OUT OF CONTROL OR RIGHT ON THE MONEY?
FUNDER SELF-EFFICACY AND CROWD BIAS IN EQUITY CROWDFUNDING

REGAN M. STEVENSON[1*]
Tel: (812) 855-2182
Email: *rstev@indiana.edu*

MICHAEL P. CIUCHTA[2]
Tel: (978) 934-2993
Email: *michael_ciuchta@uml.edu*

CHAIM LETWIN[3]
Tel: (617) 573-8363
Email: *cletwin@suffolk.edu*

JENNI DINGER[3]
Tel: (978) 934 – 2993
Email: *jdinger@suffolk.edu*

JEFFREY B. VANCOUVER[4]
Tel: (740) 593 – 1071
Email: *vancouve@ohio.edu*

[1] Department of Management & Entrepreneurship
Kelley School of Business, Indiana University
1275 E 10th St. Bloomington, Indiana, USA 47405

[2] Department of Marketing, Entrepreneurship, & Innovation
UMASS – Lowell, Robert J. Manning School of Business
One University Ave. Lowell, MA, USA 01854

[3] Department of Management & Entrepreneurship
Sawyer Business School, Suffolk University
73 Tremont St. Boston, MA, USA 02108

[4] Department of Psychology
Ohio University
1 Ohio University. Athens, OH, USA 45701

[*]Corresponding Author

Keywords: Self-efficacy, Control theory, Entrepreneurship, Equity Crowdfunding, Experiment.

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ABSTRACT

Our findings extend the entrepreneurship literature by highlighting the mechanism through which self-efficacy can hinder rather than enhance performance in entrepreneurial settings. Using two complementary experimental studies and a third quasi-experimental field study on equity crowdfunding decisions, we demonstrate that self-efficacy is negatively related to decision-making performance. This relationship is mediated by reduced searching effort. Our research also indicates that high self-efficacy funders tend to exhibit a "crowd bias" whereby they over-weight the opinions of the crowd, increasing the likelihood that they will fund poor quality ventures when such ventures are favored by the crowd. We introduce the term crowd bias and explore its effects, establishing that social indicators in the form of crowd cues can exasperate the negative effects of self-efficacy.

1. Executive Summary

In this research, we present three complementary studies grounded in control theory (Powers, 1973; Vancouver et al., 2001). Specifically, we present two experiments in which we develop a novel manipulation of self-efficacy to investigate equity crowdfunding decisions at the individual funder level. We also present a third quasi-experimental field study in which we measure self-efficacy using a previously validated measure (McGee et al., 2009). Although on the surface it appears somewhat counter-intuitive, we hypothesize and find that self-efficacy is negatively related to funder decision-making performance. Specifically, inflated funder self-efficacy reduces the likelihood that funders will select high-quality investment options over low-quality investment options via reduced funder effort. This is a novel insight for the entrepreneurship literature, given that previous research has shown self-efficacy to generally have a positive impact on entrepreneurial outcomes.

We also find that self-efficacy appears to increase a funder's "crowd bias", which we define broadly as *an individual's tendency to follow the opinions of the crowd despite the presence of contrary objective quality indicators.* Thus, our research reveals that amateur funders who are high in self-efficacy appear to be less likely to recognize and react to negative pitch cues when positive cues from the crowd are present, leading them to invest nearly three times as much in a poor quality venture, when compared with a high knowledge group. This finding has important

implications for policy. First, given that public opinions are path dependent (Salganik et al., 2006), regulators might explore how they can offset the detrimental effects of crowd bias arising from an over-inflated belief in one's own ability. One suggestion would be to offer formal training programs for novice equity crowdfunders. As our study demonstrates even short online training modules can positively influence the accuracy of individual funding decisions. Additional practical implications and policy suggestions are discussed in this research.

2. Introduction

How do crowdfunders decide which projects to fund? To answer this question, scholars have often relied on signaling theory (Spence, 1973) to explain why certain projects are favored over others. According to this theory, certain quality cues (e.g., human and social capital cues; Ahlers et al., 2015) are effective at conveying quality and increasing the overall likelihood that a venture will be successful at raising capital (Anglin et al., 2018; Plummer et al., 2016). Signaling theory, however, makes the inherent assumption that informational cues are both *observed* and *understood* somewhat uniformly by funders. We argue, in equity crowdfunding, whereby *amateur* funders with limited prior funding experience invest in risky ventures, this conjecture is less likely to apply. Thus, in this paper, we relax the assumption of uniform perceptivity amongst funders, and investigate the underlying reasons why certain informational cues may be less likely to be acted upon by some individual funders relative to others.

Specifically, we consider the role of self-efficacy in crowdfunding decisions, establishing that individual funding decisions are negatively influenced by funder self-efficacy through funder searching effort.[1] We concentrate on self-efficacy as our primary individual-level construct because it is a core explanatory variable for individual task performance (Judge et al., 2007; Locke et al., 1984), particularly as it relates to individual effort and resource allocation decisions (e.g., Gist and Mitchell, 1992; Whyte et al., 1997; Yeo and Neal, 2013). Self-efficacy

[1] Our dependent variable is *funder decision-making performance*, which we define as the propensity to allocate funds to high-quality crowdfunding pitches relative to low-quality crowdfunding pitches.

has also been shown to be highly relevant in the entrepreneurship setting (Baron et al., 2016; Hechavarria et al., 2012; Hmieleski et al., 2013; Segal et al., 2005; Tumasjan and Braun, 2012).

Our conceptual model also introduces and explores the phenomenon of "crowd bias", which we define as *an individual's tendency to follow the opinions of the crowd despite the presence of contrary objective quality indicators.* Using a moderated mediation model, we investigate what individual funders do when the crowd provides favorable social information about a crowdfunding venture that is inherently of low quality. We find that self-efficacy increases a funder's crowd bias. Because crowdfunding pitches are naturally "noisy" (Plummer et al., 2016), fully separating crowd cues and pitch quality indicators in archival pitch data presents a methodological difficulty. To overcome this challenge, we develop a set of carefully controlled crowdfunding pitch manipulations that provide us with precise and fully discernible measures of pitch quality and crowd cues. We use these manipulations across two lab-based experiments, and then follow up with a quasi-experimental field study.

To develop our theoretical model, we draw on control theory (Powers, 1973). Control theory explains how task performance is influenced by domain-specific self-efficacy or external feedback (Schmidt and DeShon, 2009; Vancouver et al., 2002). Applying the tenets of control theory, we build upon a growing body of research that emphasizes that the usefulness of information conveyed in a pitch depends on the funders' perceptive processes (Allison et al., 2017; Drover et al., 2018; Johnson et al., 2018). Relatedly, we also respond to prior calls to investigate how individual effort examining a pitch can influence crowdfunding outcomes (Davis et al., 2017).[2]

Our study contributes to the literature in several ways. First, we use control theory to question a core theoretical assumption (i.e., the assumption that self-efficacy positively affects performance) that has gone largely unchallenged in the entrepreneurship literature. Our finding

[2] Davis and colleagues (2017) called for scholars to, "consider exploring the extent to which individual funders' viewing experiences (i.e., how much time they spend examining a pitch, over what period of time…) influence their decision to provide capital." Although the operationalization in this research is specific to effort, rather than "time spent", it falls within the scope of "individual funders' viewing experiences.

that self-efficacy is negatively related to funder decision-making is particularly novel for the entrepreneurship literature given that self-efficacy has been commonly associated with positive outcomes for entrepreneurs. Thus, we introduce an alternative theoretical perspective into the entrepreneurship literature that may explain prior null findings and that future research can use in tandem with self-efficacy/social-cognitive theory. Second, our study extends the construct of entrepreneurial self-efficacy (Chen et al., 1998) to the realm of venture investing. Specifically, we explore the relevance of entrepreneurial self-efficacy for non-entrepreneur decisions, identifying a mediating mechanism (i.e., search effort) that could be applicable in future entrepreneurial self-efficacy research. Third, we introduce the concept of "crowd bias" – *an individual's tendency to follow the opinions of the crowd despite the presence of contrary objective quality indicators*. Our research demonstrates that self-efficacy increases crowd bias, while funding knowledge decreases crowd bias. Thus, we add to the literature by introducing a new type of informational cue and establishing that this cue is acted upon differently by individuals, suggesting that pitch cues are more ambiguous than previously assumed.

3. Theory and Hypotheses

3.1. The equity crowdfunding context

Traditionally, the venture funding literature has focused on professional funders such as venture capitalists or angel investors (Drover et al., 2014; Mitteness et al., 2012; Murnieks et al., 2016; Shepherd et al., 2000). These funders tend to rely on their sophisticated knowledge when making funding decisions. More recently, amateurs have begun to participate in the funding of new ventures via rewards-based and equity-based crowdfunding. Unlike rewards-based crowdfunding which has been around since 2009 (e.g., Kickstarter), issuing equity to the general public has traditionally been a prohibited practice due to investor protection rules specified in the Securities Act of 1933 (SEC, 2016a).[3] In the U.S., that changed on May 16, 2016, with the

[3] The Securities Act of 1933 restricted solicitation and sale of securities to only accredited investors with few exceptions as specified in regulation D (Warren, 1984). Accredited investors, defined as individuals with more than $1 M in net worth or with annual income of $200,000 or more for at least two years, represent less than 3% of the U.S population (Schoeff, 2014). Regulation Crowdfunding allows new and emerging firms to solicit and transact with the general public to raise up to $1,000,000 annually. Individual investors can invest up to 5 percent of the lesser of their

introduction of new securities legislation commonly referred to as “Regulation CF” (SEC, 2016b). This new legislation makes it legal for entrepreneurs to solicit and secure equity capital from crowds of amateur funders via regulated equity crowdfunding portals. Other countries too are undergoing rapid legislative changes to allow equity crowdfunding around the globe (Dushnitsky, 2016; Wahjono et al., 2015). On these portals, entrepreneurs post investment details and use scripted pitches to signal quality. These portals enable amateurs to invest with the click of a few buttons, reducing the need for entrepreneurs to personally contact and negotiate with funders in face-to-face settings.

