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Title

Managing the Unknowable

Permalink

<https://escholarship.org/uc/item/54j7z903>

Journal

Administrative Science Quarterly, 60(4)

ISSN

0001-8392

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Publication Date

2015-12-01

DOI

10.1177/0001839215597270

Peer reviewed

Managing the Unknowable: The Effectiveness of Early-Stage Investor Gut Feel in Entrepreneurial Investment Decisions

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Administrative Sciences Quarterly, forthcoming

Keywords: Gut Feel, Intuition, Investor Decision Making, Angel Investors, Entrepreneurship, Uncertainty, Entrepreneurial Finance, Investment Criteria

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ABSTRACT

Based on an inductive theory-development study, a field experiment, and a longitudinal field test, we examine early-stage entrepreneurial investment decision making under conditions of extreme uncertainty. Building on existing literature on decision making and risk in organizations, intuition, and theories of entrepreneurial financing, we test the effectiveness of angel investors' criteria for making investment decisions. We use this prior work as an integrated lens to ground our empirical findings, and discover that angel investors' decisions have several characteristics that have not been adequately captured in existing theory: angel investors have clear objectives (extraordinarily profitable investments rather than seeking to maximize return on each investment), and they rely on a combination of expertise-based intuition and formal analysis in which intuition trumps analysis, contrary to reports in other investment contexts. We also found, as proposed, that their reported emphasis on assessments of the entrepreneur accurately predict extraordinarily profitable venture success four years later. We develop this theory by examining situations in which uncertainty is so extreme that it qualifies as unknowable and propose using the term of art, "gut feel," to describe their dynamic emotion-cognitions in which they blend analysis and intuition in ways that do not impair intuitive processes, and in turn, effectively predict extraordinarily profitable investments.

Managing the Unknowable: The Effectiveness of Early-Stage Investor Gut Feel in Entrepreneurial Investment Decisions

Angel investors make decisions to invest under conditions of extreme uncertainty, and we are only beginning to understand why and how they do so. These investors participate at the earliest stages of new ventures, just after entrepreneurs' use of personal savings and "family and friends money," where they face decisions in which uncertainty is so extreme that it qualifies as unknowable. Angel investors often make decisions before prototype products have been developed (will it even work?) and for products or services that have no established markets (will anyone use this?). Yet, entrepreneurs do find investors who have developed expertise in making investment decisions when risks are unknowable (Aldrich, 1999; Baum and Oliver, 1991). For instance, most investors base their decisions on market and financial data (Zacharakis and Meyer, 1998; MacMillan, Zemann, and Subbanarasimha, 1987; Robinson, 1987; Tyebjee and Bruno, 1984), but under more extreme uncertainty, early-stage investors also rely on other less explicit social factors such as high-status affiliations (Burton, Sorensen, and Beckman, 2002), familiarity with other members of syndicates (Kelly and Hay, 2003), the quality of the entrepreneur (MacMillan, Siegel, and Narasimha, 1986), and the quality of an entrepreneurs' storytelling (Martens, Jennings, and Jennings, 2007) which facilitates investors' sensemaking about the investment opportunity (Navis and Glynn, 2011).

This work has helped us understand what early-stage investors say they do, yet begs two important questions: Why do they use the criteria they say they use? And how effective are their investment criteria in predicting which investments will result in successful firms? Even the most experienced and successful angel investors lose money on over half their investments, and only seven percent of their investments account for three-quarters of their financial returns (Shane, 2008). Here we develop and test a grounded theory of investors' investment intentions, their

effectiveness, and how they combine their criteria in making these investments – an integrated account that we believe contributes not only to our understanding of early-stage venture financing, but also to decision making when risks are unknowable, and how intuition and formal analysis can support one another in decisions of extreme uncertainty.

