sensitive to investment objectives. Specifically, a financial safety objective increased the appeal of tangibility cues more strongly than did the objective of better-than-market performance.

These results are consistent with our proposition that when people seek low risk, they are drawn to alternatives that are associated with the psychological construct of tangibility. Furthermore, a separate study (Study A1 in the Appendix) asked participants to rate the same logos individually and found that they ascribe lower risk to tangible logos than to intangible logos.

7. Study 5: Tangible versus intangible company logos of traded securities

In Study 5, rather than using the Unicode list of characters, we used logos from actual companies, generalizing the results of the previous study. Furthermore, in this study we investigated a variety of inferences about logos that might potentially influence risk judgments.

We selected stocks by scraping the online data of the Frankfurt and Shanghai Stock Exchanges. The rationale for using foreign exchanges was threefold. First, it allowed us to explore the impact of logo (in) tangibility on risk perception using real-world companies while ensuring that participants were not influenced by prior knowledge of these companies. Second, using both German and Chinese companies allowed us to generalize our results to perceptions of companies originating in Western and Eastern countries. Third, using publicly traded companies allowed us to contrast real stock volatility with perceived volatility and do so across two exchanges that vary widely in terms of market volatility.

The logos associated with each stock were simply categorized as tangible if they depicted a tangible object (e.g., evergreen tree) and coded as intangible if the logo or visual depiction had no tangible representation in the real world. This was done by an outside judge, who was unaware of the research hypotheses.

7.1. Method

Participants and Design. We opened the study on CloudResearch to 125 residents of the United States. The design of the study consisted of two within-subject factors in a 2 (logo tangibility: tangible vs. intangible) × 6 (replication) format, such that all participants were exposed to the same 12 company logos.

7.1.1. Stimuli—Logos

We specifically collected 12 logos from the Frankfurt and Shanghai Stock Exchanges (Table 3) that went against our hypotheses, thus affording the most conservative test possible. That is, we chose six companies with tangible logos that had higher actual volatility than the

Fig. 3. Fictitious logos in Study 4: top row tangible, bottom row intangible. Participants saw the logos arranged randomly (i.e., tangible and intangible mixed together).

Table 3
Descriptions and average respondent ratings of individual stock logos in Study 4. Each stock is traded on either the Frankfurt (Germany) or the Shanghai (China) Stock Exchange. Three-year beta is a stock price volatility index provided here as an indicator of the actual market risk of investing in these companies. The rest of the columns correspond to average participant responses regarding the perceived risk of purchasing the company's stock (1 = *very safe*, 4 = *very risky*), the company logo depicting something tangible (1 = *completely disagree*, 4 = *completely agree*), logo complexity (1 = *very simple*, 4 = *very complex*), familiarity with the company (1 = *not familiar at all*, 4 = *very familiar*), extent of agreement with the statement that the company seems to have been founded a long time ago (i.e., the company seems to be old; 1 = *completely disagree*, 4 = *completely agree*), and how traditional or modern the company seems to be (1 = *very traditional*, 4 = *very modern*).

Logo	Traded in	Three-year beta	Perceived risk	Tangible	Visually complex	Company familiar	Old company	Modern company
	Germany	2.35	2.21	3.17	2.29	1.58	2.44	2.54
	Germany	3.64	2.36	3.05	1.96	1.55	2.23	2.56
	China	1.69	2.34	2.90	2.29	1.60	2.40	2.55
	Germany	2.04	2.33	2.98	1.98	1.51	2.58	2.30
	Germany	4.39	2.31	3.00	1.75	1.50	2.44	2.44
	China	1.69	2.19	3.04	2.61	1.55	2.67	2.60
	Germany	−1.68	2.40	2.44	2.26	1.61	2.51	2.34
	China	2.64	2.43	2.40	2.60	1.46	2.29	2.85
	Germany	−1.33	2.50	2.24	2.38	1.64	2.19	2.98
	China	−0.82	2.25	2.38	2.93	1.57	2.53	2.70
	Germany	4.21	2.38	2.43	2.00	1.54	2.53	2.71
	China	0.89	2.46	2.32	2.36	1.57	2.60	2.63

selected six companies with intangible logos. Volatility refers to the dispersion of returns for a given stock, such that higher volatility suggests greater risk in purchasing the stock. To ensure that the actual stock volatility of the companies with tangible logos was greater than those possessing intangible logos, we collected the volatility measure of each company for the preceding three years (trailing three-year beta) and created an average risk score for each company. The net result was that the companies selected for this study with tangible logos represented greater volatility ($M = 2.63$, $SD = 1.12$) than the selected companies with intangible logos ($M = 0.65$, $SD = 2.37$; $t(10) = 1.85$, $p = .09$, $d = 1.07$). Our prediction, however, was that participants would perceive the opposite.

