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The authors propose that attempts to increase consumers' objective knowledge (OK) regarding financial instruments can deter willingness to invest when such attempts diminish consumers' subjective knowledge (SK). In four studies, the authors use different SK manipulations and investment products to show that investment decisions are influenced by SK, independent of OK. Specifically, they find that (1) willingness to pursue a risky investment increases when SK is high (vs. low) relative to a prior investment choice (Study 1); (2) willingness to enroll in a retirement saving program is enhanced by asking consumers an easy (vs. difficult) question about finance, thereby increasing SK (Study 2); (3) technically elaborating information about a mutual fund diminishes SK regarding that investment and decreases choice of that fund (Study 3); and (4) consumers invest less money in funds when missing information is made salient, holding the objective investment information constant (Study 4). Furthermore, the effects in Studies 2–4 are mediated by participants' self-rated SK. The authors propose that effective financial education must focus not only on imparting relevant information and enhancing OK but also on promoting higher levels of SK.

*Keywords:* consumer choice, financial decision making, subjective knowledge, financial education, comparative ignorance

## Subjective Knowledge in Consumer Financial Decisions

Among the most important decisions that consumers make are those that involve financial products—from the choice of a retirement savings portfolio, to the terms of a home mortgage, to the lease parameters on a car. In recent years, there has been a proliferation of new and complex financial products available to consumers. Unfortunately, an increasing body of research suggests that many consumers lack the financial literacy to evaluate financial products adequately and choose among them (Benartzi and Thaler 2001; Benartzi et al. 2007; Choi, Laibson, and Madrian 2005a, b; Choi et al. 2002; Lusardi 2008; Lusardi and Mitchell 2007).

To improve consumer decisions, governments, employers, and financial institutions have promoted various forms of financial education. However, evidence regarding the effectiveness of financial education is mixed (Boshara et al. 2010; Choi et al. 2002; Cole and Shastry 2009; Fernandes, Lynch, and Netermeyer 2012; Lusardi and Mitchell 2007).

We assert that financial education programs often fail to improve financial decisions substantially because such programs focus almost exclusively on enhancing consumers' objective level of knowledge (Fernandes, Lynch, and Netermeyer 2012) and overlook the effect these programs have on how knowledgeable consumers feel. In this research, we explore the role of subjective knowledge (SK), the metacognitive feeling of knowing (Alba and Hutchinson 2000; Brucks 1985), in financial decision making. We draw on prior studies of consumer behavior (e.g., Bearden, Hardesty, and Rose 2001; Mossman and Ziller 1968) and decisions under uncertainty (e.g., Fox and Tversky 1995; Fox and Weber 2002; Heath and Tversky 1991), showing that consumers' SK can exert a strong impact on choice. Focusing on investment decisions, we propose that holding consumers' objective information or knowledge constant, they

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are more apt to invest in relatively risky or complex options when they feel more knowledgeable about these options. In four studies, we provide empirical support for the impact of SK on financial decisions by experimentally manipulating the extent to which participants feel knowledgeable, while holding constant or controlling for their objective level of knowledge. We suggest that providing consumers with relevant but complex product information can sometimes enhance their objective level of knowledge while paradoxically diminishing their subjective level of knowledge. Thus, such well-meaning educational efforts can actually deter consumers from investing in more speculative, complex, or novel options. To the extent that such investments are welfare improving—as might be the case for 401(k) plan enrollment or life cycle fund selection, for example—educational efforts may paradoxically harm consumer financial choice.

In the section that follows, we review the literature on financial illiteracy, consumer knowledge, and the relation between SK and investment decisions. Next, we present the results of four experiments that document the relationship between consumer SK and choice of investment options. We close with a discussion of some implications of our results for the design of financial literacy programs.

### THEORETICAL BACKGROUND

#### *Financial Well-Being and Financial Illiteracy*

An increasing body of research has attributed consumers' irrational choices in a variety of financial domains to a lack of basic financial literacy necessary to evaluate financial options and choose wisely, even when full information is provided (Benartzi and Thaler 2001; Benartzi et al. 2007; Boshara et al. 2010; Choi, Laibson, and Madrian 2005a, b; Choi et al. 2002; Fernandes, Lynch, and Netemeyer 2012; Lusardi 2008; Lusardi and Mitchell 2007; McKenzie and Liersch 2011; Navarro-Martinez et al. 2011; Soll, Keeny, and Larrick 2011; Stango and Zinman 2009a, b). For example, Benartzi et al. (2007) report that 20% of survey respondents said they would rather have \$1,000 of employer stock that they could not diversify until the age of 50 years than \$1,000 that they could invest without restrictions. Likewise, employees typically diversify their investment portfolios among the available options naively, with little regard to the nature of the investments over which they are diversifying. Benartzi and Thaler (2001) find that consumers strongly tend toward spreading their money evenly among investments offered in their retirement savings plans. Langer and Fox (2012) show that this tendency can lead to portfolio choices that systematically depend on how investments happen to be grouped by vendor, whether consumers designate their investments in dollars or by number of shares, and whether consumers directly choose among possible portfolios or allocate money among base investments.

In response to such consumer deficiencies, governments, employers, and financial institutions have begun to engage in financial education. Examples of education initiatives include paycheck stuffers, newsletters, summary plan descriptions, seminars, individual consultations with financial planners, and access to Internet-based education and planning tools (Fernandes, Lynch, and Netemeyer 2012). Unfortunately, studies of the effectiveness of such interventions have revealed mixed results. Although some researchers have

found a positive effect of financial education on financial decisions (Bayer, Bernheim, and Scholz 2008; Lusardi 2008; Lusardi and Mitchell 2007), others have critiqued this work for use of nonrepresentative samples, for the researchers' reliance on statements of intention rather than actual behavior, and because it confounds a firm's provision of financial education with other factors that influence saving behavior, such as the level and structure of compensation (Boshara et al. 2010; Choi et al. 2002; Cole and Shastry 2009; Lusardi 2008; Lusardi and Mitchell 2007; Madrian and Shea 2001a).

Fernandes, Lynch, and Netemeyer's (2012) meta-analysis indicates a small (but significant) correlation between financial literacy interventions and subsequent adaptive financial behaviors such as planning for retirement, saving, and avoiding high levels of debt. Notably, a regression model predicting such financial behavior from both measured financial literacy and a trait measure of "consumer confidence in investing" revealed a substantially attenuated coefficient of literacy and a significant coefficient of confidence. This result suggests an important distinction between objective knowledge (as measured by financial literacy questions; hereinafter abbreviated to "OK") and SK (which is strongly associated with consumer confidence in investing). Moreover, this research indicates that the level of SK may be a critical driver of investment behavior. We next examine the distinction between objective and subjective consumer knowledge, their relationship to consumer confidence, and their hypothesized influence on consumer financial decisions.

#### *Consumer Knowledge*

The provision of financial education is based on the premise that increasing consumers' knowledge about available options will generally increase their tendency to choose wisely. This premise has received ample empirical support in a variety of consumer choice contexts (for an expansive review of research on consumer knowledge, see Alba and Hutchinson 1987). For example, researchers have found that when consumers are more knowledgeable about a product category, they detect product-related information more efficiently (Johnson and Russo 1984; Punj and Staelin 1983), they use fewer cognitive resources to understand product-related information (Alba and Hutchinson 1987), and they tend to be more confident in their ability to make a good choice (Brucks 1985; Park and Lessig 1981; but see Carlson et al. 2009).

Consumer research distinguishes consumers' actual knowledge from their assessment of their knowledge (e.g., Alba and Hutchinson 1987, 2000; Bearden, Hardesty, and Rose 2001; Brucks 1985). The term OK has been used to refer to accurate product-related information stored in memory; the term SK has been used to refer to consumers' assessment of their knowledge, or the metacognitive feeling of knowing (Alba and Hutchinson 1987, 2000; Bettman and Park 1980; Brucks 1985; Carlson et al. 2009; Moorman et al. 2004; Park and Lessig 1981; Park, Mothersbaugh, and Feick 1994). For example, recognizing that a mutual fund is a professionally managed collective investment vehicle is a manifestation of OK, whereas a consumer's feeling that he or she understands mutual fund investment is a manifestation of SK.