The emergence of equity crowdfunding represents a technological and institutional shock with numerous implications for entrepreneurs and funders (Drover et al., 2017). For entrepreneurs, it gives them access to funds from a new pool of potential funders. This pool of funders is substantial as more than 310 million people (97.4 percent of the U.S population) are classified as ‘non-accredited’ (Schoeff, 2014). Of course not all will become funders, but equity crowdfunding enables them to do so if they choose. Thus, for amateur funders, equity crowdfunding offers access to high-growth funding opportunities that previously were unavailable to them. However, venture investing is not for the faint of heart, as it is incredibly risky with high failure rates (Nanda and Rhodes-Kropf, 2013; Wiltbank, 2005). Indeed, there has been substantial concern from legislators and market regulators that amateur funders lack financial sophistication and are too impulsive, which will cause them to make poor funding decisions. In a recent bulletin, the SEC issued stern guidance warning amateur funders of the risks and uncertainties that make it difficult for them to successfully identify quality ventures, specifically noting funders should be prepared to lose their entire investment (SEC, 2016c).

Although investing in equity is inherently challenging and potentially dangerous for amateurs, equity crowdfunding has grown rapidly (Vulkan et al., 2016). Scholars have noted that equity crowdfunding democratizes funding markets (Short et al., 2017), allowing novice funders

annual income or net worth each year (SEC, 2016a). Note: this individual investor restriction is not enforced by the SEC, rather it is to be self-regulated.

to take part in high stakes new venture funding rounds. Belleflamme and colleagues (2014), initiated early theoretical work in this area by presenting a fully rational model that compared the value of crowdfunding with profit-sharing approaches for entrepreneurs. Empirically, Ahlers and colleagues. (2015) found that signals of human capital were positively related to funding success. Cholakova and Clarysse (2015) explored the motivations of equity crowdfunders, revealing that they tended to be extrinsically motivated by financial returns. Thus, selecting high quality investments appears to be the primary goal for equity crowdfunders. Yet, to date, little research has examined which individual differences and mechanisms might impede crowdfunders from achieving this performance goal. We consider this as part of our framework.

3.2. Self-efficacy and control theory

3.2.1. Self-efficacy. Self-efficacy is a situation-specific individual difference variable that represents one's own beliefs in his or her ability to be successful at a defined (Bandura, 1986). Though influenced by and related to personality, self-efficacy is not stable, distinguishing it from other personality traits (Bandura, 1997; Jackson et al., 2012). Instead, self-efficacy can change over time based on an individual's own task experiences. In the entrepreneurship literature, self-efficacy has been used extensively (Boyd and Vozikis, 1994; Chen et al., 1998; Hmieleski and Baron, 2008; McGee et al., 2009; Wilson et al., 2007). For example, self-efficacy has been shown to be associated with undertaking entrepreneurial actions (Chen et al., 1998) and forming growth aspirations (Baum and Locke, 2004). Entrepreneurship scholars have tended to conclude that self-efficacy is a valuable, positive, self-regulatory resource for entrepreneurs, for the most part eschewing integration of the control theory perspective that we describe below.

3.2.2. Control theory. Control theory (Powers, 1973) is a theory of self-regulation that explains how self-efficacy functions to influence individual effort and individual outcomes through a network of negative feedback loops which seek to "control" task related perceptions (Vancouver and Purl, 2017). Control theory was originally proposed to explain how purposive mechanistic systems are regulated based on feedback obtained from their previous actions (Powers, 1978). More recently, it has been used to explain how self-efficacy could theoretically

influence individual performance in a negative fashion. Specifically, control theorists assert that individuals high in self-efficacy may exert less effort in tasks because they believe they are likely to be effective at achieving their desired task outcome (Vancouver and Kendall, 2006), particularly when task outcomes are ambiguous (Bledow, 2013; Richard et al., 2006; Schmidt and DeShon, 2009; Vancouver, 2008; Vancouver et al., 2014, 2010).

This negative self-regulation mechanism is somewhat complex. To explain it, Vancouver and Purl (2017) describe a set of two self-regulatory agents that can be used to understand the processing of a choice task and self-efficacy's role in it. One agent, called the task agent, regulates task progress (e.g., performance) and one, called the choice agent, regulates progress across tasks by determining whether to work on or stop working on a task. In this way, the choice agent describes the stop rule for working on a task. In a straightforward scenario where information (i.e., feedback) about task progress is available, the task agent could be expected to accurately apply the effort needed to achieve the goal. In a scenario where information about task success is ambiguous or unavailable (such as in crowdfunding decisions), the task agent might use information about action, weighted by a belief about the effectiveness of that action, to estimate task progress, potentially inaccurately. What is somewhat counter-intuitive about this process is that when one has relatively high beliefs in effectiveness (i.e., high self-efficacy), one will estimate greater task progress per unit of action and thus create the perception that one can reach a particular performance goal more easily, in turn reducing effort toward that goal.

Outside of the entrepreneurship setting, control theory has been used broadly to explain the negative effects that self-efficacy can have on individual task performance (Vancouver, 2012). Initiating empirical work in this area, Vancouver et al. (2002, 2001) assessed the relationship between self-efficacy and task performance using an experimental task. In these experiments, participants attempted to guess sequences of a series of colored pegs. After each round, participants were provided with performance feedback that informed them how close they were to providing the right answer. Results revealed that previous performance positively affected the participants' self-efficacy beliefs, but that participant self-efficacy in turn was negatively related

to individual task performance (Vancouver et al., 2001). Notably, when participants' self-efficacy was relatively high, participants appeared to commit too early to the wrong answer. Subsequent control theory research further explored this mechanism, identifying that individuals tend to reduce effort during tasks when their self-efficacy is relatively high (Vancouver et al., 2008; Vancouver and Kendall, 2006). In the present research, we apply control theory to individual funding decisions. Figure 1 displays our conceptual model.

3.3. Self-efficacy and funder decision-making from a control theory perspective.

3.3.1. Self-efficacy's effect on searching effort. Based on control theory we expect that self-efficacy will likely hinder funder decision-making performance. The control theory perspective states that self-efficacy is negatively related to task-effort, and this effort in turn reduces task performance for individuals. In crowdfunding decisions, funders seek to uncover and evaluate information in order to make a funding decision. Because funders cannot directly observe the true underlying quality of a venture (Kirsch et al., 2009), they often rely on informational cues when making funding decisions (Ahlers et al., 2015; Allison et al., 2015). A key question for funders then relates to what information to assess and when to stop collecting information prior to making a funding decision. That is, funders must determine their own "stop rules" and determine in their own mind when sufficient information has been processed. In entrepreneurial contexts, including the crowdfunding context, the true state of progress is often highly ambiguous (Huang and Knight, 2017), complicating matters further. Indeed, on crowd-based platforms quality information might be available, but the question for funders, and particularly for amateur funders, revolves around what information to search for and what information to consider valuable (cf. Lee et al., 2015).

According to control theory, the higher one's self-efficacy, the more quickly one is to think he or she has sufficiently considered the decision, potentially leading to hasty decision-making (Vancouver et al., 2002). Hasty decision-making is likely to result in insufficient consideration of information. In particular, prior research indicates that high self-efficacy individuals tend to use less effort during tasks (e.g., Vancouver et al., 2008; Vancouver and Kendall, 2006). The control

theory model also implies that individuals are likely to inflate their own perceptions of their progress on specific tasks (Vancouver and Purl, 2017). This inflated perception would lead one to think one had more readily reached one's own processing goal, resulting in a premature end to considering additional information. Thus, reduced individual effort for those high in self-efficacy is expected in a variety of task environments, and is particularly likely in highly uncertain investment contexts such as crowdfunding. Formally, we propose:

H1a: Funder self-efficacy is negatively related to funder searching effort.

3.3.2. Searching effort's effect on decision-making performance. On crowdfunding portals, funders search for and assess informational cues prior to making funding decisions (Ciuchta et al., 2016). In this research, our expectation is that when a funder increases his or her searching efforts and evaluates more information about a particular venture on a crowdfunding portal, he or she will be in a position to make better funding decisions. That is, in line with previous control theory research, we expect that decision-making performance will be enhanced for individuals when they exert effort and gather additional information pertinent to the funding decision.[4]

In the entrepreneurship literature, Ardichvili and colleagues (2003) showed that when individuals acquire additional information about a venture, they increase their likelihood of determining the feasibility of a venture and recognizing opportunities. While not explicitly studied via the lens of control theory, the notion that effort will enhance entrepreneurial decisions has been indirectly supported in other studies as well (e.g., Chen et al., 2009; Gaglio and Katz, 2001; Kaish and Gilad, 1991). Moreover in crowdfunding, Ahlers and colleagues (2015) argued that access to certain types of information (i.e., equity and risk information) influenced investment decisions at the aggregate level. Outside of the entrepreneurship literature, the effort to performance link has been established in a variety of contexts including sales

[4] The dependent variable in this research is funder decision-making performance measured as the propensity to allocate funds to high-quality crowdfunding pitches relative to low-quality crowdfunding pitches.

environments (Brown and Peterson, 1994; Mengüç, 1996), occupational health (Siegrist, 1996), education (Sugrue and Baker, 2010; Wise and DeMars, 2005), and corporate settings (McClean and Collins, 2011). In terms of task performance, prior research demonstrates that effort increases progress toward performance goals (Carver and Scheier, 1982). Finally, directly relevant to decision-making, Guo (2001, p. 505) argues ‘‘information search is essential in making a wise choice”. We expect that this underlying relationship will extend to crowdfunding decisions. Specifically, we suggest that the effort that an individual funder expends to collect additional information when evaluating a funding pitch will be positively related to his or her own decision-making performance. Formally:

H1b: Funder searching effort is positively related to funder decision-making performance.

3.3.3. Mediation. From the control theory perspective, self-efficacy is theorized to reduce individual effort toward tasks, which in turn can reduce individual task performance (Vancouver, 2008; Vancouver et al., 2001). In the context of crowdfunding decisions, it would follow then that funder self-efficacy will likely decrease the effort that a funder puts forth to search for information (cf. Vancouver and Kendall, 2006), and that this reduction in effort will ultimately result in poorer quality decisions for funders via an ‘over-confidence’ effect. Indeed, prior research has shown that when individuals receive positive feedback, self-efficacy can in turn become over-inflated (e.g., Stajkovic and Luthans, 2002; Stone, 1994), which could negatively influence performance via effort (Vancouver, 2012). According to Bledow, (2013, p. 19), this is “an adaptive characteristic of the psychological system as it prevents escalating degrees of effort on any one activity and allows the organism to conserve energy”. Using this underlying control theory logic, we expect a mediated relationship such that, all else equal, self-efficacy will be negatively related to funder decision-making performance through a reduction in searching effort. Formally, we propose the following mediation hypothesis:

H1c: Funder searching effort mediates the negative relationship between funder self-efficacy and funder decision-making performance.