Our work provides an empirical test of entrepreneurial decision making at the earliest stage of financing – where decisions are most fraught with uncertainty and noise. Angel investors who operate at these earliest stages have received less attention than venture capitalists (VCs), despite estimates that the stage at which angel investors invest may be more important for high-potential startup investments than the later stage at which VCs typically invest (e.g., Goldfarb, Kirsch, and Miller, 2007; Shane 2008). Venture capitalists invest when there is more evolving certainty about systematic risk, and unlike angels, who invest their own funds, VCs manage the pooled money of others in a professionally-managed fund with larger sums of total investment. Yet total annual angel investments are almost as much as all venture capital funds combined, and based on some estimates angels invest in more than 60 times as many companies as venture capitalists (Sohl, 2011; National Venture Capital Association, 2010).

We draw on and contribute to three literatures in developing this theory and test of the nature and effectiveness of angel investment decisions: decision making under conditions of risk; theories of affective and cognitive judgments with particular attention to the role of schemas, heuristics, and intuition; and entrepreneurial finance theory. Grounding our analysis in these streams of work, we first develop an inductive theory from interviews with experienced angel investors about how and why early-stage investors develop their investment schemas to address the particular uncertainties they face in their decision context (Study 1), and then test this theory in two studies with different samples of experienced angel investors – one an experiment (Study 2) in which Study 1 investors' claims about the schemas they rely on are tested, and Study 3 in which

we collect subsequent investment performance data to test how accurate angels were in achieving their stated objectives of making a few extraordinarily profitable investments.

DECISION MAKING AND UNKNOWABLE RISK

Most decisions are made under conditions of risk and uncertainty. There are other decisions that are made when risks are unknowable. Although there is a great deal of research on uncertainty and numerous distinctions in this literature (e.g. risk vs. uncertainty in creation theory, Alvarez and Barney, 2007; Knight, 1921), recent scholars have framed extreme uncertainty as decisions in which risks are unknowable (Diebold, Doherty and Herring, 2010). Angel investors face cases in which uncertainty is so extreme that it qualifies as unknowable: they decide on investments in ideas for markets that often do not yet exist, and propose products and services that have no precedent for whether they will work. That is, rather than simply facing decision contexts where probabilities are unknown (e.g. Knight, 1921), angel investors face the types of “unknown unknowns” (Diebold, Doherty and Herring, 2010) that include both uncertainty and noise due to a large amount of unsystematic risk and conditions of evolving certainty around systematic risk (Knight, 1921; Foss and Klein, 2012). Put simply, angel investors are deciding among uncertain solutions to a market, while simultaneously grappling with inherent uncertainty about the services, products, and markets themselves – as one of the angels in our sample describes, the equivalent of “chasing an invisible moving target”.

Therefore, although the theoretical approaches to describing uncertainty are vast, we draw on recent work on unknowable risks because it best captures the decisions facing entrepreneurs. These scholars classify risks into the knowable (K), which can be assigned probabilities; uncertainty (u), or unknown risks that are known but cannot be quantified; and the unknowable (U), where the risks cannot be known (Diebold, et al., 2010). Work on decision making when risks are unknowable has primarily been conducted in behavioral finance where scholars focus on the

difference between uncertainty and unknowability (c.f. Hastie and Dawes, 2009; Kahneman, 2011; Plous, 1993). Because of its base in finance, most interest in unknowable risk has concerned unexpected negative events – planes destroying New York’s World Trade Towers or devastating weather events, for example. To angel investors, however, especially those who are experienced, unknowable risks may represent more than unforeseeable events, and an emergent insight that we examine is why experienced angel investors have the belief that only by investing in companies with unknowable risks can they personally find the most attractive extraordinarily-profitable investments – and as we discuss below, the impact of various factors on how they manage unknowable risks.