Some might expect that OK and SK would be strongly and positively correlated. That is, the more a consumer knows about a product, the more knowledgeable he or she should feel. However, empirical research across a range of domains has found that OK and SK are distinct constructs that do not always coincide (e.g., Brucks 1985; Carlson et al. 2009; Moorman et al. 2004; Park, Mothersbaugh, and Feick 1994; Radecki and Jaccard 1995). First, the correlation between OK and SK varies substantially across studies, with some documenting no significant relationship (Carlson et al. 2009). For example, whereas Brucks (1985) reports a correlation of .54 between OK and SK of sewing machines and Duhan et al. (1997) find a correlation of .54 in the domain of medical services, Ellen (1994) obtains a non-significant correlation of .08 in the domain of pro-ecological behavior. Second, OK and SK have distinct associations with related constructs: OK is more strongly related to ability and expertise, whereas SK is more strongly related to product-related experience and consumers' confidence in their ability to make effective decisions (Alba and Hutchinson 1987; Bearden, Hardesty, and Rose 2001; Park, Mothersbaugh, and Feick 1994; Parker et al. 2011; Radecki and Jaccard 1995).

Note that it is important to distinguish confidence in one's *knowledge* from confidence in one's *decisions*. The former may be construed as a measure or manifestation of SK, whereas the latter may be construed as a consequence of SK. For example, a person who feels subjectively knowledgeable about mutual funds may also be confident in his or her knowledge about mutual funds. However confidence in his or her *choice* of mutual funds is more likely to follow from a feeling of high SK than be a cause of it. Thus, in this article, we treat confidence as a measure of SK, and we verify this relationship empirically in Study 4.

Most relevant to the present research is the finding that OK and SK have distinct consequences for information search, choice, and willingness to take action (e.g., Radecki and Jaccard 1995; Raju, Lonial, and Mangold 1995). For example, Brucks (1985) finds that the number of sewing machine attributes consumers examined significantly correlates with consumer OK but not with consumer SK. Another example of SK's influence on information search, independent of OK, is Moorman et al.'s (2004) finding that, holding OK about nutrition constant, consumers are more likely to search in categories that are more compatible with their SK (e.g., consumers who have higher SK regarding nutrition are more likely to search in "healthy" supermarket aisles). In the domain of financial decision making, Graham, Harvey, and Huang (2009) use data from several U.S. Bank/Gallup investor surveys to find that investors who rated themselves "more comfortable" in their "ability to understand investment product alternatives and opportunities" tended to trade more often and diversify more internationally.

In a related vein, studies of decisions under uncertainty (e.g., Fox and Tversky 1995; Fox and Weber 2002; Heath and Tversky 1991) have found that decision makers' SK can have a strong impact on willingness to act, holding OK constant. For example, Fox and Weber (2002, Study 2a) asked American participants which of two candidates they thought would win the upcoming Russian election (a medium-knowledge item for most) and whether they would prefer to receive \$50 for sure or \$150 if they were correct. One group

of participants answered these questions after being asked who they thought would win the upcoming American election (so the contrast would make them feel less competent predicting the Russian election winner), whereas another group received this item after being asked who they thought would win the upcoming Dominican Republic election (so the contrast would make them feel more competent predicting the Russian election winner). Although both groups presumably had the same level of OK with regard to the Russian election, the first group, for whom this was a comparatively less familiar event (i.e., the group with presumably lower SK), was much less likely to bet on their forecast than the second group.

The notion that investment behavior is influenced by a decision maker's level of SK has strong parallels with Heath and Tversky's (1991, p. 7) competence hypothesis, according to which,

Holding judged probability constant,... people prefer to bet in a context where they consider themselves knowledgeable or competent than in a context where they consider themselves ignorant or uninformed. We assume that our feeling of competence in a given context is determined by what we know relative to what can be known. Thus it is enhanced by general knowledge, familiarity, and experience, and it is diminished, for example, by calling attention to relevant information that is not available to the decision maker, especially if it is available to others.

Heath and Tversky (1991) attribute the preference to bet in conditions of higher relative knowledge to two sources: (1) the cognitive tendency to overgeneralize the principle that one typically "does better" in situations that one understands better and (2) the motivation to protect against self-recrimination—experts can attribute good outcomes to skill and bad outcomes to chance, whereas people with limited understanding of an issue must attribute good outcomes to luck and bad outcomes to lack of skill. Although several studies have examined this relationship between SK and willingness to act under uncertainty, little research specifically explores the relationships between OK, SK, consumer investment, and financial education. The present work is an attempt to fill that gap.

#### *SK and Financial Education*

Financial education programs aim to provide consumers necessary expertise or knowledge to better manage their financial affairs. In so doing, financial education programs typically focus on increasing consumers' OK (Fernandes, Lynch, and Netemeyer 2012). The importance of financial OK to wise financial decision making is unquestionable. Indeed, Fernandes, Lynch, and Netemeyer's (2012) meta-analysis indicates a small but significant correlation between consumer financial literacy and a variety of downstream financial behaviors, such as planning for retirement, saving, and avoiding high levels of debt. Notably, this correlation was driven mostly by studies that measured literacy rather than those that manipulated financial OK through education interventions. Moreover, the impact of financial OK on financial behavior was usually attenuated when consumer confidence, propensity to plan, and willingness to take risks were added to the predictive model.

In summary, the aforementioned prior research has found that financial education, which tends to focus on promoting financial OK, does not substantially affect financial behavior. Given the well-documented dissociation between OK and SK and the latter's influence on consumers' willingness to act in uncertain or complex choice settings, we suggest that attempts to provide consumers with relevant but technical or complex product information may sometimes enhance their OK while paradoxically diminishing their SK. Thus, such well-meaning efforts can actually deter consumers from choosing speculative, novel, or complex financial instruments even when these instruments better suit consumers' needs. We hypothesize that interventions that promote greater financial SK can increase willingness to invest under uncertainty, when controlling for or holding constant a consumer's level of OK. Furthermore, we assert that when less familiar and/or more speculative options are more suitable for consumers, interventions designed to enhance both OK and SK may improve decisions.

We next present four studies designed to test the hypothesis that consumers' willingness to invest under uncertainty increases with their level of SK about relevant investments, independent of their level of OK. Table 1 presents an overview of these studies. In Study 1, we ask undergraduate students to choose between a simple risky investment and a safe one. We hold OK constant by presenting all participants with the same amount of historical information on returns of these investments; we manipulate SK by providing different groups of participants comparatively more or less information about a preceding pair of investments. In Study 2, we ask undergraduate students whether they would be willing to enroll in a 401(k) retirement savings plan. We make no attempt to affect OK; we manipulate SK by asking participants an easy or difficult financial question. In Study 3, we ask management students to choose between two "life cycle funds" that automatically rebalance saving in stocks versus bonds over a period of 40 years. We marginally increase OK by providing some participants with an elaboration of basic information that is described in technical terms; we manipulate SK in the opposite direction in that elaborated information is more difficult to understand than basic information. Finally, in Study 4, we ask an online sample of American consumers to choose how to allocate money between an Exchange Traded Fund (ETF) and a Real Estate Investment Trust (REIT). We explicitly manipulate OK by varying the amount of information provided to participants (taken from The Vanguard Group's web page); we

manipulate SK by presenting some participants with additional information that has been blotted out, thus making the missing information more salient for these participants. Collectively, these studies test in a range of subject populations our general hypothesis that manipulations of SK can affect a wide range of investment choices, controlling for OK or holding it constant. Studies 2–4 explicitly test whether ratings of SK mediate these effects. Study 4 also tests whether our results are robust to financial incentives and whether manipulations of OK affect choices through SK.

#### STUDY 1: WILLINGNESS TO CHOOSE A RISKY INVESTMENT

Our first study examines the impact of SK on preference for a safe investment option that offers a constant rate of return versus a risky investment option that offers a variable return. We presented participants with past month-by-month returns of hypothetical investments, varying the amount of historical information presented for a prior pair of investments.

#### Method

We recruited 24 undergraduate students at University of California, Los Angeles (UCLA), to participate in a brief study in exchange for fixed payment of \$5. The study included two choice tasks, a reference task and a target task. We asked participants to imagine that they wanted to invest money for a period of one month and had to choose between two investment options: one that had yielded fixed positive returns (the "safe" fund) and another that had yielded varying positive returns (the "risky" fund). Participants were not given any explicit information about the risk level of each fund but instead learned about the funds' past performance by reviewing samples of their past monthly returns. In the first (reference) choice task, the safe fund consistently yielded a 5% monthly return and the risky fund yielded a 10% or a 0% monthly return with equal probabilities. In the second (target) task, the safe fund consistently yielded a 3% monthly return and the risky fund yielded a 4% monthly return with probability .8 and a 0% monthly return otherwise. Returns were drawn in a random order for each participant from distributions that were fixed in advance, without replacement. We made participants explicitly aware of the sampling regime.