7.1.2. Procedure

Participants read that they would be exposed to the logos of several companies and were asked to indicate their perception of these companies on several dimensions. Participants were then directed to the next page, where they were exposed to the 12 company logos presented in randomized order. After examining the company logos, participants used the questionnaire to indicate their perceived risk of buying the stocks of each company (anchored: 1 = *very safe*, 4 = *very risky*). Afterward, participants indicated the extent to which they agreed that the

company logo represented something tangible, which served as the manipulation check (anchored: 1 = *completely disagree*, 4 = *completely agree*). Participants then rated the perceived visual complexity of each logo (anchored: 1 = *very simple*, 4 = *very complex*), and their familiarity with each company (anchored: 1 = *not familiar at all*, 4 = *very familiar*). Finally, participants indicated their agreement with a statement that captured the extent to which they believed the company had been founded a long time ago (anchored: 1 = *completely disagree*, 4 = *completely agree*), followed by rating the extent to which they believed the company to be traditional/modern (anchored: 1 = *very traditional*, 4 = *very modern*). People might assume that logos depicting tangible objects belong to older or traditional companies or might feel a stronger sense of familiarity when they see a logo depicting tangible objects. These would be alternative explanations for why tangible logos might be rated as less risky than intangible ones. We asked the above questions to explore this possibility.

7.2. Results

The study was completed by 126 participants (M_{age} = 36.48, SD = 11.24; 41% female). To reiterate, the design of the study consisted of two within-subject independent variables, one independent variable of interest (logo tangibility) and one independent variable that served replication purposes (six logos for each level of logo tangibility). To accommodate the nature of the design, the data were first analyzed by collapsing the ratings for logos that served replication purposes into a composite score and conducting paired-samples t-test analyses on each variable as a function of logo tangibility.

The results confirmed that participants indeed perceived tangible logos to represent something more tangible (M = 3.02, SD = 0.55) than did intangible logos (M = 2.36, SD = 0.83; $t(125) = 7.39$, $p < .001$, d = 0.66, 95% CI_{diff} [0.48, 0.83]), suggesting that our choice of logos functioned as intended. Furthermore, and in support of our core hypothesis, participants perceived buying the stocks of companies with tangible logos to be less risky (M = 2.29, SD = 0.56) than buying the stocks of companies with intangible logos (M = 2.40, SD = 0.54; $t(125) = 1.99$, $p < .05$, d = 0.18, 95% CI_{diff} [0.001, 0.22]).

There were no significant differences between tangible and intangible logos in perceived familiarity with the company ($M_{tangible}$ = 1.55, SD = 0.88 vs. $M_{intangible}$ = 1.56, SD = 0.92; p = .68, d = 0.04, 95% CI_{diff} [−0.07, 0.04]) and in perceived length of time the company had been operational ($M_{tangible}$ = 2.46, SD = 0.65 vs. $M_{intangible}$ = 2.44, SD = 0.63; p = .71, d = 0.03, 95% CI_{diff} [−0.08, 0.12]). However, compared to the intangible logos, participants rated the tangible logos significantly lower on complexity ($M_{tangible}$ = 2.14, SD = 0.63 vs. $M_{intangible}$ = 2.42, SD = 0.59; $t(125) = -5.06$, $p < .001$, d = 0.45, 95% CI_{diff} [0.17, 0.39]) and company modernity ($M_{tangible}$ = 2.49, SD = 0.57 vs. $M_{intangible}$ = 2.70, SD = 0.58; $t(125) = -3.08$, $p < .005$, d = 0.27, 95% CI_{diff} [0.07, 0.34]). This raises the possibility that the risk-rating differences are explained by some of these factors. Therefore, we tested whether any of the above factors (i.e., visual complexity of the logos, familiarity with the companies, perceived company age, and perceived company modernity) predict risk ratings or eliminate the effect of tangibility on risk ratings when controlling for these factors.