DYNAMIC EMOTION-COGNITIONS AND INTUITION

In examining how decision makers might handle unknowability, we turn to research on intuition to help inform our understanding of the treatment of unknowable risks in decisions that angel investors face. Newell, Shaw and Simon (1958) proposed that decision makers develop heuristics, or “short-cuts”, to aid them in those decisions where risks are highly uncertain (see also, Barnard, 1938; Prietula and Simon, 1989). Other scholars have traditionally called this form of decision-making intuition-based and have contrasted it with formal analysis (e.g., Epstein, 1990, 1994; Hogarth, 2001; Tversky and Kahneman, 1983).

Many have identified analytic decision making as being rational, intentional, deliberate, rule-based or System 2. While there is little dispute about what formal analytic decision-making is, there are a wide variety of terms and several debates regarding intuitive decision-making. Dane and Pratt (2007) addressed the differing definitions in their comprehensive review and theory of intuition. They define the core of intuition as affectively charged judgments that arise through rapid, nonconscious and holistic associations among different elements. They propose that intuition is more than heuristics (which they consider to be simple rules of thumb); intuition also

includes complex, expertise-based schemas. Following Dane and Pratt (2007), we also adopt the term “schemas,” rather than heuristics, to refer to the experience-based complex patterns angel investors seek and use to arrive at investment decisions.

There is debate about whether the use of such intuitive schemas is subconscious or some combination of conscious and subconscious. This is central to understanding angel investors’ decision-processes because we must rely on their (conscious) reports. Drawing on Jung (1933), Dane and Pratt (2007) propose that intuition is subconscious and Shapiro and Spence (1997) propose that intuitive decision makers have no awareness of how they arrive at their decision. In contrast, Khatri and Ng (2000) proposed that intuition lies along a continuum of consciousness-subconsciousness (see also Parikh, 1994). They emphasize that components of intuitive processes may be subconscious but disagree with the strong argument that intuitive processes are wholly subconscious. If they are correct, theories of intuition may be subject to empirical testing.

In addition, there are differences about the role of emotion in intuitions. Barnard (1938) and Shirley and Langan-Fox (1996) emphasize “the feelings” in intuitive decisions, and Burke and Miller (1999) argue that intuition is affect-initiated. By contrast, Simon (1987) and Vaughan (1989) argued that emotions interfere with intuitive processes. Hindriks (2014) proposed that intuition has both affective and cognitive components; this claim is supported by recent research in psychology that has emphasized that emotions are not distinct from cognition, but both emotion and cognition interact in dynamic emotion-cognition interactions (e.g., Izard, 2009). Dane and Pratt (2007) propose that cognition is involved in intuition but that intuitions also are affectively charged, consistent with recent psychological theorizing.

A number of scholars have argued that formal analysis results in decisions superior to those based on intuition. This is because intuition tends to be biased and leads to predictable errors, much like that of heuristics (Bazerman, 2006; Denes-Raj and Epstein, 1994; Hammond,

Keeney, and Raiffa, 1998; Tversky and Kahneman, 1983). However, Nado (2014) addresses those who claim that intuition is unreliable by proposing that the term itself covers a broad number of decision approaches, some quite reliable, certainly more reliable than any alternative. There is a growing literature identifying the circumstances in which intuition results in better decisions. These include the need for quick, rapidly made judgments (e.g. Ambady and Rosenthal, 1992), and reliance on cue-based prompts (Gigerenzer, 2007; Gigerenzer and Gaissmaier, 2011) that are honed with experience.

Intuition-based heuristics can also be more effective when feedback is provided in a repeated judgment task (Kleinmuntz, 1985), and when schemas based on experience are used (Dane and Pratt, 2007; Dane, Rockmann, and Pratt, 2012; Foss and Klein, 2012). Khatri and Ng (2000) found that the more unstable an organization's environment the more executives reported relying on their intuition and that their organizations' performance was better than the industry average when they did so. Elsbach and Kramer (2003) reported that movie producers who engage in intuitive processes like pattern matching are less likely to make errors when operating under uncertainty (see also, Dreyfus and Dreyfus, 1986; Klein, 2003; Prietula and Simon, 1989; Simon, 1987). Finally, Dane and colleagues (2012) also suggest that in certain decomposable tasks, intuitive processes are more effective.