3.3.4. Comparing self-efficacy effects with the effects of knowledge. Meta-analytic studies suggest that prior work often fails to explicitly model the effects of skill acquisition or individual task knowledge as a conceptual variable of interest in self-efficacy research (Sitzmann and Yeo, 2013), thus allowing for alternative explanations for observed self-efficacy effects. To avoid this issue, in this research we test the relationship between individual funding knowledge and funder decision-making performance in parallel with our tests of self-efficacy.

We expect in contrast to our negative self-efficacy predictions, that funder knowledge will increase funder decision-making performance. Indeed, several applied psychology studies demonstrate that individual domain knowledge functions to increase task performance (e.g., Hinds et al., 2001; Robinson and LeFevre, 2012). Related to investment decisions, scholars have shown that as financial sophistication or knowledge increases, funders are more effective at money management (Hilgert et al., 2003; van Rooij et al., 2011), more likely to achieve superior financial returns (Goetzmann and Kumar, 2008; van Rooij et al., 2012), and less prone to bias (Korniotis and Kumar, 2011). Likewise, prior entrepreneurship research has shown that knowledge capabilities empower entrepreneurial actors to identify opportunities, make consistent judgments, and sustain high performance (Baron and Markman, 2003; Haynie et al., 2010; Hmieleski and Baron, 2009; Mitchell et al., 2011). Likewise, Shepherd and colleagues (2007) suggest that the discriminating feature between one who recognizes an opportunity and one who does not is domain-relevant knowledge and individual effort. Relatedly, Lumpkin and Lichtenstein (2005) note that conscious effort can trigger the effectiveness of domain knowledge in entrepreneurial decisions. Thus, in contrast to self-efficacy, which we have argued is negatively related to funder decision-making performance through funder searching effort, we

expect funding knowledge to be positively related to funder decision-making performance through funder searching effort.[5] Formally, we hypothesize:

> **H1d: Funder searching effort mediates the positive relationship between funding knowledge and funder decision-making performance.**

4. Study One

4.1 Study one design and procedure

In Study One, we examined the link between self-efficacy, funding knowledge, and funder decision-making performance. We developed a controlled lab experiment to isolate the effects of these predictors on the hypothesized mediating mechanism (search effort) and outcome variable of interest (funder decision-making performance).

4.1.1. Overview of procedure. Participants reported to a university research lab to take part in this study. Upon arrival, participants were assigned to a computer terminal and asked to follow the written instructions on the screen. Participants were randomized into either a self-efficacy condition, a funding knowledge condition, or a control condition (described in more detail in the measures section below). After receiving their respective manipulations (or control), participants were then given the following instructions for the funding decision-making task:

> **Task Instructions:** In this next task, you will view two separate pitches from companies that have recently pitched their business concepts on a crowdfunding website. For the purposes of this study, the entrepreneurs have put their pitches into a standardized crowdfunding format. You will view one company pitch at a time. After you view each company pitch you will be asked to imagine you have up to $1000 to invest in each company should you desire to do so. You will then be asked to make a hypothetical investment decision on each company. **Important Note:** You can take as much time as you like for each company. You can also request as much additional information as you like for each company. Once you have decided that you have enough information on the company, you can then proceed to make your investment decision.

Participants then began the crowdfunding decision-making task. For the first company, participants received either a high or low quality version of the pitch based on random assignment. After participants read the first part of the first pitch, they were given the option to immediately make an investment decision, or view additional information about the company.

[5] While predicting a positive relationship between knowledge and task performance is perhaps not at all surprising in it of itself, considering the effect of knowledge in self-efficacy research allows us to make theory-based comparisons with the predictive effects of self-efficacy, particular given that we propose an inverse relationship.

Specifically, they were asked, “Would you like more information about this company before you make your investment decision?” Participants that selected, “No, I have enough information about this company and I would like to make my investment decision now” were automatically advanced to screen in which they made their funding allocation for the first company. Participants that selected, “Yes, I would like additional information on this company before I make an investment decision” subsequently viewed additional information about the company that was in line with the original manipulation (i.e., additional high or low quality information in line with the earlier manipulation). This procedure continued until the participant eventually selected no or until they viewed fifteen screens of information, the maximum that could be requested for each company before participants made a funding decision.

After making a funding allocation for the first company, participants then viewed a second company. The pitch quality of the second company was counterbalanced so that all participants saw the opposite condition in comparison to the first pitch (i.e., if a participant saw a high quality version of Company 1, they received the low quality version of Company 2, and vice versa). Thus, the order of pitch quality that participants received in this experiment was randomized, while the order of the company was held constant. Order of companies was purposely held constant to avoid introducing an ordering effect that was not theoretically meaningful (Trochim and Donnelly, 2001). Once participants completed both tasks, they answered demographic items, and open-ended items about the pitches they had watched.

4.1.2. Experimental design: Crowdfunding pitches. In this study, we use a controlled experiential design that allows us to eliminate, rather than control for potential confounds (McDermott and Miller, 2007), in effect isolating our analysis solely on our specific experimental manipulations of interest (cf. Greenberg et al., 1995). Since experimental vignettes can be criticized as mundane or unrealistic, we embrace recent scholarly recommendations to design experimental materials with high levels of psychological realism (Colquitt, 2008; Wood et al., 2017). In total for Study One, we developed four unique pitches derived from two distinct companies (i.e., we developed a high and a low quality version for each company). Each

participant saw a total of two pitches, one pitch per company, counterbalanced so that one pitch was high quality and one pitch was low quality. We did this because it would have been unrealistic to ask participants to evaluate both a high and low quality pitch for the exact same product, with the exact same founders, with only slight modifications in terms of pitch quality.

Before developing our experimental materials, we systematically reviewed the domain of equity crowdfunding. Based on SEC legislation (SEC, 2016a) every U.S company raising equity crowdfunding is required to file with the SEC. From inception through July 1, 2017, 381 companies filed with the SEC. We systemically reviewed a total of 75 campaigns. This domain review accounted for 20% of the entire population of equity crowdfunding campaigns in the U.S. at the time our study was conducted, thus our review of the domain was extensive and broad. During our review of the domain, we became familiar with the structure, style, and presentation techniques used by companies in equity crowdfunding pitches so that we could increase the ecological validity of our experimental materials.

After reviewing these campaigns, we selected two companies to serve as the basis of our experimental materials. We selected these companies because they were distinct in terms of their product lines but similar in other ways. Both companies were offering technology-integrated retail products, focused on end consumers rather than business-to-business customers. Both companies had easy to understand value propositions, increasing the likelihood that novice funders would easily comprehend both pitches. At the time, both companies had raised approximately the same amount of funds, $190,899 and $193,550 respectively on the same U.S.-based equity crowdfunding platform. In addition, both companies were early-stage producers of physical fitness technology products. We focused on just one industry to control for industry effects. The first company was the maker of a 3D weight scale, while the second was the maker of an athletic recovery device. Using these unique companies as our baseline, we then carefully developed four total versions of our experimental stimuli (i.e., one high quality and one low quality version of the two company pitches).

For the high quality pitches, we adopted actual language from the pitches whenever possible. Although the scripts between companies were different given their distinct product offerings, market focus, and value propositions, we standardized certain pitch wording, layouts, founder names, pitch length, and other features. To manipulate the level of quality between high and low pitches, we relied on prior literature, specifically the Maxwell et al. (2011) paper that indicated the key criteria that distinguish high-quality pitches from low-quality pitches. Drawing on the criteria and examples provided in Maxwell et al. (2011), we modified each pitch, enhancing the high-quality pitches and diminishing the low-quality versions. For instance, in the high-quality scenario, we ensured the founders had extensive prior experience, a diverse team, a number of highly qualified advisors, numerous indicators of customer adoption, high market potential, and solid profit margins (cf. Maxwell et al., 2011). Relative to the high-quality versions, the low-quality versions of each company had less favorable metrics on the same quality indicators. Pitch features were held constant across both high-quality conditions whenever possible, e.g., in both high-quality conditions, the founders were serial entrepreneurs with 23 years of combined experience. In contrast, in both low-quality conditions, the founders had no industry experience. Since participants only saw two total pitches, one version of each company, duplication across companies was not an issue. Prior to launching, we pretested and adapted each pitch to ensure the ecological validity and effectiveness of these manipulations as described below.

4.1.3. Adaptation of experimental materials and pretest. Before launching, we utilized a small team of domain experts and active entrepreneurs to assess and improve the ecological validity of our experimental materials (cf. Wood et al., 2017). We made several small adaptations during this process, increasing the overall face validity for our pitch scenarios. Once finalized, we then pretested the experimental materials with a sample of 18 undergraduate students from a business school in the Midwestern United States (pretest 1a). These participants were not part of the final experimental study. We ran the pretest participants through a between-person experiment and analyzed the results by testing group differences using a series of t-tests and the 3-item Ciuchta et al. (2016) idea quality measure (see Appendix A for items). This

measure was previously validated in crowdfunding research. There was a significant difference between the high quality and low quality manipulations for both Company 1 ($F=12.63$, $p<.01$) and Company 2 ($F=9.91$, $p<.01$) as expected. The pretest also confirmed there was no significant mean difference when comparing the two high quality ($F=1.43$, ns) and two low quality conditions ($F=2.27$, ns), ensuring relative stability within these manipulated experimental levels.[6]

We also gathered open-ended responses from participants to assess the experimental realism of the task. These responses indicated that participants viewed the pitches as highly realistic and they considered the investment task worthwhile as it provided practicing "entrepreneurs with usable feedback". As a result, it became apparent that we could enhance participant engagement by telling participants that the entrepreneurs in each scenario were seeking feedback from study participants to use in future revisions of their pitches and that the participants should provide honest responses and participate as if they were making actual funding decisions. We made these instructions explicit in the final version of the experiment. Participants embraced this, noting that the survey was "highly engaging", and that it made them feel as though they were participating in "a real life shark tank". The final pitch lengths were on average 1504 words (these experimental materials are available from the authors).