To analyze the effect of tangibility on market-risk perception while controlling for the above factors, we tested a multilevel model in which the ratings of the logos are nested within individual respondents. Tangibility was dummy coded (i.e., intangible: 0, tangible: 1). The model allows the effect of each explanatory variable on risk to vary across individual respondents. Specifically, we tested the following model.

$$Risk_{ij} = \beta_{0j} + \beta_{1j}(Tangibility)_{ij} + \beta_{2j}(Complexity)_{ij} + \beta_{3j}(Familiarity)_{ij} + \beta_{4j}(CompanyAge)_{ij} + \beta_{5j}(Modernity)_{ij} + r_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

Table 4
Mixed-model parameter estimates in Study 4. The outcome variable is perceived market risk; −2 Log Likelihood for the model is 3587.84; * p < .05, ** p < .01, *** p < .001.

	Coefficient	*Standard Error*	*95% CI*
Intercept (γ_{00})	2.62***	0.12	2.38, 2.85
Tangibility (γ_{10})	−0.12*	0.05	−0.23, −0.02
Complexity (γ_{20})	−0.05	0.03	−0.10, 0.004
Familiarity (γ_{30})	−0.09*	0.04	−0.16, −0.02
Company age (γ_{40})	−0.08**	0.03	−0.13, −0.02
Modernity (γ_{50})	0.04	0.03	−0.01, 0.09

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + u_{3j}$$

$$\beta_{4j} = \gamma_{40} + u_{4j}$$

$$\beta_{5j} = \gamma_{50} + u_{5j}$$

Index i denotes logos (level-1 variable), and j denotes individual respondents (level-2 variable). The model uses five level-1 predictors and no level-2 predictor, although it allows the level-1 intercept and slopes to vary across individual respondents.

Results indicated that tangibility significantly and negatively predicted market risk, $F(1, 137.61) = 5.75$, p = .02, even after controlling for the effect of visual complexity, $F(1, 499.04) = 3.32$, p = .07, familiarity $F(1, 586.09) = 6.18$, p = .01, company age $F(1, 573.04) = 7.54$, p = .01, and company modernity, $F(1, 721.32) = 2.04$, p = .15 (parameter information in Table 4). In other words, the tangibility of a company logo reduced risk ratings even after statistically controlling for the effects of a variety of other factors. Among these factors, perceptions of familiarity with the company and company age also reduced risk ratings. Study 5 provides further evidence for the intuitive link between tangibility and risk perception.

8. General discussion

Evidence from five studies suggests that intangible assets are considered riskier than tangible assets (Study 1); that intangibility frames increase perceived risk (Study 2), suggesting bias (Kahn, Luce, & Nowlis, 2006); and that subjective feelings associated with tangibility can reduce perceived risk (studies 4 and 5). A critical outcome of these studies is that perceived tangibility can influence decisions to choose (Study 4) and trade assets (Study 1) when the goal is to minimize risk. Perceptions of permanence underscore this tangibility bias (studies 2 and 3). The direct contribution of this research is to uncover a potential bias in highly consequential financial judgments. We further provide insight as to how this bias might come about and the scope of judgments and decisions that it might influence.

The marketplace consists of high- and low-risk tangible assets as well as high- and low-risk intangible assets (Barro & Misra, 2016; Malliaris & Malliaris, 2015; Korteweg, Kräussl, & Verwijmeren, 2015; Almeida & Campello, 2007; Füss, et al., 2010; Quigley, 2006; Case & Shiller, 1989; Lintner, 1965). An alternative to our heuristic processing account is that people might be overgeneralizing from instances of low-risk tangible assets and/or high-risk intangible assets and generate lay theories based on these generalizations. Although this may indeed be true for some people, such a process cannot account for our data. Our evidence includes studies (studies 2, 4, and 5) that manipulate tangibility in ways that keep the underlying asset or the asset class constant, which renders this account inapplicable.

Risk perception is an integral part of financial decision making and risk-taking behavior in general, but research has shown that risk

perception is also subject to many biases like framing (Kahneman & Tversky, 1979), loss aversion (Camerer, 2005), and overconfidence (Moore, Kurtzberg, Fox, & Bazerman, 1999; Odean, 1998). Our research makes an important theoretical advance by uncovering a novel aspect of consumers' financial risk judgments. Our results are unique in that they show how the specific cognition of *perceived permanence* regulates financial risk judgments by influencing the intensity of feelings of risk: Greater appraisals of permanence lead to weaker feelings of risk.