We provided all participants with 20 months of past returns for the target task. Following Fox and Weber's (2002, Study 2) approach, we manipulated SK through the relative amount of information provided for the reference

Table 1  
SUMMARY OF STUDIES

Study	Population	Choice (Dependent Variable)	SK Manipulation	OK	Consequences
1	UCLA undergraduate students	Risky over safe investment	Contrast amount of information with previous choice	Relevant information held constant	Hypothetical
2	UCLA undergraduate students	Participation in a 401(k) plan	Vary level of quiz question difficulty	Relevant information held constant	Hypothetical
3	Interdisciplinary Center Herzliya undergraduate management students	Riskier versus safer life cycle fund	Elaborate information using technical jargon	Presumably negatively correlated with SK	Hypothetical
4	American adults on MTurk	ETF versus REIT investment	Vary salience of missing information	Manipulated independently	Incentive-compatible payoff

task that preceded the target task. Participants in the high SK condition viewed the returns of each fund for the past 10 months in the reference task; participants in the low SK condition viewed the returns to each fund for the past 40 months in the reference task. Note that all participants received the same sample of information about past returns to each fund of the target task (20 months) and thus had the same level of OK about the target decision. However, participants in the low SK condition received more information about the returns to the investment options of the reference set of investments, thus making them relatively poorly informed about the returns to the target investments; meanwhile, participants in the high SK condition received less information about the returns to the reference set of investments, making them relatively well informed about the returns to the target investments.

We hypothesized that participants would be more likely to choose the risky investment in the high SK condition. Table 2 summarizes the return distribution and the amount of information provided about each fund in the reference and target choice tasks, by condition.

### Results and Discussion

The results of Study 1 provide strong support for our prediction. Although 62% of the participants in the high SK condition chose to invest in the risky fund in the target task, none of the participants chose to do so in the low SK condition ( $p < .002$  by Fisher's exact test). Because all participants received the same information regarding alternative choices in the target task, this difference in choices between the high and low SK conditions cannot be attributed to differences in objective information about the funds. In summary, Study 1 supports the hypothesis that, holding OK constant, willingness to choose risky investments increases with a consumer's level of SK.

Although it seems reasonable to assume that the contrast between the number of monthly returns provided in the reference and target tasks influenced feelings of SK with regard to the target task, we did not measure this construct directly. In Study 2, we directly measure SK in the context of 401(k) retirement saving plans and examine whether SK mediates willingness to enroll in a retirement savings plan.

### STUDY 2: ENROLLMENT IN A RETIREMENT SAVINGS PLAN

In 2005, approximately one-quarter of American employees eligible to participate in 401(k) retirement savings plans failed to do so, even when their employers offered valuable matching contributions and even though the government offers tax advantages for contributing (Brookings Institution 2013). One possible explanation for this puzzling behavior is that employees are deterred by the complexity of the decision. Joining a 401(k) plan requires that employees decide how much to save (on the basis of how much money they estimate that they will need at retirement, a complex calculation in itself) and how to allocate this money among an ever-expanding menu of possible investments (Benartzi and Thaler 2001; Choi, Laibson, and Madrian 2005b; Madrian and Shea 2001a). Consistent with the notion that complexity deters investment, research has shown that attempts to simplify 401(k) plan features have increased participation (Choi, Laibson, and Madrian 2005b). In Study 2, we examine whether explicitly manipulating employees' SK about 401(k) retirement savings plans affects the likelihood that they join these plans.

In this study, we use a new manipulation of SK to provide converging evidence for our hypothesis and further validate our prior results. Participants in the low SK condition were asked a difficult-to-answer question about finances, whereas participants in the high SK condition were asked an easy-to-answer question about finances. We predicted that uncertainty answering the difficult question would call attention to participants' incompetence and consequently diminish their SK about a related investment; in contrast, confidence answering the easy question would call attention to participants' competence and consequently enhance SK about a related investment. We further expected that willingness to enroll in 401(k) plans would increase with ratings of SK.

### Method

Two hundred undergraduate students at UCLA answered a brief survey as part of a larger packet of unrelated items in exchange for \$20. We provided participants with the following brief information on 401(k) retirement plans:

Table 2  
RETURN DISTRIBUTIONS AND AMOUNT OF INFORMATION PROVIDED FOR EACH FUND IN THE REFERENCE AND TARGET CHOICE TASKS (STUDY 1)

Choice Task	Low SK Condition			High SK Condition		
	Amount of Information About Each Fund	Safe Fund	Risky Fund	Amount of Information About Each Fund	Safe Fund	Risky Fund
Reference <sup>a</sup>	40 months	5% return (1)	10% return (.5); 0% returns, (.5)	10 months	5% return (1)	10% return (.5); 0% returns (.5)
Target <sup>b</sup>	20 months	3% return (1)	4% return, (.8); 0% returns, (.2)	20 months	3% return (1)	4% return, (.8); 0% returns, (.2)

<sup>a</sup>The safe fund consistently yielded a 5% monthly return, and the risky fund yielded a 10% monthly return or no return with equal probability.

<sup>b</sup>The safe fund consistently yielded a 3% monthly return, and the risky fund yielded a 4% monthly with probability .8 and a 0% return otherwise.

Notes: The rate of return of each fund is presented, and the probability of receiving each return appears in parentheses. Participants in the low SK condition received more information about the returns of the reference funds (40 months) compared with the target funds (20 months), leading to the perception that they were relatively poorly informed about the target funds; participants in the high SK condition received less information about the returns of the reference funds (10 months) compared with the target funds (20 months), leading to the perception that they were relatively well informed about the target funds. Note that the return distribution and the amount of information about the target funds were similar across SK conditions, indicating that OK was held constant.

A 401(k) plan is a type of employer-sponsored retirement plan under section 401(k) of the Internal Revenue Service. The plan allows a worker to save for retirement while deferring income taxes on the saved money and earnings until withdrawal. The employee elects to have a portion of his or her wage paid directly, or “deferred,” into his or her 401(k) account. In most cases, the employee can select from a number of investment options that emphasize stocks, bonds, money market investments, or some mix of the above. The employee can generally re-allocate money among these investment choices at any time.

We next asked participants a question allegedly designed to evaluate their general financial knowledge. One group of participants (high SK condition) were asked an easy-to-answer question (“Which is expected to yield a higher return over a period of 10 years, a savings account or a stock investment?”) and the other group of participants (low SK condition) were asked a difficult question (“What was the annual change in value of the NASDAQ 100 index in 2008? \_\_\_\_ %”). Finally, we asked participants to rate their knowledge of saving plans in general, their knowledge of 401(k) retirement plans in particular, and the likelihood that they would join a 401(k) plan when they were eligible to do so on seven-point scales (1 = “very low,” and 7 = “very high”). Note that the objective information provided on 401(k) plans was identical in the two SK conditions.

### *Results and Discussion*

A manipulation check confirmed that a much higher proportion of participants correctly answered the easy question (62%) than the difficult question (2%;  $p < .001$  by Fisher’s exact test). Participants’ ratings of their knowledge about saving plans in general and about 401(k) retirement plans in particular were highly correlated, and we therefore averaged them to form a composite SK rating scale (Cronbach’s  $\alpha = .91$ ). An examination of the impact of the SK manipulation confirmed that participants who received an easy question rated their SK higher than participants who received a difficult question ( $M_{\text{Easy}} = 3.06$ ,  $M_{\text{Difficult}} = 2.14$ ;  $t(173) = 4.36$ ,  $p < .0001$ ) and also indicated that they were more likely to join 401(k) plans ( $M_{\text{Easy}} = 5.50$ ,  $M_{\text{Difficult}} = 5.04$ ;  $t(173) = 2.06$ ,  $p < .05$ ).

We performed the recommended bootstrapping technique to test whether question difficulty influences willingness to join 401(k) plans through its impact on SK (Preacher and Hayes 2008; Zhao, Lynch, and Chen 2010). The results confirmed that SK ratings mediated the effect of question difficulty on willingness to join 401(k) plans ( $b = -.41$ ; 95% confidence interval =  $-.67, -.22$ ). Thus, participants who easily answered a marginally relevant financial question believed they knew more about finances and 401(k) plans and were thus more willing to join them. Appendix A provides a correlations matrix for all variables included in the mediation analysis.

Studies 1 and 2 show that, holding OK constant, SK promotes the choice of risky and complex investment options. In the studies that follow, we more directly simulate attempts to educate consumers by manipulating both OK and SK and examine their subsequent impact on investment behavior.

### *STUDY 3: PROVIDING MORE INFORMATION CAN DIMINISH SK AND WILLINGNESS TO INVEST*

Imagine having to decide between two investment options. The information about investment A is easily understood by most people; investment B offers equivalent information but is described in more technical terms and includes additional advanced information that elaborates the basic information. From a normative standpoint, a technical elaboration of existing information from which participants can derive knowledge should not affect the attractiveness of an investment. However, we propose that receiving information in a more technical form will cause consumers to feel less knowledgeable and render the investment less attractive.