4.2. Study One sample.

In Study One, participants were randomized into either a self-efficacy condition, a funding knowledge condition, or a control condition. To increase the effectiveness of these manipulations, we determined it would be optimal to work with a participant pool that *did not* have extensive prior venture funding experience. Instead, a sample that had a relatively low base rate in terms of their prior experience in funding new ventures was optimal, since this type of sample, as opposed to a sample of highly-experienced investors, allowed us to diminish the

[6] A manipulation check in the final study using the Ciuchta and colleagues (2016) idea quality measure also confirmed there was a significant difference between the high quality and low quality pitches and no significant mean difference when comparing the two high-quality and two low-quality pitches.

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possibility that prior funding experience would confound our experimental manipulations (cf. Bönte et al., 2016). However, we still wanted to ensure the participants were at minimum familiar with the concept of crowdfunding. Considering both of these sought-after features for our sample, we determined that business school students would be optimal.[7]

One hundred and eighty-two business school students at a leading business school in the Midwestern United States participated in our study. To detect inattentive participant responses a directed answer question (see Meade and Craig, 2012) and a content check question were presented to participants. One hundred and seventy-eight participants (98%) correctly answered the content check question and one hundred and sixty-three (90%) participants correctly answered the directed answer question. We eliminated the participants that incorrectly answered the check questions, leaving us with final sample of 163. Importantly for our study, one hundred percent (100%) of participants verified that they were not full-time professional investors, and the majority (65%) indicated that they some prior exposure to amateur funding. On average, participants had 2.25 years of work experience. The sample was 64% male.

4.3. Study One measures

4.3.1 Self-efficacy and funding knowledge manipulations. Before participants began the crowdfunding decision-making task, we randomly assigned them into either one of two treatment conditions (self-efficacy manipulation or funding knowledge manipulation) or a control condition. In the ***Self-efficacy*** condition, participants were told they would be provided an opportunity to complete an initial task that would allow them to better understand their own skills in evaluating crowdfunding pitches. These participants were then presented with three separate pitches (all participants in this condition saw the same pitches and ordering was held constant). After each pitch, participants were asked to predict which businesses had either *a successful outcome* or a *complete business failure* within 5 years of launching. After providing a rating for each venture, participants were provided with feedback on their decisions. Following

[7] To accentuate this point, consider the opposite scenario: Had we decided to use experienced crowdfunders or angel investors in this study, our participants would have had a high base rate in terms of funding knowledge, and thus it is unlikely that our short manipulations would have had much influence on them due to restricted range.

prior experimental self-efficacy research (see Bandura, 1997; Beck and Schmidt, 2012; Gerin et al., 1996; Motl et al., 2006), we used false positive feedback to prime participants into a state of high self-efficacy. Specifically, participants were told that they "correctly predicted the venture success of all the investments," and that their score was 3 out of 3.

In the ***funding knowledge*** condition participants read a training document entitled, "Understanding early-stage equity investing: A short training module for novice investors". This training document was developed by the authors in consultation with five domain experts (two Professors of Management and Entrepreneurship, one currently practicing entrepreneur, one Certified Public Accountant, and two graduate students engaged in entrepreneurship research). In the ***control condition*** participants read a training document entitled, "Understanding how to use the game of golf to advance your career: A short training module for novice golfers". The stimuli were on average 708 words (see Appendix B for additional details).

We pretested these manipulations using a sample of 30 undergraduate business students that were not part of the final study (pretest 1b). We assessed the validity of our manipulation using the 3-item entrepreneurial searching self-efficacy scale from McGee and colleagues (2009). The pretest revealed that participants in the self-efficacy condition had significantly higher mean scores on this scale ($F=5.41$, $p<.05$). At the end of the pretest, we asked participants to report on any peculiarities of the studies and had verbal debriefing sessions with participants that allowed us to probe them further on the instrument. During the pretest, we also asked participants to describe the purpose of the study in their own words. No participant raised any suspicion about the underlying manipulations.

4.3.2. Mediator: Funder search effort. Because we were specifically interested in testing investment search effort as a mediating mechanism, we divided each pitch into 15 sequentially ordered components. The layout was standardized, and ordering was held constant for all participants. For instance, in all conditions, participants first saw a pitch component entitled company details. This part of the pitch revealed the company's product and primary value proposition. Other components that participants viewed during the pitch included long-term

vision, meet the founders, key facts, financial model, why are we the team to execute on this, how will we make money, and investment terms, etc. After viewing each component, participants had to determine if they would like to continue to view additional information by answering the following item, "Would you like more information about this company before you make your investment decision?" We summed the total number of pieces of information requested by each participant in order to derive a measure of *funder search effort.* There were a total of 15 components available per pitch. On average, participants viewed 7.88 pieces of information per pitch (min=1, max=15, SD=3.53).

4.3.3. Dependent variable: Funder decision-making performance. Participants viewed a high-quality pitch and a low-quality pitch independently. After each pitch, participants were instructed to assume they had up to $1000 to allocate to each pitch should they desire to do so. We used $1000 because this figure approximated the mean equity crowdfunding investment amount based on population data (WeFunder, 2017). To compute a *funder decision-making performance score* we subtracted the amount of funds that participants allocated to the low-quality pitch from the high-quality pitch as a way to determine their ability to discriminate between high and low quality pitches. Because participants could have chosen to invest as little as $0 to as much as $1000 in each pitch, the range for this raw variable is -$1,000 (in the case they allocated $1,000 to the low-quality pitch and $0 to the high-quality pitch) to $1,000 (in the case they allocated $0 to the low-quality pitch and $1,000 to the high-quality pitch).

4.4. Study One results

In Study One, we used the PROCESS SPSS path analysis macro (Hayes, 2013) to test our mediation hypotheses. This macro uses a regression-based, bootstrap approach to test the direct and indirect paths of the variables in the model. The results of these tests are displayed in Table 1. As shown in Model 1, participants in the self-efficacy group had a negative relationship with funder searching effort (b = -2.61, $p<.05$), providing support for Hypothesis 1a. This is in line with control theory (Vancouver, 2012), indicating that funder self-efficacy decreased the amount of effort that funders put forth when assessing crowdfunding pitches. Model 1 also indicates that

in the self-efficacy condition, funder searching effort had a positive effect on funder decision-making performance (b=20.15, p<.01), providing support for Hypotheses 1b. Thus, as effort increased, participants tended to perform better on the crowdfunding task.[8]

Hypotheses 1c stated that investment search effort would mediate the negative relationship between self-efficacy and funder decision-making performance. Based on 5,000 bootstrap samples, the bias-corrected bootstrap 95% confidence interval for the indirect effect (b= -52.58, p <.05) did not contain zero. This indicates that there was evidence of an indirect effect of self-efficacy on funder decision-making performance through searching effort. These results support Hypothesis 1c, and indicate the presence of mediation. In contrast, Hypotheses 1d stated that funder searching effort would mediate the positive relationship between funding knowledge and funder decision-making performance. As shown in Table 1, Model 2, the 95% confidence interval for the indirect effect based on 5,000 bootstrap samples did not contain zero (b=62.53, p <.05), indicating that there was evidence of an indirect relationship, supporting hypotheses 1d. Notably, there was a positive relationship between funding knowledge and searching effort (b=3.20, p<.01) and searching effort and decision-making performance (b=19.58, p<.01) in line with expectations. Thus, we observed the inverse relationship in the funding knowledge condition in comparison to the self-efficacy condition. Practically speaking our results indicate that self-efficacy when manipulated decreased funder decision-making performance indirectly by $53. While $53 is not a lot by traditional investment standards, it does represents a material amount for the average amateur funder based on statistics from the largest U.S. equity crowdfunding portal (WeFunder, 2017).

5. Study Two: Crowd cues and funder decision-making performance.

Study One demonstrated that self-efficacy was negatively predictive of funder decision-making performance through searching effort, and the inverse was observed for funding knowledge. In practice, crowdfunder decisions are more complex than the experimental scenario

[8] Based on recommendations from an anonymous reviewer we used OLS regression analysis in SPSS to retest the a-path (H1a) and b-path (H1b) relationships. These tests were significant and in the same direction as the results reported above.

presented in Study One. That is, when visiting crowdfunding platforms, in addition to pitch information, funders are also exposed to prominently displayed "crowd cues" – which we define as crowdfunder endorsements and collective opinion data that is displayed on a crowdfunding platform.[9] Crowdfunding scholars have noted that social indicators, such as crowd cues, are likely to increase the aggregate funding amounts received by entrepreneurs (Kuppuswamy and Bayus, 2013; Mollick, 2014). Yet, despite the scholarly understanding of the effects of social conformity and groupthink on individual decision-making (Asch, 1956; Esser, 1998; McCauley, 1989), little work has been conducted to assess how social indicators might influence some individual funders relative to others to conform to the consensus opinion of the crowd. In this study we investigate how crowd cues influence individual funder decisions, particularly as it relates to funder self-efficacy.

Given that research related to crowd cues is a nascent literature, we present a simplified conceptualization of crowd cues. Specifically we note that crowd cues come in one of two basic forms, qualified crowd cues or unqualified crowd cues. We define qualified crowd cues as displays of crowd endorsements or collective crowd opinions representative of the *true objective value* of the underlying pitch. Thus, when qualified crowd cues are displayed on a crowdfunding platform following the crowd may be considered a rational and effective behavior (cf. Anderson and Holt, 1997). In contrast, we refer to cases in which the consensus of the crowd is misaligned with the true quality of the pitch as "unqualified" crowd cues.[10] Of course, one fundamental challenge for individual funders, particular amateurs, is discerning the extent to which crowd

[9] We reviewed the five of the largest registered equity crowdfunding portals in the United States and the practice of prominently displaying crowd cues was consistent across these portals. In practice, crowd cues come in various forms including displayed data on crowd assessments, endorsements, or overall crowd interest. For example, Wefunder.com - the leading equity crowdfunding platform in the United States - prominently displays the following crowd cues: endorsements from members of the crowd, the raw number of backers to date, and the real-time amount of funds raised.