The number of people who manage their own portfolios has increased substantially in recent years, leaving critical decisions—including investment choices—to people with limited financial knowledge and no training (Barber & Odean, 2008; Benartzi & Thaler, 2007; Brennan & Torous, 1999; Bogan, 2008; Lusardi & Mitchelli, 2007; Van Rooij, Lusardi, & Alessie, 2011). Financial risk judgments are often difficult but extremely important for the livelihood and well-being of ordinary people. Whereas institutional investors sometimes rely on technologically sophisticated analysis of objective risk, untrained investors rely much less on risk calculations and more on intuitive risk judgments (Capon, Fitzsimons, & Prince, 1996; Diacon & Ennew, 2001; Slovic, 1987; Weber, 2004; Weber, Siebenmorgen, & Weber, 2005). Moreover, objectively measuring risk is a challenge. Although there have been recent advances in measuring financial risk (Berkowitz & O'Brien, 2002), widely used risk measures such as value-at-risk have come under attack, especially after they failed when big market risks materialized (Taleb, 2004; Taleb, Goldstein, & Spitznagel, 2009). The limitations of the current models of quantifying financial risk make understanding intuition even more important.

Previous research on consumer behavior has investigated the relationship between tangibility and risk in the context of goods and services (Murray & Schlacter, 1990; Guseman, 1981; Laroche et al., 2004). Consumers often perceive purchasing (tangible) goods such as clothing to involve less risk than does purchasing (intangible) services such as appliance repair or tax preparation advice (Murray & Schlacter, 1990). However, the process that leads to different risk perception for goods and services is different from the heuristic process that we investigate for assets. Services are produced at the time of consumption (i.e., are often not directly observable before purchase) and are less standardized than goods (Murray & Schlacter, 1990; Zeithaml, 1981). The resulting uncertainty about the outcome of purchasing a service increases the risk of having an unsatisfactory consumption experience. Note that the degree of uncertainty is indeed generally higher for services than for goods (i.e., the difference is not mere perception). Therefore, the reasoning that people use seems appropriate when assessing the risk of purchasing goods versus services. In contrast, the process that we investigate is more intuitive than reasoning-based and is detached from the factors that determine actual risk.

The tangibility heuristic documented in this research has important implications. If tangibility is used as a heuristic, it could bias risk assessment and thus may lead to risk-taking that is higher than one would otherwise tolerate or lower than one would otherwise accept. For instance, it may contribute to the low perceived market risk for tangible assets such as gold and real estate (Smith et al., 2009) despite evidence of high risk for these assets (Shiller, 2008; Barro & Misra, 2016). A practical implication is that companies may benefit from seeking ways to associate themselves with tangibility to reduce investors' perception of risk. Study 1 documented a tendency to ascribe low risk to a company that acquires tangible assets such as buildings and land. Moreover, tangibility and the resulting perception of permanence may help companies build trust with investors. Feelings of trust might be an antecedent to risk judgment and investment choice (Houser, Schunk, & Winter, 2010; Olsen, 2012). Impressions that a company is durable or lasting, or that it owns assets that are durable or lasting, may induce trust in investors.

In practice, investors may get exposed to information besides tangibility, e.g., details about a company, historical price movements, and other investment statistics. The size of the tangibility effect relative to other influences and whether they would drown out the tangibility effect in everyday financial decisions remains to be investigated by future research.

Although we focused on financial decisions, the tangibility heuristic may apply more broadly to other decisions. Many consumer goods that were until recently only available in tangible physical form (e.g., print books, physical music recordings) are now also available in intangible digital form (e.g., e-books, downloadable music). In a process similar to the one we described for intangible assets, perceiving digital goods as impermanent may lead to apprehension about their future market value. This may foster reluctance to purchase these goods because of the perceived risk of paying too much. The nascent markets for non-fungible tokens and digital artwork might be affected by such perceptions even after these markets become more established and familiar.

CRediT authorship contribution statement

Özgün Atasoy: Conceptualization, Methodology, Software, Formal analysis, Investigation, Writing – original draft, Visualization. **Remi Trudel:** Conceptualization, Methodology, Investigation, Writing – review & editing. **Theodore J. Noseworthy:** Investigation, Writing – review & editing. **Patrick J. Kaufmann:** Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors wish to thank Donald R. Lichtenstein, Carey K. Morewedge, Tuğkan Tüzün, Barış Depecik, Catherine Caldwell-Harris, and Ellen J. Langer for their comments on this manuscript.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.obhdp.2022.104150.

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