Preliminary support for this assertion comes from Fox and Weber (2002, Study 4a), in which Stanford undergraduate students were first asked whether they thought the inflation rate in Holland over the previous year was greater than or less than 3.0% and then asked to choose between (1) \$50 for sure or (2) \$150 if they were correct about the inflation rate. Half the participants were provided with additional macroeconomic data that could have been useful to someone with extensive training in economics but were most likely not useful to undergraduate students in an introductory psychology course (indeed, it did not significantly change their assessment of inflation). Nevertheless, participants who were provided the additional information were much less likely to bet on their assessment of inflation.

To test our hypothesis more directly, we asked participants in Study 3 to choose between two mutual funds. We provided summary fund descriptions, a common form of financial education (Bayer, Bernheim, and Scholz 2008; Lusardi 2008; Lusardi and Mitchell 2007). Specifically, we asked student participants to choose between two “life cycle” mutual funds that gradually shift from a stock-heavy portfolio to a bond-heavy portfolio over the course of the participant’s working life. Each fund was described in either basic terms that included its most important elements or more advanced terms that elaborated on the basic information in a more technical and jargon-laden manner. We predicted that providing more technical information about an option would diminish participants’ SK of that option and thus deter them from choosing it.

### *Method*

We recruited 143 senior undergraduate students majoring in management at Interdisciplinary Center Herzliya, Israel, to participate in a brief survey for course credit. Participants were asked to imagine that they want to save for retirement from age 30 years until 70 years and that they have been offered two mutual funds especially designed for retirement saving. Participants were presented with brief descriptions of the funds and were asked to indicate which fund they would prefer to save in. They were then asked to rate, on seven-point scales, their knowledge about each fund, the extent to which they understood the saving mechanism of each fund, and how comfortable they would be investing in each fund (1 = “not at all,” and 7 = “very much”).

The funds that participants were asked to choose from differed in risk level (low, high) and in the technical level of the description provided (basic, advanced). The proportion

of assets invested in stocks (and otherwise in bonds) in the high-risk fund began at 80% and steadily decreased to 30%, whereas the proportion of assets invested in stocks in the low-risk fund began at 50% and decreased to 10%. The basic fund description explained the parameters in relatively simple terms. For example, the basic description of the low-risk fund was as follows:

The fund consists of two elements: (1) a diversified stock Index fund, designed to mirror the composition of the S&P 500 index, a risky but a more profitable long-term investment option, and (2) bonds in the form of 30-year U.S. Treasury Bills, a conservative saving option yielding lower long-term return. In the beginning of the saving period 50% of your savings will be invested in stocks (and 50% will be invested in bonds). This mix will gradually shift, at a fixed rate once a year, from stocks to bonds until you retire, at which point 10% will be invested in stocks (and 90% in bonds).

The advanced information explained the same parameters in more technical terms as well as additional information on the investment's Standard Deviation and Beta, two commonly used parameters used to quantify investment risk. For example, the advanced description of the low-risk fund was as follows:

The fund consists of two elements: (1) a diversified stock Index fund, designed to mirror the composition of the S&P 500 index, a risky but a more profitable long-term investment option, and (2) bonds in the form of 30-year U.S. Treasury Bills, a conservative saving option yielding lower long-term return. The rate of exposure to equity at any given time will not exceed  $80 - A$  where  $A$  = the insured's age (in years). The risk level of the investment equals a standard deviation of 20% in the beginning of the saving period and will gradually diminish, at a fixed rate once a year, to a standard deviation of 12% at retirement. The fund's Beta will be 0.6 at the beginning of the saving period and will gradually diminish, at a fixed rate once a year, to 0.1 upon retirement.

Note that our participants, all of whom had completed multiple courses in economics and finance, were familiar with the concepts and measures presented in both the basic and advanced descriptions. In addition, despite the variations in content, the basic and advanced information were equal in length when translated into Hebrew (approximately five lines).

We independently varied, between subjects, whether the high- and low-risk funds were described in basic or advanced terms. We randomly assigned participants to one of four conditions: (1) both funds were described in basic terms, (2) both funds were described in advanced terms, (3) the high-risk fund was described in basic terms and the low-risk fund was described in advanced terms, and (4) the high-risk fund was described in advanced terms and the low-risk fund was described in basic terms. We counterbalanced the order of presentation of the funds.

### Results and Discussion

**SK.** We first examined the effect of fund descriptions on SK. Participants' ratings of knowledge, understanding, and comfortableness investing for each fund formed a reliable SK index (Cronbach's  $\alpha_{\text{High-risk fund}} = .84$ ;  $\alpha_{\text{Low-risk fund}} =$

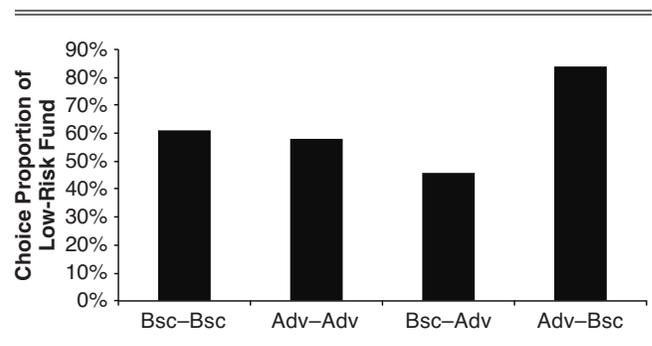
.86) and were thus averaged. Two t-tests comparing the average SK index of the basic versus the advanced descriptions confirmed that the average SK ratings were higher for the basic description than for the advanced description for both the high-risk fund ( $M_{\text{High risk, basic}} = 3.7$  vs.  $M_{\text{High risk, advanced}} = 2.5$ ;  $t(140) = 5.2$ ,  $p < .0001$ ) and the low-risk fund ( $M_{\text{Low risk, basic}} = 4.4$  vs.  $M_{\text{Low risk, advanced}} = 2.6$ ;  $t(140) = 8.0$ ,  $p < .0001$ ). These findings confirm our hypothesis that more elaborate and advanced information can diminish SK.

**Choice.** Figure 1 presents the proportion of participants choosing the low-risk fund in each experimental condition. These data reveal that the choice of the high- versus low-risk fund depended on the funds' descriptions ( $\chi^2(3) = 11.76$ ,  $p < .01$ ): when both funds were described in basic or in advanced terms (Conditions 1 and 2), the majority of participants preferred to invest in the low-risk fund (61% and 58%, respectively). When the high-risk fund was described in advanced terms and the low-risk fund was described in basic terms (Condition 4), the tendency to choose the low-risk fund increased (84%). However, when the high-risk fund was described in basic terms and the low-risk fund was described in advanced terms (Condition 3), the tendency to choose the low-risk fund decreased (46%).

To further examine the impact of fund description on choice, we ran a logistic regression in which we regressed choice of the low-risk fund on two dummy variables—the description of the low-risk fund in advanced terms and the description of the high-risk fund in advanced terms—and the interaction between these two variables. The results indicated that the likelihood of choosing the low-risk fund decreased significantly with advanced description of the low-risk fund ( $\beta = -.91$ ,  $\chi^2(1) = 6.3$ ,  $p < .02$ ) and increased significantly with the advanced description of the high-risk fund ( $\beta = .80$ ,  $\chi^2(1) = 4.9$ ,  $p < .03$ ). There was no significant interaction effect ( $\beta = .17$ ,  $\chi^2(1) = 0.92$ , n.s.).

**Mediation.** We performed a bootstrapping analysis to directly test our hypothesis that fund descriptions affect choice through their influence on SK. We compared participants' ratings of knowledge, understanding, and comfortableness investing in the high- and low-risk funds by subtracting the scores of the low-risk fund from those of the

Figure 1  
CHOICE PROPORTIONS OF THE LOW-RISK FUND (STUDY 3)



Notes: Bsc = basic description; Adv = advanced description. Regarding the fund description pairs on the x-axis, the left-hand fund description refers to the high-risk fund, and the right-hand fund description refers to the low-risk fund. For example, "Adv-Bsc" refers to Condition 4, in which the high-risk fund was described in advanced terms and the low-risk fund was described in basic terms.

high-risk fund. These three difference variables formed a reliable index of relative SK (Cronbach's  $\alpha = .87$ ); therefore, we averaged them.