[10] In our experiment crowd cues were specifically operationalized to serve as a distractor from the true quality of the pitch, therefore we refer to them as "unqualified". In practice, it may be difficult to separate the "true" quality of a pitch from the crowd cues embedded on the webpage, yet understanding the conditions that cause some investors to follow the crowd and herd unjustifiably is an important theoretical question (Bradford De Long et al., 1990; Hoitash and Krishnan, 2008). An experimental design is particular appropriate for this type of research question.

cues are qualified (i.e., representative of the true value of the pitch) or unqualified (overconfident assessments from the crowd). In this research, since we are focused on how individual crowdfunding decisions vary based on self-efficacy, we are particularly interested in *unqualified* crowd cues. That is, we seek to understand how individual funding decisions are impacted when the crowd inaccurately overvalues the quality of an otherwise low-quality pitch. Below we build our theoretical argument to explain how we expect unqualified crowd cues to moderate the indirect self-efficacy to funder decision-making relationship we observed in Study One.

Unqualified crowd cues and decision-making performance. Unqualified crowd cues represent additional noise in an already ambiguous decision-making context. We are interested in understanding if crowd cues will make the difficult task of selecting high quality investments even more difficult for high self-efficacy funders. In general, we know from the social influence literature that individuals in group environments tend to reduce efforts and acquiesce to group norms (Bond and Smith, 1996; Huang et al., 2014). Although this literature has largely ignored the role of individual differences in herding, there are a few exceptions relevant to self-efficacy. For instance, Baddeley et al. (2010) argue that certain individual differences, particularly those that contain an affective component, predispose individuals to follow the crowd. While self-efficacy is considered cognitive in nature, scholars have demonstrated a partial link between self-efficacy and affective reactions (Bandura, 1997; Baron, 1990; Compeau and Higgins, 1995; McAuley et al., 2003). Affectively-charged beliefs in oneself could lead individuals to simplify their decision rules (Isen and Baron, 1991).

In terms of control theory, prior research shows that high self-efficacy individuals tend to reduce effort during tasks (Austin and Vancouver, 1996). Reducing effort and/or simplifying decision rules in the context of crowdfunding could mean that high self-efficacy individuals might be more likely to gravitate toward and rely on salient crowd cues. This could induce high self-efficacy individuals to herd or follow the opinions of the crowd even if there is no underlying reason to do so in terms of pitch quality. Overall, we argue that self-efficacy will cause individuals' to use fewer internal resources when assessing crowdfunding options (cf.

Vancouver and Kendall, 2006). Thus, high self-efficacy funders will likely be more prone to follow the crowd into poor quality investments when favorable unqualified crowd cues are observable. We hypothesize:

> **H2: Unqualified crowd cues moderate the negative indirect relationship between self-efficacy and funder decision-making performance through searching effort, such that the negative indirect effect will be larger when unqualified crowd cues are observable compared to unobservable.**

5.1 Study Two design and procedure

Study One results revealed that self-efficacy had a negative relationship with searching effort, in turn revealing a negative indirect effect on funder decision-making performance. In Study Two, we wanted to test if funder decision-making performance would be incrementally worse for individuals high in self-efficacy when they were exposed to unqualified crowd cues during the pitch viewing experience. We designed a randomized between-participant experiment for this purpose as described below.

5.1.1. Overview of procedure. We followed the same initial procedure described in Study One and randomized participants into either a self-efficacy condition, a funding knowledge condition, or a control condition. Participants were then randomly assigned to either a low-quality control pitch (control: low quality pitch with no crowd cues) or the exact same low quality pitch with unqualified positive cues from the crowd (treatment: low-quality pitch with unqualified crowd cues). After participants read the first part of the pitch, they were given the option to immediately make a funding decision, or view additional information in the same manner as in Study One. Fifteen pieces of information was the maximum number that could be requested before participants were asked to make a funding allocation. Participants then made their allocation, answered demographic questions, and provided responses to open-ended items about the pitch they had just viewed.

5.1.2. Experiment design. In this study, we were explicitly interested in how unqualified crowd cues would influence unwarranted crowdfunder herding, i.e., a negative funding performance effect. Therefore, we sought to present participants a realistic, yet very low-quality

pitch that would have a low base rate in terms of participant quality assessments. Importantly, prior to launching we established that the pitch presented in both scenarios was a highly undesirable funding opportunity by selecting a failed crowdfunding campaign and validating its low level of quality with domain experts. The domain experts, consisting of one angel investor, one active entrepreneur, and one business school professor, unanimously determined that the pitch quality was extremely low, rating it a 1 on a seven-point Likert scale that ranged from extremely bad to extremely good. Expert comments on the pitch included, "It is consistently awful", "solution is laughable", and "no market need". Using this undesirable pitch in both conditions in our experiment, and then manipulating only the presence of unqualified crowd cues, we reasoned that incremental funding allocations in treatment condition (the unqualified crowd cue condition) could be conceptualized as a negative performance effect. Thus, although it would be extremely difficult to assess the negative value of herding in the field, using a controlled experiment allowed us to conclude that incremental funding allocations in the treatment condition relative to the control condition were (1) fully attributable to presence of unqualified crowd cues, and (2) representative of a very poor funding decision according to experts, i.e., negative funder decision-making performance.

5.1.3. Adaptation of experimental materials and pretest. We selected the pitch used in this study after reviewing numerous failed crowdfunding campaigns. Our goal was to source an actual campaign that was of low quality but still credible enough that some amateur participants might be induced to invest. We ultimately choose a pitch that had a failed crowdfunding campaign raising $0. The company was a producer of customizable locket watches designed to hold personal mementos. We modified aspects of the pitch to standardize its format, but whenever possible we used language from the actual crowdfunding campaign. We then pretested the stimuli extensively as described below.

Before launching, we piloted and pretested our experimental materials with two samples of undergraduate students from a business school in the Midwestern United States. In the first pretest (pretest 2a), we asked participants several questions about the quality of the idea and

about their likelihood of investing in the idea if they had $1000 hypothetical dollars to invest. Originally, the actual pitch that we used was so bad that it was not fully believable by participants, as 17 of 18 (94%) indicated that they would not invest a single dollar after viewing the initial pitch. Participants comments about the pitch included, “seems like a sham”, “I think that the idea was cheesy”, and, “I chose not to fund this company because the CEO of the company does not seem mature.” Specific advice directed to the pitching entrepreneur from pretest participants included, “don't waste your time with this company”, and “you need to work out more details before looking for investors”.

To adjust this pitch to make it more realistic, we again utilized a small team of domain experts and active entrepreneurs. We made a number of adaptations during this process. For instance, we changed the primary product being pitched from a “standard locket watch” to a “digital locket watch”. We also adapted the pitch script so that participants would take it more seriously. Overall, we still desired a low base rate, but the pitch needed to be believable by participants in order to allow for potential variance between the treatment and control conditions in our actual experiment. Once finalized, we pretested the pitches for a second time with 34 new participants who were not part of the final study (pretest 2b). In the second pretest the funding base rate increased (26% of participants decided to fund the pitch, mean=$100.18, SD=201.36, min=$0, max=$901). Qualitative data gathered during the pretest confirmed that the crowd cue manipulation induced some participants to allocate funding. For instance, participants that decided to fund the company commented, “according to the others investors' opinion, it should be a good choice to invest”, and, “many other investors seem to like it”. Overall, the quantitative and qualitative data gathered over the two pretests and from consultations with domain experts was critical in allowing us to develop suitable experimental materials for Study Two.

5.2. Study Two sample

Eighty-two (82) business school students at a Midwestern business school participated in our study in exchange for extra course credit. As in Study One, we again used two inattentive participant responding questions, eliminating cases in which at least one item was answered

incorrectly, leaving us with a final sample of 76. The mean work experience of the sample was 2.83 years. Sixty-four percent (64%) of participants were male and one hundred percent (100%) verified that they were not current or previous full-time professional investors.

5.3. Study Two measures

All measures in Study Two were identical to Study One unless indicated below.

5.3.1. Unqualified crowd cues. In the treatment condition, crowd cues were specifically operationalized to serve as a distractor from the true quality of the low-quality pitch presented, therefore we refer to these crowd cues as "unqualified". We embedded a pictographic icon on the webpage next to the company pitch. Pictographs are commonly used in online settings, thereby allowing us to increase the realism of our stimuli. The icon demonstrated a visual breakdown of the crowds' interest in funding the venture, specifically indicating that 90% of those that had viewed the campaign had opted to fund the venture. In addition, participants in the treatment condition also saw positive qualitative crowd cues in the form of crowdfunder comments and testimonials alongside the pitch. No crowd cues were displayed in the control condition.

5.3.2. Dependent variable: Funder decision-making performance. Participants viewed one pitch; either the control pitch (low-quality pitch with no crowd cues) or the treatment pitch (the exact same low-quality pitch with unqualified positive crowd cues). After participants viewed the pitch, they were instructed to assume they had up to $1000 to allocate to the company should they desire to do so. Because performance in the experimental scenario was inversely related to the total number of dollars invested, deviations from zero were input as negative values. As a result, the highest performance value is zero ($0), indicating the participant allocated zero dollars to the bad investment. Alternatively, the lowest possible value would be -1,000, indicating the participant allocated all $1,000 to the bad investment. Therefore, worse performance is indicated by larger negative values (Control condition M= -34.07; Treatment condition, M= -55.56).

5.4. Study Two results

In Study Two, we used the PROCESS path analysis macro (Hayes 2013). Hypothesis 2 proposed that unqualified crowd cues would moderate the indirect negative relationship between

self-efficacy and funder decision-making performance through searching effort, such that the indirect negative effect would be larger when unqualified crowd cues were observable compared to unobservable. To test Hypothesis 2, we conducted a moderated mediation analysis. Following recommendations from Hayes (2013), we calculated confidence intervals utilizing 5,000 bias-corrected bootstrap samples (See Table 2). First, we considered the index of moderated mediation. This index represents the formal test of moderated mediation (Hayes, 2015). The bootstrapped confidence interval for the index of moderated mediation did not contain zero at the 95% level (*index*= -26.05), providing support for Hypothesis 2. Practically speaking, our analysis revealed that amateur funders in the high self-efficacy condition were less likely to recognize and react to negative pitch cues when positive crowd cues were present, leading the self-efficacy group to invest nearly three times as much in the poor quality venture based on a mean comparison with the high knowledge group

6. Study Three: The relative impact of self-efficacy and knowledge with a field sample.

In the previous studies, we assessed our theoretical moderated mediation model via two randomized experiments. We found that self-efficacy was negatively related to funder decision-making performance via funder searching effort. In contrast, we found that funding knowledge was positively related to funder decision-making performance via funder searching effort. In addition, self-efficacy appeared to increase an individual's susceptibility to crowd bias. Building upon these findings, we present Study Three. The goal of Study Three is to directly compare the performance effects of self-efficacy relative to funding knowledge using a field sample, increasing our confidence in the external validity of our research. In Study Three, we removed some of the experimental constraints, and *measured* rather than *manipulated* self-efficacy and funding knowledge, allowing us to jointly assess these constructs rather than testing each in isolation. We ask the following research question in Study Three:

> **Research Question 1: (a) Using a field sample, will funders with high self-efficacy be less likely to select high quality pitches compared to funders with high funding knowledge, and in contrast, (b) will funders with high self-efficacy be more likely to follow crowd cues compared to funders with high levels of funding knowledge?**

6.1. Study Three design

In Study Three we moved our data collection beyond the lab and launched a 2x2 (pitch quality x crowd cue) quasi-experimental randomized between-participants field study. This design is quasi-experimental because we *measure* individual-level variables (funding knowledge and self-efficacy); while at the same time we use controlled randomization for pitch-level variables (pitch quality and crowd cues). For this study, we created two versions of a crowdfunding pitch (high and low quality) drawing on Maxwell and colleagues (2011) and following procedures described in Study One. We also randomly embedded either high or low crowd cues in the form of pictographic icons, extending the approach described in Study Two.