Thus, prior research suggests that under instability, unknowable risks, and non-decomposable tasks, when speed is critical and decision makers have complex, domain-relevant experience, intuition may be more effective than analytic decision making. This echoes the arguments Bhide (1992) and Alvarez and Barney (2010) made about entrepreneurs. Thus, angel investors would seem to face the kinds of investment decisions where we would expect intuition to dominate. However, we know little about how the dynamic emotion-cognitions that compose an intuitive decision operate in the field, and here, we integrate the literature on intuition to develop a

theory proposing that whenever intuition is positive, formal analysis contributes additively to confidence in decisions, whereas the reverse is not necessarily the case. In addition, by elaborating and extending Dane and Pratt's (2007) suggestion that intuitions are emotion-laden by proposing exactly how emotions do, and do not, feature in angel investors' decisions, we examine and draw particular attention to why decision makers characterize these decisions as affect-based.

EARLY-STAGE ENTREPRENEURIAL INVESTMENTS

We examine how intuition and formal analysis might interact in the context of unknowable risks in investments decisions by integrating the entrepreneurship and entrepreneurial investing literature. This latter body of research is embedded in a rich tradition of studying entrepreneurial risk from two perspectives: entrepreneurs' own management of risk, and angel and venture capitalists' decisions about risky investments.

Consistent with the affective decision making literature, Alvarez and Barney (2007) proposed that entrepreneurs made decisions based on heuristics and biases, often through the use of an inductive, iterative and incremental effectuation process (Sarasvathy, 2001). That is, because opportunities cannot be known in advance, entrepreneurs (and, therefore, angel investors) cannot collect the information required to assess risks. Rather than trying to identify how they might achieve a particular goal, entrepreneurs, and we would suggest experienced angel investors, learn to make do with the resources at hand and with what they can control, shifting their goals as they proceed. Dew, et al. (2009) found that experienced entrepreneurs did use such an effectual logic, in contrast to MBA-student novices who used the means-to-ends logic taught in their schools. In so doing, entrepreneurs' use of their biases and heuristics (specifically, over-confidence and not seeking representative information) actually will make them more effective when decisions had to be made quickly and much information is simply not available (Busenitz and Barney, 1997; see also, Foss and Klein, 2012 for a more general discussion of the effectiveness of heuristic search).

Further, Alvarez and Barney (2007) follow Bhidé (1992) in proposing that entrepreneurs who seek funding from banks and venture capitalists will damage their ability to grow because such funders force entrepreneurs to pursue opportunities where risk can be more formally assessed. Yet, angel investors do not require or expect informative business analyses, and we propose that angel investors are like entrepreneurs in using experience-based schemas.

The second perspective largely has its origins in later-stage investors such as venture capitalists, but has begun to include angel investors (e.g. Mason and Stark, 2004; Shane and Cable, 2002). Venture capitalists rely to a greater extent than angel investors on market and financial data (Zacharakis and Meyer, 1998; MacMillan, Zemmann, and Subbanarasimha, 1987; Robinson, 1987; Tyebjee and Bruno, 1984), but under conditions of increasing risk, also place a great deal of weight on less formal information. For example, Kirsch, Goldfarb, and Gera's (2009) study of 722 funding requests submitted to an American venture capital firm found that the form of business plans was weakly predictive of funding decisions, and the content of the document did not inform venture capitalists' decisions to invest at all. Rather, the critical information venture capitalists report they used came through informal channels.