The mediation analysis included two independent variables, the descriptions of the high- and low-risk funds. Following Preacher and Hayes' (2008) recommendation, we tested two bootstrapping models: In the first model, the description of the high-risk fund was the independent variable and the description of the low-risk fund was a covariate; in the second model, the description of the low-risk fund was the independent variable and the description of the high-risk fund was a covariate. In both models, the mediator was relative SK and the dependent variable was choice of the low-risk fund. We found that relative SK mediated choice in both the first model ( $b = .95$ ; 95% confidence interval = .45, 1.76) and the second model ( $b = -1.25$ ; 95% confidence interval =  $-2.17, -.61$ ). Thus, Study 3's main result (the choice of a fund diminished with the complexity of its description) was mediated by a tendency for participants to rate themselves as relatively less knowledgeable about funds described in more complex terms. Appendix B provides a correlations matrix for all variables included in the mediation analysis.

In summary, the results suggest that a more technical and elaborated description of an investment option, though ostensibly providing additional relevant objective information, can paradoxically deter consumers from choosing that option. We found that this effect held beyond the impact of risk on choice. Moreover, we find that this effect is mediated by consumers' perceptions of their relative SK with regard to the two funds.

Study 3 contrasted the impact of SK and OK on investment decisions. However, we deliberately confounded the manipulations of OK and SK: the more elaborate fund information was also more technical and was thus negatively correlated with SK. In Study 4, we manipulate both OK and SK independently.

#### STUDY 4: SK TRUMPS OK

Study 4 helps establish the importance of SK in financial education in several respects. First, as we noted previously, we vary both OK and SK independently. We manipulate OK through the amount of information provided about investment options; the addition of relevant information should generally increase OK. We manipulate SK by explicitly withholding some investment information; when consumers perceive that they are missing information, SK should decrease, holding objective information constant. Second, we examine continuous allocation of savings among investments rather than a discrete choice between them. Third, we separately measure both perceived level of knowledge (i.e., SK) and confidence in investing to explore the relationship between these constructs. Fourth, we explore the robustness of our findings in a more externally valid context by (1) recruiting a sample of nonstudent adults, who presumably have greater experience than students at making investment decisions; (2) providing an incentive-compatible payoff to participants, thereby increasing their motivation to respond thoughtfully; and (3) using descriptions of investment options taken from actual products listed on The Vanguard Group's website.

Consistent with our previous studies, we hypothesize that explicitly withholding investment information from consumers will undermine their SK about an option. Lower SK should, in turn, lead consumers to allocate less money to that option. In contrast, we do not make a specific prediction with regard to the impact of increasing OK on allocation behavior. Whereas increased SK of an option should lead to increased investment in that option, increased OK of an option may not make it more attractive. Indeed, increasing the OK of an option can sometimes lead consumers to realize that the option is not well suited for their needs. Most importantly, we propose that, to the extent that providing more investment information affects allocation behavior (in any direction), the effect will be mediated by the impact of the objective information on consumers' SK rather than their overall OK scores.

#### Method

*Participants.* We recruited 850 adults through Amazon.com's Mechanical Turk (MTurk) to complete a short survey on financial decisions in return for a \$1 payment (for a recent review regarding MTurk, see Goodman, Cryder, and Cheema 2012). A large majority of participants ( $N = 795$ , 52% female;  $M_{\text{age}} = 32.4$  years,  $SD = 12.3$  years) completing the survey passed an attention filter, and we therefore included them in our analysis.

*Procedure.* Participants were asked to imagine that they receive a \$10,000 bonus from their company and that they may invest the money in an MSCI Emerging Markets ETF, a REIT Index Fund Investor Shares, or both. Next, participants were provided with partial descriptions of these two funds, excerpted from The Vanguard Group's website, and then were asked to allocate the \$10,000 bonus between the two funds. They were explicitly informed that they could allocate all bonus money to a single fund or divide the money between the two funds as they wanted and that investing their money in more than one fund would not incur additional fees. Participants were further informed that two respondents would be selected at random to receive an additional dollar for every \$10 earned on their portfolio during the week following termination of data collection. (In case of negative returns, no additional compensation would be provided.)

Following the allocation task, participants rated the extent to which they understood the information, felt knowledgeable, and were confident in their knowledge of each investment option, using seven-point scales (1 = "not at all," and 7 = "very much"). Next, participants answered two sets of four multiple-choice questions that we designed to measure their OK of each investment option (see Appendix C).

We designed the descriptions of investment options to manipulate participants' levels of both OK and SK. We attempted to manipulate OK through the amount of information provided for each fund (low, high). We refer to this as the provided information (PI). We attempted to manipulate SK by making some participants aware that they were missing some fund information. Specifically, in the missing information (MI) conditions, additional investment information was presented but blotted out, leaving deletion marks (for samples of stimuli, see Figure 2, Panels A–C). Note that the MI manipulation added information that was blotted out so this manipulation did not affect the objective

Figure 2  
DESCRIPTIONS OF THE DEFAULT INVESTMENT OPTION  
(STUDY 4)

<i>A: High PI, No MI</i>	
<b>MSCI Emerging Markets ETF</b>	
This fund invests in stocks of companies located in emerging markets around the world, such as China and Brazil. This fund has high potential for growth, but also high risk; share value may swing up and down more than that of stock funds that invest in developed countries. One of the fund's primary risks is the chance that world events—such as political upheaval, financial troubles, or natural disasters—will adversely affect the value of securities issued by companies in foreign countries or regions. This risk is especially high in emerging markets.	
<i>B: Low PI, No MI</i>	
<b>MSCI Emerging Markets ETF</b>	
This fund invests in stocks of companies located in emerging markets around the world, such as China and Brazil. One of the fund's primary risks is the chance that world events—such as political upheaval, financial troubles, or natural disasters—will adversely affect the value of securities issued by companies in foreign countries or regions.	
<i>B: Low PI, MI</i>	
<b>MSCI Emerging Markets ETF</b>	
This fund invests in stocks of companies located in emerging markets around the world, such as China and Brazil. One of the fund's primary risks is the chance that world events—such as political upheaval, financial troubles, or natural disasters—will adversely affect the value of securities issued by companies in foreign countries or regions.	

level of information presented. We predicted that participants in the MI condition would feel less knowledgeable about the relevant investment option(s) than those in corresponding no-MI condition.

We varied the objective level of provided information (PI) and missing information (MI) regarding each investment option in a full factorial design. We randomly assigned participants to a 2 (ETF PI: low, high) × 2 (ETF MI: MI, no MI) × 2 (REIT PI: low, high) × 2 (REIT MI: MI, no MI) between-subjects design. We predicted that participants would allocate more money to an investment option about which they felt more knowledgeable and that SK would be affected by both PI and MI manipulations.

**Results**

*OK manipulation check.* We computed individual OK measures for each investment option by calculating the number of correct answers in the OK surveys. Two t-tests confirmed that providing participants with more information about an investment resulted in modestly but significantly higher measured OK (ETF:  $M_{Low PI} = 3.10$  vs.  $M_{High PI} = 3.21$ ;  $t(793) = -1.98, p < .05$ ; REIT:  $M_{Low PI} = 2.97$  vs.  $M_{High PI} = 3.36$ ;  $t(793) = -6.04, p < .05$ ).

*Investment SK measure and manipulation check.* Two factor analyses (one for each investment option) revealed that the SK and confidence items loaded on a single factor. Further analysis revealed that these items formed two reli-

able measured SK scales, one for each investment option ( $\alpha_{ETF} = .85, \alpha_{REIT} = .85$ ), and we therefore averaged items for each scale. An analysis of variance with repeated measures on the two measured SK scales (for the two investment options) confirmed that having relevant investment information blotted out (MI condition) resulted in lower measured SK about that investment relative to the investment that had no blotted out information (ETF:  $M_{MI} = 4.25$  vs.  $M_{No MI} = 4.42$ ;  $t(793) = -1.79, p < .07$ ; REIT:  $M_{MI} = 4.09$  vs.  $M_{No MI} = 4.51$ ;  $t(793) = -4.36, p < .05$ ).

*Allocation behavior.* We ran a regression analysis to measure the effects of MI and PI of ETF and REIT on allocation to REIT. The results reveal three significant main effects and one marginally significant main effect. Specifically, and consistent with our predictions, we find that consumers allocated less money to the option about which they felt less knowledgeable: MI for ETF increased allocation to REIT ( $\beta = .11, t(790) = 3.27, p < .01$ ), and MI for REIT decreased allocation to REIT ( $\beta = -.06, t(790) = -1.70, p = .09$ ); the omnibus effect of MI is statistically significant ( $p < .05$ ). Moreover, as we predicted, consumers did not always allocate more money to the option for which they received more information: more PI for ETF increased allocation to REIT ( $\beta = .13, t(790) = 3.84, p < .01$ ), whereas more PI for REIT increased allocation to REIT ( $\beta = .08, t(790) = 2.37, p < .05$ ). This suggests that respondents may have objectively found the REIT more attractive than the ETF. Panels A and B in Table 3 provide the average allocation to REIT per MI and PI conditions, respectively.