Other than the pitch quality and crowd cue manipulations, both pitches were identical, so as to remove any potential sources of bias that could be derived from the pitch itself (e.g., persuasiveness, professionalism, video quality). Such variables have been shown to be pertinent in prior field studies (cf. Allison et al., 2017, 2013; Younkin and Kuppuswamy, 2017). To ensure experimental realism**,** we used a script from an actual business pitch. Further, to increase the level of immersion and increase confidence in ecological validity, we purchased an external domain name for our study and developed a media-rich simulated equity crowdfunding website. Participants in the study were told that they were visiting a beta version of a new equity crowdfunding website. We again used a pilot study to confirm the effects of our manipulations.

6. Study Three sample

To increase the scope of our research and extend our lab results into the field more broadly, we sourced participants from a large diversified international sample of individuals who were actively engaged in the crowd-based economy using Amazon's Mechanical Turk crowdsourcing platform (MTurk). The M-Turk platform has been increasingly used in management research (Chua, 2013; Welsh and Ordóñez, 2014; Yam et al., 2016). Recent research has established that data derived from this source is in line with the psychometric standards of previously published research (Buhrmester et al., 2011; Welsh and Ordóñez, 2014). In the case of research focused on amateur crowds, as in this study, MTurk is particularly appropriate. To ensure that participants

were amateur funders and understood crowd-based transactions, we screened participants to identify if they had previously invested in a financial instrument, had experience transacting in the crowd-based economy, and were over the age of 18. We screened 386 participants. Two-hundred and ninety-three (293) participants met the study criteria. As in our prior studies, to detect inattentive participant responding a directed answer question, a manipulation check question, and a content check question were presented to participants. Participants were highly attentive, with 287 participants (98%) correctly answering the directed answer question, 291 participants (99%) correctly answering the manipulation check question, and 293 participants (100%) correctly answering the content check question. We eliminated 8 participants that incorrectly answered one of the check questions, leaving us with final sample of 285. The mean age of the sample was 34.6 years of age and 60% of the participants were male.

6.2. Study Three measures

6.2.1. Dependent variable: Likelihood of funding. A two-item scale adapted from Baron et al. (2006) was used to assess the likelihood of funding each pitch. A sample item is, "How likely would you be to make an equity investment in this opportunity?" Reliability was .93.

6.2.2 Self-efficacy. To complement our experimental manipulation of self-efficacy in the prior studies, we used the 3-item entrepreneurial searching self-efficacy scale from McGee and colleagues (2009) to measure self-efficacy in this study. This construct is defined as one's own belief in his or her ability to scan for quality new venture opportunities. Reliability was .84.

6.2.3 Funding knowledge. Participants reported their overall funding knowledge using a four-point Likert-type scale which ranged from no knowledge to advanced knowledge.

6.2.4. Control variables. In the case of survey based field studies, self-report variables may be susceptible to certain methodological issues (e.g., social desirability bias). To address this concern we controlled for financial numeracy self-awareness using a six-item scale from Forbes and Kara (2010). We also controlled for participant gender, participant age, and geographic location because the sample was international.

6.3 Study Three results

We used Study Three simply to compare self-efficacy with funding knowledge in a quasi-experimental field study. Thus, we relied upon a series of Chow tests (Chow, 1960). Related to Research Question 1a, we ran a chow test to assess if funders with high self-efficacy would be less likely than funders with high funding knowledge to select quality pitches. The results of our Chow test indicated there was structural change when comparing these effects ($F=10.31$, $p<.01$), revealing that funders with relatively high self-efficacy were significantly less likely to fund the high quality pitch compared to funders with high funding knowledge. In contrast, regarding Research Question 1b, the results of our Chow test revealed that funders with high self-efficacy were more likely to follow crowd cues relatively to funders with high funding knowledge ($F=9.29$, $p<.01$).

7. Discussion

7.1. Implications for theory and future research

7.1.1. Self-efficacy, not always a good thing. Using a multi-study research design, we contribute to what is known about self-efficacy in the entrepreneurship and organizational psychology literatures. First, relevant to the entrepreneurship literature, we challenge a long-held view that self-efficacy is positively related to entrepreneurial success. In previous research, entrepreneurial self-efficacy has been shown to be positively associated with entrepreneurial intentions (Boyd and Vozikis, 1994), growth aspirations (Baum and Locke, 2004), and entrepreneurial actions (Chen et al., 1998). In contrast, we present a nuanced assessment of the negative effects of self-efficacy, rooted in control theory (Vancouver et al., 2014, 2001; Vancouver and Kendall, 2006), an original perspective for the entrepreneurship literature. Our results are particularly novel given that self-efficacy is has been typically associated with positive outcomes for entrepreneurs. Thus, we introduce an alternative theoretical perspective into the entrepreneurship literature that may explain prior null findings. Future research rooted in control theory could build upon our approach to evaluate the effects of self-efficacy in other critical entrepreneurial activities. For instance, research could juxtapose our framework with research on the creative process (e.g., Ford and Gioia, 2000; Makri and Scandura, 2010) to

investigate if entrepreneurs or managers are more likely to sustain efforts toward organizational innovation if they have low levels of self-efficacy relative to high levels of self-efficacy.

Second, we contribute to the organizational psychology literature by showing that the negative effect of self-efficacy is amplified when individuals are exposed to unqualified positive social indicators. Thus, our research has implications beyond entrepreneurship and adds organizationally relevant empirical evidence to the ongoing and highly contentious theoretical debate over the *efficacy* of self-efficacy taking place between organizational psychology scholars (see Vancouver, 2012). In terms of how our study could propel future experimental research, we see several avenues. To conduct this study we developed experimental materials to prime self-efficacy in the context of crowdfunding decisions. A major criticism of self-efficacy primes based on training protocols previously used in the literature is that confound changes in knowledge with changes in self-efficacy beliefs (Vancouver et al., 2013). In this study, we used a carefully constructed manipulation to prime self-efficacy in parallel with a discrete knowledge manipulation and a control condition. Although our study uses the context of crowdfunding as a suitable venue for testing our theory, we believe our self-efficacy prime could be applied in other entrepreneurship contexts, such as entrepreneur opportunity selection, entrepreneur growth decisions, or corporate venturing decisions.

7.1.2. Entrepreneurial self-efficacy and non-entrepreneurs. Entrepreneurial self-efficacy is a well-established construct in the entrepreneurship literature (e.g., Baron et al., 2016; Chen et al., 1998; Hechavarria et al., 2012; Hmieleski et al., 2013). Yet, to our knowledge, the boundaries of this construct have never been extended beyond the domain of lead entrepreneurs. Our findings contribute to the understanding of entrepreneurial self-efficacy within the entrepreneurial process more broadly. Baron (2006) notes that when searching for quality opportunities, entrepreneurs attempt to "connect the dots" as it relates to technology, demographics, markets, regulation, and other factors. Similarly, we argue that amateur funders are also trying to "connect the dots" as they search for high quality funding opportunities. Thus, during this process, the entrepreneurial self-efficacy construct appears to be a relevant self-

regulatory construct for funders as well. In this way, we incorporate what is known about entrepreneurial self-efficacy and extend it to the realm of new venture investing. Given we found that entrepreneurial self-efficacy was influential for non-entrepreneur decisions, future research might consider how our results could be extended for other entrepreneurial actors. For instance, does the entrepreneurial self-efficacy of startup employees, partners, and collaborators influence their efforts, behaviors, and decisions during the growth stage? In what other stages might entrepreneurial self-efficacy be relevant for non-entrepreneurs?

7.1.3. Crowd bias and the influence of discrete cues. In recent theoretical and empirical work, scholars have argued that informational cues are more ambiguous than previously assumed and that the impact of these cues is contingent on receiver perceptive processes (e.g., Davis et al., 2017; Drover et al., 2018; Johnson et al., 2018). Building on this work, we contribute to the developing scholarly understanding of the impact of informational cues in new venture funding decisions in at least two ways. First, unlike the extensively studied VC or angel investment settings - where expert funders are characterized as highly calculative decision-makers (e.g., Zacharakis and Meyer, 2000) unlikely to succumb to social pressures, we demonstrate that certain types of amateur crowdfunders can quite easily be influenced by crowd cues. Maxwell et al. (2011, p. 221) state that the professional funders in their sample "want to stand out from others, thereby diminishing any motive to follow the crowd". Likewise, Wuebker and colleagues (2015, p. 183) argue that professional funders in their sample, "cannot be conceived as herd animals blindly following their peers". In contrast, we specify that amateurs with inflated levels of self-efficacy may be highly susceptible to crowd bias and herding behaviors.

Although we explore crowd bias in equity crowdfunding, we believe investigating crowd bias in other contexts could be valuable well beyond the entrepreneurship setting. Since social influence is a micro-level human phenomenon, future research could evaluate the impact of crowd bias in other organizational settings, including micro-enterprises (Davis, 2016), the sharing economy (Caza et al., 2017), e-lancing (Aguinis and Lawal, 2012), open-source systems (Mollick, 2016), and innovation collaborations (Colombo et al., 2012). Indeed, collaborative

platforms are shifting the way many organizational decisions are made (Matzler et al., 2015), and thus applying our framework in these contexts could be valuable as a way to extend our understanding of how crowd bias could influence organizational decision-making.