*Mediation.* We performed a bootstrapping analysis to examine whether allocation behavior was mediated by measured SK and/or measured OK. The analysis included four independent variables: ETF-MI, REIT-MI, ETF-PI, and REIT-PI. Drawing on Preacher and Hayes (2008), we tested four bootstrapping models, each using one independent variable and the other three independent variables as covariates. All four models included four mediators: ETF-SK, REIT-SK, ETF-OK, and REIT-OK. Table 4 describes each bootstrap model and depicts the results. Appendix D provides a correlations matrix for all variables included in the mediation analysis.

Table 3  
MEAN ALLOCATIONS (STUDY 4)

<i>A: Allocation to REIT, per MI Condition</i>			
	REIT		Total
	No MI	MI	
<i>ETF</i>			
No MI	\$5,150	\$4,723	\$4,937
MI	\$5,510	\$5,392	\$5,451
Total	\$5,330	\$5,058	
<i>B: Allocation to REIT, per PI Condition</i>			
	REIT		Total
	PI <sub>High</sub>	PI <sub>Low</sub>	
<i>ETF</i>			
PI <sub>High</sub>	\$5,818	\$5,205	\$5,512
PI <sub>Low</sub>	\$4,966	\$4,819	\$4,893
Total	\$5,392	\$5,012	

Table 4  
BOOTSTRAPPING ANALYSIS (STUDY 4)

Model	Covariates	Independent Variable	Mediator	Indirect Effect Coefficient	Mediator's 95% Confidence Interval
1	REIT-MI	ETF-MI	ETF-SK	58.8	(-11.0, 138.0)
	ETF-PI		REIT-SK <sup>a</sup>	101.0	(29.8, 185.7)
	REIT-PI		ETF-OK	.3	(-4.9, 10.8)
2	ETF-MI	REIT-MI	REIT-OK	-1	(-9.1, 7.2)
	ETF-PI		ETF-SK	65.3	(-2.4, 143.5)
	REIT-PI		REIT-SK <sup>a</sup>	-160.9	(-254.3, -85.1)
3	ETF-MI	ETF-PI	ETF-OK	-1.6	(-20.3, 10.3)
	REIT-MI		REIT-OK	-1.5	(-17.2, 3.0)
	REIT-PI		ETF-SK <sup>a</sup>	-120.4	(-203.6, -51.3)
4	ETF-MI	REIT-PI	REIT-SK	22.3	(-48.2, 94.0)
	REIT-MI		ETF-OK	1.6	(-10.5, 19.3)
	ETF-PI		REIT-OK	2.0	(-2.6, 19.1)
	ETF-MI		ETF-SK	19.1	(-44.7, 94.3)
	REIT-MI		REIT-SK	-23.2	(-98.7, 45.6)
	ETF-PI		ETF-OK	-7	(-14.6, 4.8)
			REIT-OK	14.1	(-18.9, 50.1)

<sup>a</sup>A significant mediator.

The results of this analysis confirm that the effects of MI on allocation to REIT are mediated by SK. When the description of ETF was missing information (ETF-MI condition) participants rated their SK about REIT higher, and consequently allocated more money to REIT; when the description of REIT was missing information (REIT-MI condition) participants rated their SK about REIT lower and therefore allocated less money to REIT. Notably, the effect of PI on allocation is not mediated by participants' OK score. Instead, SK mediates the effect of PI on allocation to the extent that PI affected SK. Specifically, the effect of more PI for ETF (ETF-PI condition) on allocation behavior is mediated by participants' ratings of their SK (but not their OK) about ETF. Further analysis verified that the more information that was provided for ETF, the higher participants rated their SK about ETF ( $M_{Low\ PI} = 4.18$  vs.  $M_{High\ PI} = 4.50$ ;  $t(793) = -3.43$ ,  $p < .001$ ) and the less money they allocated to REIT. However, the effect of providing more information for REIT (REIT-PI condition) on allocation behavior is not mediated by SK or OK scores, presumably because PI for REIT did not affect participants' SK ratings of ETF ( $M_{Low\ PI} = 4.33$  vs.  $M_{High\ PI} = 4.26$ ;  $t(793) = .76$ , n.s.). A similar bootstrapping analysis, in which we used the differences between REIT and ETF in measured OK and SK, revealed similar results.

### Discussion

The results of Study 4 support our central hypothesis that consumers are more likely to allocate money to investments about which they feel more knowledgeable. Moreover, the results expose a fundamental difference in the impact of SK versus OK on investment allocations. Whereas increasing SK about an investment consistently increases the attractiveness of that investment, increasing OK about an investment does not necessarily increase its attractiveness. In Study 4, more PI about the ETF decreased its attractiveness (more money was allocated to REIT), whereas more PI about the REIT increased its attractiveness. That is, we observe no consistent effect of providing more information

on an investment per se. Not surprisingly (at least in hindsight), the effect of providing more investment information on allocation behavior depends on the nature of the information and the particular investment in question. Thus, educating consumers about an investment option may help them realize that an investment is not for them. Accordingly, participants' OK scores did not mediate the effect of investment information on allocation behavior. However, to the extent that providing more investment information affected participants' subjective feeling of knowledge about an investment, SK ratings mediated their allocation behavior. These Study 4 results reinforce findings from Studies 1-3 that SK strongly influences investment behavior when holding constant or controlling for OK.

Study 4's finding that more PI about ETF increased consumers' SK of ETF may initially seem to contradict Study 3's finding that SK decreased with elaborated information about life cycle funds. We note that the result in Study 3 was due to the negative correlation between information and SK that we deliberately induced by making elaborated information more complex. In contrast, in Study 4, the added information in the high-PI conditions (excerpted from The Vanguard Group's web page) did not include distinctly more complex or technical information than in the low-PI condition. To validate this assumption, we ran two regression analyses, one for ETF and one for REIT, in which we regressed measured SK on the respective PI condition. The rationale was that if participants perceived the investment information in the high-PI conditions as more complex or difficult to understand than that in corresponding low-PI conditions, their SK for that investment should be negatively affected. We found that the presentation of more investment information did not have a significant effect on measured SK for REIT ( $\beta = -.03$ ,  $t(793) = -.8$ , n.s.); for ETF, we found that more PI increased measured SK ( $\beta = .12$ ,  $t(793) = 3.4$ ,  $p < .001$ ). These findings contradict the notion that added information made the available investments seem more complex. In summary, the results of Studies 3 and 4 collectively show that providing additional information about a financial instrument can diminish SK if the added information is complex or technical, resulting in reduced willingness to choose that option; however, if the added information is easy to understand, it can instead enhance SK (recall that SK is often positively related to OK [Alba and Hutchinson 1987; Radecki and Jaccard 1995]).

Although measured SK mediated the effect of ETF-MI, REIT-MI, and ETF-PI on allocation, we did not find measured OK to be a mediator of any of the independent variables. One explanation for this null effect is that presented investment information affects choice primarily through its impact on SK rather than its effect on OK. This finding is compatible with prior research showing that the effect of financial professionals' and investors' OK of mutual funds on self-reported willingness to take risks in mutual fund investments was mediated by their self-reported SK of mutual funds (Wang 2009). In addition, given that confidence is positively correlated with SK, our findings are compatible with those of Fernandes, Lynch, and Netemeyer (2012), described previously. Another possible explanation for our findings regarding the inferior pre-

dictive power of OK involves the validity of our OK measure. Recall that our OK measure included four questions about each investment option. These questions were focused on the information presented in each investment description, which we took from The Vanguard Group's website. Although these questions provided a successful check of our OK manipulation, we had no means of otherwise testing its validity as a measure of OK. Further research might attempt to replicate our results using more sensitive and independently validated measures of financial OK.

With Study 4, we also aimed to explore the relationship between consumers' SK and their confidence in their knowledge. For both investment options (ETF and REIT), factor analysis revealed that SK and confidence in knowledge items formed a single index. This finding is consistent with the notion that consumers' confidence in their knowledge may be construed as a measure or manifestation of SK.

In summary, the results of Study 4 provide strong support for the notion that consumers are more likely to allocate money to the high SK investment. Furthermore, we found evidence that SK may be affected by the available investment information as well as by the salience of missing information, which is consistent with prior research documenting a positive relationship between OK and SK (Carlson et al. 2009). Finally, although the role of OK in mediating the impact of financial information on investment behavior remains an open question, we found that in some cases, SK appears to mediate the impact of product information on investment allocations.

#### GENERAL DISCUSSION

Although previous research has acknowledged the unique impact of SK on judgment and choice, little is known about the effect of SK on investing behavior and how it interacts with OK. The impact of SK on investing behavior is especially noteworthy because most investment decisions are made under uncertainty; that is, they are made without complete knowledge of the probability distribution over possible outcomes of each option. Such uncertainty is manifested not only in consumers' levels of OK but also in their levels of SK. That is, consumers typically make financial decisions under conditions of both imperfect OK *and* moderate to low SK.

Taken together, the present studies demonstrate that financial information influences consumer investment decisions through its impact on SK, even when controlling for or holding constant consumers' relevant OK. In particular, (1) consumers who felt more knowledgeable about target investment options (vs. reference options) were more likely to choose a riskier investment option; (2) consumers who were prompted to feel more knowledgeable about retirement saving plans were more willing to invest in them; (3) consumers were more likely to invest in a life cycle fund that shifts its balance between stocks and bonds over time when its description was basic compared with when its description was elaborated and more technical; and (4) consumers were more likely to allocate money to an investment about which they felt more knowledgeable, regardless of how much objective investment information was presented. Moreover, the effect of additional investment information

on allocation was not mediated by its impact on measured OK but rather by its impact on SK (at least in the case of ETF).

In an attempt to help consumers choose financial products more wisely, governments, employers, and financial institutions have tried to enhance consumer financial knowledge through various forms of financial education. Unfortunately, such attempts to educate have not always succeeded in improving consumer financial decisions. The current research suggests a possible reason for this curious finding: financial education programs, in their attempts to enhance consumers' OK, can actually undermine consumers' level of SK.

Naturally, we do not propose that financial education programs should be abandoned. Instead, we argue that financial educators should pay special attention to their impact on consumers' SK about what they have learned. If too much information is presented in too technical a format, consumers may be deterred from those investment options and may otherwise choose inferior alternatives. In contrast, providing simple investment descriptions in layman's terms may enhance SK and willingness to invest.

It is also important to note that high SK is a double-edged sword. If consumers are made to feel especially competent in their understanding of a truly complex financial instrument, they may invest without due caution. Indeed, previous research on consumer goods has indicated that consumers who believe themselves to be highly knowledgeable search less for product information and are thus less likely to learn new product information than are moderately knowledgeable consumers (Alba and Hutchinson 2000; Bettman and Park 1980; Johnson and Russo 1984).

Therefore, we propose that consumer education programs should aim to enhance both objective and subjective consumer knowledge. As our studies show, if a consumer knows more about an investment (i.e., OK is high) but feels that he is not sufficiently knowledgeable about it (i.e., SK is low), he is more likely to choose the safer or more familiar option, regardless of which option best suits his needs. In contrast, as mentioned previously, if a consumer feels particularly knowledgeable about an investment (i.e., SK is high) without having sufficient actual knowledge necessary to make a good decision (i.e., OK is low), she is likely to act boldly even if a safer or more familiar option better suits her needs.

Thus, the best investor education interventions should promote both OK and SK about more complex, speculative, or novel investments so that consumers invest only to the extent that these options meet their needs. Our studies suggest that one way to reach this goal is to provide consumers with only the most relevant information in terms that the consumer can easily understand. We note that The Vanguard Group's website design captures the spirit of what we propose (e.g., <https://investor.vanguard.com/home/>). The main web page for each investment option presents only the primary elements of the investment, described in only basic terms. That is, although the main web page may only modestly enhance consumer OK regarding the investment at hand, it is also not likely to diminish their corresponding SK. However, more sophisticated consumers, who may believe that they can apprehend more complex investment information, can follow a link presented below the basic

information to receive more detailed and technical investment information. Thus, although all the relevant investment information is available, consumers can control the complexity and the amount of investment information to which they are exposed. Further research might examine more directly the effect that various web configurations have on consumers' OK and SK and the impact this has in turn on the quality of financial choices.

### Appendix A

#### CORRELATIONS MATRIX FOR ALL VARIABLES INCLUDED IN THE MEDIATION ANALYSIS (STUDY 2)

	Question Difficulty (Difficult)	Self-Rated SK Scale
Self-rated SK scale	$r = -.32$ $p < .0001$	
Willingness to join 401(k) plans	$r = -.16$ $p = .041$	$r = .45$ $p < .0001$

### Appendix B

#### CORRELATIONS MATRIX FOR ALL VARIABLES INCLUDED IN THE MEDIATION ANALYSIS (STUDY 3)

	Description of High-Risk Fund	Description of Low-Risk Fund	Relative SK
Description of low-risk fund	$r = -.035$ $p = .674$		
Relative SK	$r = -.420$ $p < .001$	$r = .542$ $p < .001$	
Choice of low-risk fund	$r = .189$ $p = .023$	$r = -.215$ $p = .010$	$r = -.398$ $p < .001$

### Appendix D

#### CORRELATIONS MATRIX FOR ALL VARIABLES INCLUDED IN THE MEDIATION ANALYSIS (STUDY 4)

	REIT-MI	ETF-MI	REIT-PI	ETF-PI	ETF-SK	REIT-SK	ETF-OK	REIT-OK
ETF-MI	$r = .044$ $p = .217$							
REIT-PI	$r = .014$ $p = .700$	$r = -.021$ $p = .546$						
ETF-PI	$r = .002$ $p = .964$	$r = -.024$ $p = .504$	$r = -.009$ $p = .808$					
ETF-SK	$r = -.067$ $p = .057$	$r = -.064$ $p = .073$	$r = -.020$ $p = .581$	$r = .121$ $p = .001$				
REIT-SK	$r = -.153$ $p < .001$	$r = .092$ $p = .010$	$r = -.027$ $p = .446$	$r = .019$ $p = .586$	$r = .763$ $p < .001$			
ETF-OK	$r = -.070$ $p = .048$	$r = .010$ $p = .787$	$r = -.033$ $p = .359$	$r = .070$ $p = .048$	$r = .024$ $p = .494$	$r = .017$ $p = .642$		
REIT-OK	$r = -.020$ $p = .573$	$r = -.007$ $p = .840$	$r = .210$ $p < .001$	$r = .028$ $p = .426$	$r = .047$ $p = .183$	$r = .055$ $p = .122$	$r = .233$ $p < .001$	
Allocation to REIT	$r = -.052$ $p = .141$	$r = .107$ $p = .003$	$r = .078$ $p = .028$	$r = .130$ $p < .001$	$r = -.076$ $p = .033$	$r = .118$ $p = .001$	$r = .024$ $p = .490$	$r = .056$ $p = .117$

### REFERENCES

- Alba, Joseph W. and Wesley J. Hutchinson (1987), "Dimensions of Consumer Expertise," *Journal of Consumer Research*, 13 (4), 411-54.
- and — (2000), "Knowledge Calibration: What Consumers Know and What They Think They Know," *Journal of Consumer Research*, 27 (2), 123-56.

### APPENDIX C

Please answer the following questions about MSCI Emerging Markets ETF:

1. MSCI Emerging Markets ETF invests mainly in:
  - a. Companies that invest in emerging markets
  - b. Companies located in emerging markets
2. MSCI Emerging Markets ETF invests in emerging markets:
  - a. In the far east
  - b. Around the world
3. MSCI Emerging Markets ETF share values may swing up and down \_\_\_\_\_ than that of stock funds that invest in developed countries.
  - a. More
  - b. Less
4. Foreign country/regional risk is \_\_\_\_\_ in emerging markets.
  - a. High
  - b. Low

Please answer the following questions about REIT Index Fund Investor Shares:

1. REIT Index Fund Investor Shares invests in:
  - a. Companies that develop revolving energy technologies
  - b. Companies that purchase real estate
2. REIT Index Fund Investor Shares tend to perform \_\_\_\_\_ stocks and bonds.
  - a. Similarly to
  - b. Differently than
3. One of the REIT Index Fund Investor Shares' primary risks is:
  - a. Its narrow scope
  - b. Stock market risk
4. REIT Index Fund Investor Shares may offer diversification to a portfolio of:
  - a. Stocks and bonds
  - b. Foreign investments

- Bayer, Patrick J., B. Douglas Bernheim, and John K. Scholz (2008), "The Effects of Financial Education in the Workplace: Evidence from a Survey of Employers," Working Paper No. 5655, National Bureau of Economic Research Working Paper Series.
- Bearden, William O., David M. Hardesty, and Randall L. Rose (2001), "Consumer Self-Confidence: Refinements in Conceptu-