7.2. Discussion of strengths, weaknesses, and limitations of our experimental approach.

Developing an experiment presents a number of unique challenges. Given the nature of this special issue, we describe the strengths and weaknesses of our approach in this section.

7.2.1. Weaknesses and limitations of our approach. First, a weakness of our experimental design was that we measured participants' interest in making an investment, rather than a behavioral outcome (e.g., an actual investment decision). We addressed this by using an intention-based measure, in-line with prior research (e.g., Baron et al., 2006).

Second, in our experiments we asked participants to make independent investment decisions with the assumption that they had up to $1000 to invest in each campaign should they wish to do so. This request was somewhat artificial, and in effect, these instructions constrained the full range of investment amounts that a participant could assign to any given campaign. Yet, this level of artificiality was necessary to have direct between person comparisons.

Finally, we also note that two of our studies used students as participants. The principle argument against student samples is that they lack external validity, defined as the extent to which an observed causal relationship will hold over variations in settings, treatments, persons, and outcomes (Shadish et al., 2002: 83). In our case, however, we used purposive sampling in which one defines appropriate characteristics of the typical persons and settings to which one wants to generalize and then selects a sample that matches this target (Shadish et al., 2002). Specifically, in this research the target population was *first-time crowdfunders*, who had a *basic* understanding of the concept with *limited or no prior investment experience*. Thus, business students were actually an ideal sample for this research since these participants in general understood the domain of crowdfunding but were novices. Our use of purposive sampling also rules out other populations such as angel investors or venture capitalists (i.e., professional investors who were not part of the theoretical model or sampling frame of this research).

7.2.2. Strengths of our approach. In terms of strengths of our approach, we used a multi-study, multi-method, multi-operational approach in this research (See Figure 2). Specifically, we developed two experiments which built upon each other. We then followed these studies up with a quasi-experimental field study. Across these studies, we used more than one operationalization of self-efficacy to avoid mono-operation bias (Shadish et al., 2002; Whyte et al., 1997). Combining experimental manipulations with field studies allows researchers to increase confidence in their results by triangulating across multiple studies with divergent methods and samples (Cortina and Folger, 1998; Scandura and Williams, 2000).

Additionally, to overcome constraints of the artificiality in the lab, we did several things to increase ecological validity. First, we simulated an equity crowdfunding decision-making task with high levels of experimental realism (Goldman et al., 2006; Green et al., 2001). Increasing the level of immersion and the similarity between experimental and natural settings also serves to increase observed effects (Taylor, 2006) and extend external validity (Aguinis and Bradley, 2014; Goldman et al., 2006). Second, in our experimental instructions we told participants that the top 20% of participants would be eligible to receive a contingent reward (cf. Wood et al., 2017) in the form of cash-equivalent gift cards. Our pretest revealed these instructions increased participant motivation to perform well and offset the lack of personal financial risk. In a debriefing session with pretest participants, when asked about the contingent reward offered, several participants indicated that it increased their motivation to do well in the task. Third, in developing our studies we conducted an extensive search of the equity crowdfunding domain to develop highly realistic funding pitches.

Finally, prior studies in venture funding have often used conjoint designs. Conjoint designs are beneficial because they allow researchers to use repeated trials to determine an organized underlying structure for decision processes (see Lohrke et al., 2010; Shepherd and Zacharakis, 1999). However, one challenge with conjoint designs is that because they often require repeated trials, the stimuli is often compressed. This could potentially reduce the realism of dynamic tasks, such as a crowdfunding decision. In prior crowdfunding research, studies have relied on

multiple *actual* crowdfunding pitches to assess individual investment patterns. The advantage of this approach is that it has high external validity, allowing the researcher to test a wider assortment of real pitches. However, one potential challenge of this approach is that it is susceptible to internal validity issues, as each pitch has certain dissimilarities that must be accounted for, requiring researchers to input various control variables in their models in order to rule out potential confounds. In contrast, experimentalists generally prefer to rely on controlled stimuli and randomization to account for non-manipulated differences in a systematic fashion, reducing the threat of alternative explanations. This degree of control is what allows researchers to infer causality via controlled manipulations (Shadish et al., 2002), and is one of the major strengths of our approach.

7.3. Discussion of implications for practice and policy

Our research indicates that positive evaluations by the crowd for a low-quality venture could have the effect of catalyzing overly eager funding behavior by funders with high levels of self-efficacy. This could result in substantial investment losses for amateur funders who, on average, possess much less wealth than angels or VCs. One recommendation to ameliorate the negative aspects of the crowd's influence would be to require novice equity crowdfunders to undertake training programs. As our study demonstrates, modest knowledge manipulations positively influenced funder decision-making performance. This implies that even short training programs could be valuable for novice funders, potentially offsetting negative self-efficacy effects. As a second recommendation, we suggest that proposed investment restrictions be closely monitored by equity crowdfunding platforms and regulators. The SEC has also suggested that they do not intend to monitor or enforce individual funding limits, expecting amateurs to track and self-regulate their own funding behaviors. We suggest that this policy might be worth revisiting.

8. Conclusion

Our research reveals that self-efficacy was negatively related to funder decision-making performance through searching effort. In addition, high levels of self-efficacy increased the tendency for funders to over-rely on the opinions of the crowd and follow the crowd into a poor

quality funding options even when the opinions of the crowd were without merit, a phenomenon we termed “crowd bias”. We tested these relationships using two randomized experiments and a third quasi-experimental field study. Overall, our research contributes to the organizational psychology and entrepreneurial funding literatures, and practically speaking raises some concern for amateur funders with high self-efficacy engaged in risky equity crowdfunding decisions.