- alization and in Measurement,” *Journal of Consumer Research*, 28 (1), 121–34.
- Benartzi, Shlomo and Richard H. Thaler (2001), “Naive Diversification Strategies in Defined Contribution Savings Plans,” *American Economic Review*, 91 (1), 79–98.
- , ———, Stephen P. Utkus, and Cass R. Sunstein (2007), “The Law and Economics of Company Stock in 401(k) Plans,” *Journal of Law and Economics*, 50 (1), 45–79.
- Bettman, James R. and C. Whan Park (1980), “Effects of Prior Knowledge and Experience and Phase of the Choice Process on Consumer Decision Processes: A Protocol Analysis,” *Journal of Consumer Research*, 7 (3), 234–48.
- Boshara, Ray, John Gannon, Lewis Mandell, John W.R. Phillips, and Stephen Sass (2010), “Consumer Trends in the Public, Private, and Nonprofit Sector,” white paper, National Endowment for Financial Education.
- Brookings Institution (2013), “Retirement Security Project,” (accessed March 18, 2013), [available at <http://www.retirementsecurityproject.org>].
- Brucks, Merrie (1985), “The Effects of Product Class Knowledge on Information Search Behavior,” *Journal of Consumer Research*, 12 (1), 1–16.
- Carlson, Jay P., Leslie H. Vincent, David M. Hardesty, and William O. Bearden (2009), “Objective and Subjective Knowledge Relationships: A Quantitative Analysis of Consumer Research Findings,” *Journal of Consumer Research*, 35 (5), 864–76.
- Choi, James J., David Laibson, and Brigitte C. Madrian (2005a), “Are Empowerment and Education Enough? Underdiversification in 401(k) Plans,” *Brookings Papers on Economic Activity*, 36 (2), 151–98.
- , ———, and ——— (2005b), “\$100 Bills on the Sidewalk: Suboptimal Investment in 401(K) Plans,” Working Paper No. 11554, National Bureau of Economic Research Working Paper Series.
- , ———, ———, and A. Metrick (2002), “Defined Contribution Pensions: Plan Rules, Participant Choices, and the Path of Least Resistance,” in *Tax Policy and the Economy*, Vol. 16. Cambridge, MA: National Bureau of Economic Research, 67–113.
- Cole, Shawn and Gauri K. Shastry (2009), “If You Are So Smart, Why Aren’t You Rich? The Effects of Education, Financial Literacy, and Cognitive Ability on Financial Market Participation,” working paper, Harvard Business School and University of Virginia.
- Duhan, Dale F., Scott D. Johnson, James B. Wilcox, and Gilbert D. Harrell (1997), “Influences on Consumer Use of Word-of-Mouth Recommendation Sources,” *Journal of the Academy of Marketing Science*, 25 (4), 283–95.
- Ellen, Pam Scholder (1994), “Do We Know What We Need to Know? Objective and Subjective Knowledge Effects on Pro-ecological Behaviors,” *Journal of Business Research*, 30 (1), 43–52.
- Fernandes, Daniel, John G. Lynch Jr., and Richard G. Netemeyer (2012), “The Effect of Financial Literacy and Financial Education on Downstream Financial Behavior,” working paper, Leeds School of Business, University of Colorado Boulder.
- Fox, Craig R. and Amos Tversky (1995), “Ambiguity Aversion and Comparative Ignorance,” *Quarterly Journal of Economics*, 110 (3), 585–603.
- and Martin Weber (2002), “Ambiguity Aversion, Comparative Ignorance, and Decision Context,” *Organizational Behavior and Human Decision Processes*, 88 (1), 476–98.
- Goodman, Joseph K., Cynthia E. Cryder, and Amar Cheema (2012), “Data Collection in a Flat World: The Strengths and Weaknesses of Mechanical Turk Samples,” *Journal of Behavioral Decision Making*, (published electronically April 2), [DOI:10.1002/bdm.1753].
- Graham, John R., Campbell R. Harvey, and Hai Huang (2009), “Investor Competence, Trading Frequency and Home Bias,” *Management Science*, 55 (7), 1094–106.
- Heath, C. and A. Tversky (1991), “Preference and Belief: Ambiguity and Competence in Choice Under Uncertainty,” *Journal of Risk and Uncertainty*, 4 (1), 5–28.
- Johnson, Eric J. and J. Edward Russo (1984), “Product Familiarity and Learning New Information,” *Journal of Consumer Research*, 11 (1), 542–50.
- Langer, Thomas and Craig R. Fox (2012), “Partition-Dependence, Unit-Dependence, and Procedure-Dependence in Consumer Financial Decisions,” working paper, University of Muenster.
- Lusardi, Annamaria (2008), “Household Saving Behavior: The Role of Financial Literacy, Information, and Financial Education Programs,” Working Paper 13824, National Bureau of Economic Research Working Paper Series.
- and Olivia S. Mitchell (2007), “Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education,” *Business Economics*, 42 (1), 35–44.
- Madrian, Brigitte C. and Dennis F. Shea (2001a), “The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior,” *Quarterly Journal of Economics*, 116 (4), 1149–87.
- and ——— (2001b), “Preaching to the Converted and Converting Those Taught: Financial Education in the Workplace,” working paper, University of Chicago.
- McKenzie, Craig R.M. and Michael J. Liersch (2011), “Misunderstanding Savings Growth: Implications for Retirement Savings Behavior,” *Journal of Marketing Research*, 48 (Special Issue), S1–S13.
- Moorman, Christine, Kristin Diehl, David Brinberg, and Blair Kidwell (2004), “Subjective Knowledge, Search Location, and Consumer Choice,” *Journal of Consumer Research*, 31 (3), 347–56.
- Mossman, Beal Monroe, III, and Robert C. Ziller (1968), “Self-Esteem and Consistency of Social Behavior,” *Journal of Abnormal Psychology*, 73 (4), 363–67.
- Navarro-Martinez, Daniel, Linda Court Salisbury, Katherine N. Lemon, Neil Stewart, William J. Matthews, and Adam J.L. Harris (2011), “Minimum Required Payment and Supplemental Information Disclosure Effects on Consumer Debt Repayment Decisions,” *Journal of Marketing Research*, 48 (Special Issue), S60–S77.
- Park, C. Whan and V. Parker Lessig (1981), “Familiarity and Its Impact on Consumer Decision Biases and Heuristics,” *Journal of Consumer Research*, 8 (2), 223–31.
- , David L. Mothersbaugh, and Lawrence Feick (1994), “Consumer Knowledge Assessment,” *Journal of Consumer Research*, 21 (1), 71–82.
- Parker, Andrew M., Wandi Bruine De Bruin, Joanne Yoong, and Robert Willis (2011), “Inappropriate Confidence and Retirement Planning: Four Studies with a National Sample,” *Journal of Behavioral Decision Making*, (published electronically June 15), [DOI:10.1002/bdm.745].
- Preacher, Kristopher J. and Andrew F. Hayes (2008), “Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models,” *Behavior Research Methods*, 40 (3), 879–91.
- Punj, Girish N. and Richard Staelin (1983), “A Model of Consumer Information Search Behavior for New Automobiles,” *Journal of Consumer Research*, 9 (4), 366–80.
- Radecki, Carmen M. and James Jaccard (1995), “Perceptions of Knowledge, Actual Knowledge, and Information Search Behavior,” *Journal of Experimental Social Psychology*, 31 (2), 107–138.
- Raju, Puthankurissi S., Subhash C. Lonial, and W. Glynn Mangold (1995), “Differential Effects of Subjective Knowledge, Objective Knowledge, and Usage Experience on Decision Making: An Exploratory Investigation,” *Journal of Consumer Psychology*, 4 (2), 153–80.

- Soll, Jack B., Ralph L. Keeney, and Richard P. Larrick (2011), "Consumers' Understanding of Credit Card Debt: Shortcomings and Solutions," paper presented at 2011 Boulder Summer Conference on Consumer Financial Decision Making, Boulder, CO (June 26–28).
- Stango, Victor and Jonathan Zinman (2009a), "Exponential Growth Bias and Household Finance," *Journal of Finance*, 64 (6), 2807–849.
- and ——— (2009b), "Fuzzy Math, Disclosure Regulation and Credit Market Outcomes: Evidence from Truth in Lending Reform," working paper, Graduate School of Management, University of California, Davis.
- Wang, Alex (2009), "Interplay of Investors' Financial Knowledge and Risk Taking," *Journal of Behavioral Finance*, 10 (4), 204–213.
- Zhao, Xinshu, John G. Lynch Jr., and Qimei Chen (2010), "Reconsidering Baron and Kenny: Myths and Truths About Mediation Analysis," *Journal of Consumer Research*, 37 (2), 197–206.

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