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Figure 1. Conceptual model

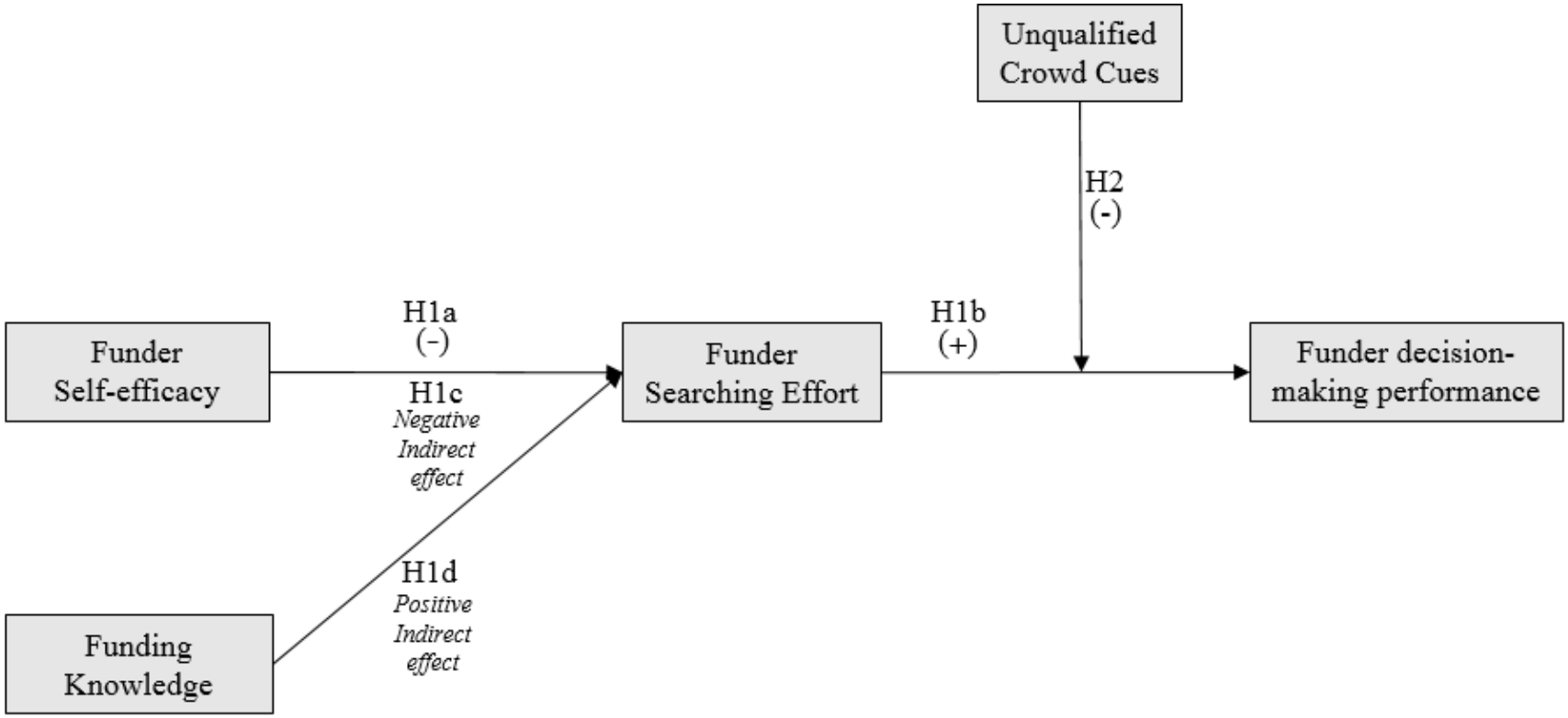


Figure 2. Summary of study designs

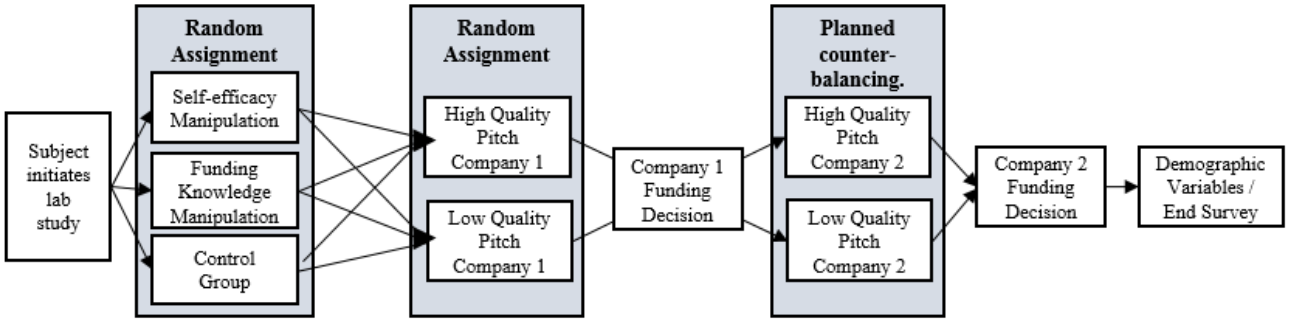
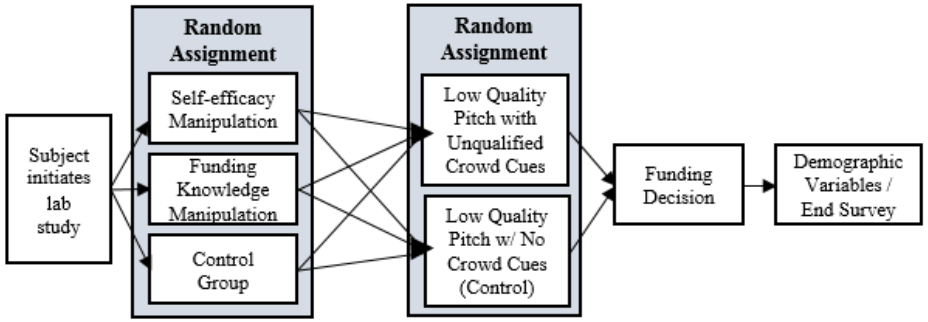
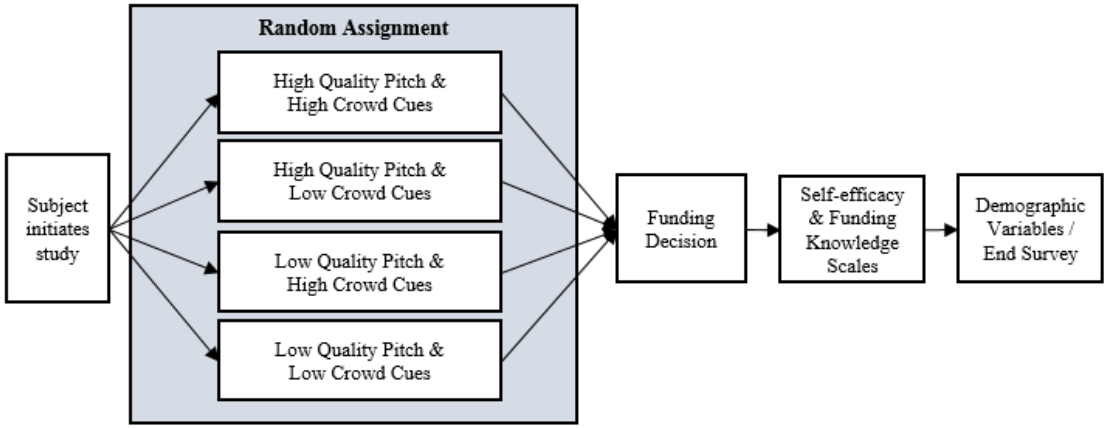
Study	Objective	Visual Representation of Procedure	Hypotheses Tested
Study 1 Between-person experiment.	Assess the indirect effect of investor self-efficacy on effort and funder decision-making performance when participants are presented with high and low quality pitches.		H1a H1b H1c H1d
Study 2 Between-person experiment.	Assess the indirect effect of investor self-efficacy on effort and funder decision-making performance when participants are presented with a low quality pitch and unqualified crowd cues (i.e., crowd bias).		H2
Study 3 Quasi-experimental between-person field study	Assess the influence of investor self-efficacy relative to funding knowledge on funder decision-making performance using measured variables with a field sample performing a controlled decision-making task.		RQ1a RQ1b

Table 1. Study 1: Mediation Results

Model 1: Funder self-efficacy			**Model 2: Funding knowledge**		
	Mediator: Funder searching effort	DV: Funder decision-making performance		Mediator: Funder searching effort	DV: Funder decision-making performance
Path A			**Path A**		
Funder self-efficacy	**-2.61 (1.31)***		Funding knowledge	**3.20 (1.31)***	
Path B			**Path B**		
Funder searching effort		**20.15 (4.86)****	Funder searching effort		**19.58 (4.89)****
Path C'			**Path C'**		
Funder self-efficacy		50.69 (81.93)	Funding knowledge		9.20 (82.47)
R^2	.03	.13	R^2	.04	.13
F	2.57	7.87**	F	3.59*	7.73**
Indirect effect of X on Y			**Indirect effect of X on Y**		
ab		**-52.58***	*ab*		**62.53***
SE		31.05	*SE*		31.95
LLCI 95%		**-132.60**	LLCI 95%		**13.85**
ULCI 95%		**-5.45**	ULCI 95%		**142.88**

Note. Path A=first stage effect; Path B=second stage effect; Path C'= direct effect, *ab*= indirect effect. All coefficients are unstandardized. Results based on 5,000 bias corrected bootstrap samples. * $p \leq .05$; ** $p \leq .01$

Table 2. Study 2: Conditional Indirect Effects and Index of Moderated Mediation

Conditional indirect effects				
	Coeffecient	*SE*	LLCI 95%	ULCI 95%
No Crowd Cues (control)	9.62	12.08	-1.38	56.14
Unqualified Crowd Cues	-16.42 *	17.01	-76.72	-0.01
Index of Moderated Mediation				
	Index	*SE*	LLCI 95%	ULCI 95%
	-26.05 *	24.16	-102.99	-0.13

Note. Results based on 5,000 bias corrected bootstrap samples. * $p \leq .05$.

APPENDIX A: Instruments used in this research for manipulation checks and attention checks.

Quality manipulation check. We used the Ciuchta et al. (2016) 3-item idea quality scale to assess the relative quality of the various pitch stimuli presented in this research. This measure has been previously validated in crowdfunding research. The scale ranged from *definitely not* to *definitely*, and the stem to these items read, "Based on the information you have received so far, please answer the following questions"

1. "The idea is practical"
2. "The idea is clever"
3. "The idea is high quality"

Cite: Ciuchta, M.P., Letwin, C., Stevenson, R.M., McMahon, S.R., 2016. Regulatory focus and informational cues in a crowdfunding context. Applied Psychology. 65, 490–514.

Self-efficacy manipulation check. We used McGee et al.'s (2009) 3-item searching self-efficacy scale to assess the effectiveness of our self-efficacy manipulation. Given that individual self-efficacy is domain-specific (Bandura, 1991; Gist and Mitchell, 1992), and that generalized self-efficacy scales are less precise than domain-specific scales (Bledow, 2013), it is well established in the literature that scholars should use context-specific self-efficacy scales when possible in their research (Bandura, 2012, 2006; Compeau and Higgins, 1995). The searching self-efficacy construct is a sub-facet of entrepreneurial self-efficacy. It is defined as one's own belief in his or her ability to scan for quality new ventures. The scale ranged from *no confidence* to c*omplete confidence*, and the stem to these items read, "How much confidence do you have in your ability to…"

1. "Brainstorm (come up with) a new idea for a product or service."
2. "Identify the need for a new product or service."
3. "Design a product or service that will satisfy customer needs and wants."

Cite: McGee, J.E., Peterson, M., Mueller, S.L., Sequeira, J.M., 2009. Entrepreneurial self-efficacy: Refining the measure. Entrepreneurship Theory & Practice. 33, 965–988.

Directed answer question. In line with recommendations, we embedded a directed answer question to detect inattentive participant responding (see Meade and Craig, 2012). The item read, *"This row is used to verify if a human rather than a machine is taking this survey. Please select definitely for this row."*

Content check question. We also embedded a content check question to detect inattentive participant responding. This was a multiple choice fact-based item intended to assess participant attention while they engaged in the task (Berinsky et al., 2012; Hauser and Schwarz, 2016). After each pitch, we asked participants to select the name of the company from a list of multiple-choice options.

APPENDIX B: Study 1 and Study 2 treatment and control conditions.

Prior to engaging in the final decision-making task, we randomized participants into one of the following conditions:

(a) Self-efficacy manipulation: We manipulated participant self-efficacy using a false feedback task (see Bandura, 1997; Beck and Schmidt, 2012; Gerin et al., 1996; Motl et al., 2006). In this condition, prior to engaging in the actual investment task, participants were told they would be provided an opportunity to complete an initial task that would allow them to better understand their own skills in evaluating crowdfunding pitches. These participants were then presented with three separate pitches. An excerpt from one of the pitches is included below as an example:

PerkUp Coffee Corp. is a coffee company specializing in producing cold brewed coffee concentrate and cold brew ready-to-drink beverages. PerkUp Coffee Corp. bottles its craft coffee drinks and products in a facility based in Riverside, California. The coffee industry is a steadily growing industry with 68.7% of Americans drinking at least one cup of coffee daily. PerkUp Coffee Corp. produces a high-quality coffee product that is positioned as a specialty drink and retails for $2.49 for a 12 oz bottle. PerkUp Coffee Corp. is distinct from the typical hot brewed coffee, in that it brings out a different flavor profile of the coffee beans, as well as almost 4 times as much caffeine, and much less acidity, making for a less bitter taste. The founder…..

After reading the pitch, participants were asked to determine if the venture either *a successful outcome* or a *complete business failure* within 5 years of launching. The procedure was repeated for two additional pitches. All participants in this condition were told that they "correctly predicted the venture success of all the investments," and that their score was 3 out of 3. To increase the realism of this task, we provided pictures of the company founders and products, and we used graphics that appeared to be dynamic in nature to provide feedback to participants.

(b) Venture-funding knowledge manipulation: We manipulated participant funding knowledge by providing them with a short training document entitled, "Understanding early-stage equity investing: A short training module for novice investors". The training document was 704 words in length. It included the following headings; what is early-stage investing?, how does early-stage investment work?, how do investors analyze early-stage deals? The final section included the following sub-headings; Revenue potential; Market size and return on investment; The entrepreneur; Barriers to entry and competition. For details on how this document was developed please refer to the methods section in the article.

(c) Control condition: In the control condition participants read a training document entitled, "Understanding how to use the game of golf to advance your career" as a filler task. It was 709 words in length.

The stimuli discussed herein are available from the authors.