Several have addressed the limited use of formal data in receiving venture capital funding by trying to understand what factors outside the formal business plan drive venture capitalists' decisions to invest. In their inductive field study, Zott and Huy (2007) found that entrepreneurs are more likely to acquire resources for new ventures if entrepreneurs perform symbolic actions signaling their legitimacy based on the entrepreneur's personal credibility, professional organization, previous organizational achievement, and the quality of their stakeholder relationships. They propose that the greater the uncertainty in the marketplace about the value of a company's offering, the more important symbolic management is to receiving venture-capital funding, suggesting its particular importance for angel investors. Others have found that venture

capitalists will invest based on entrepreneurs' high-status prior company affiliations (Burton, Sorensen, and Beckman, 2002) and directorships in other firms (Florin, Lubatkin, and Schulze, 2003); venture capitalists will follow other investors (e.g. Rao, Greve, and Davis, 2001), and are swayed by the quality of the entrepreneurs' storytelling (Martens, Jennings, and Jennings, 2007) which facilitates venture capitalists' sensemaking about the investment opportunity (Navis and Glynn, 2011). Thus, even later-stage venture capitalists rely heavily on factors outside of market, financial and product data. Yet, we know little about how they combine formal analyses and more informally gathered information; we expect that our theorizing about how angel investors integrate these types of information can shed more light on these investment decisions.

As we would expect, angel investors report that they rely heavily on their intuitions about the entrepreneurs in making their decisions. Shane and Cable (2002) found that direct and indirect ties between entrepreneurs and angel investors increase the likelihood of investment. Maxwell and Levesque (2011) emphasized the role of trust between angel investors and entrepreneurs, and Mason and Stark (2004) reported that the "chemistry" between angel investors and entrepreneurs drove investment decisions.

However, there are concerns about this heavy reliance on assessments of the entrepreneurs. Kaplan, Sensoy, and Stromberg (2009), in a study of all 2004 Initial Public Offerings found that while new business products or services remained largely stable there was a great deal of management turnover, suggesting that angel investors' reports of their reliance on their intuition of the quality of the entrepreneur may be misplaced. That is, questions remain about whether these reports of heavy reliance on their assessments of entrepreneurs are based on a successful strategy in the face of unknowable risks or an example of the well-known bias of over-confidence in their ability to understand other people. We examine experienced investors' own reported reliance on intuitions to see if these assessments outperform formal business data and below discuss our

emergent insights on how those who seek unknowable risks have developed a strategy based on seeking few extraordinarily profitable investments combined with risking small stakes, fully expecting to lose their entire investments on most of their investments – and why they do not seek to manage or minimize risk, contrary to central tenets of finance.

In sum, previous research has found that early-stage investors report that they attend to entrepreneurs' personal characteristics, as well as other experiential and social factors, yet missing from the literature is an empirically grounded investigation of how these assessments are combined with their formal analyses of the business. To what extent do experienced angel investors, when faced with unknowable risks, dynamically come to decisions based on both intuition and formal analysis and how effective is this for their investment objectives? Kleindorfer (2010), Prinz (2005), and Wilson (2002) report that formal analysis undermines intuition, yet angel and venture capitalists report that they rely heavily on their intuitions about the entrepreneurs; how do they manage this? Put simply, we do not yet know how early stage investors attempt to manage the unknowable, and how the varied factors are integrated and weighted. Therefore, we employ a qualitative-quantitative multi-method design to address these questions (see Table 1 for overview of empirical design), beginning with an inductive, grounded theory building study of how and why angel investors build dynamic emotion-cognition interactions, a theory we test in subsequent Studies 2 and 3.

[INSERT TABLE 1 ABOUT HERE]

STUDY 1: A GROUNDED THEORY OF WHY AND HOW ANGEL INVESTORS MAKE DECISIONS

Method

Data Collection. We observed monthly meetings of five different angel investment groups, where entrepreneurs are invited to give short presentations to a group of investors,

followed by Q&A sessions and individual decisions to proceed with further due diligence or investment. While some angel investors work in syndicates (Shane, 2010) members of this group made individual investment decisions. Other sources of data – such as interviews, investor feedback sheets, and due diligence documents – were used to extend and verify insights. The angel groups we observed typically looked for funding opportunities between US\$250 thousand and US\$2 million, with individual investors averaging between \$10,000 to \$20,000 (per angel, per venture). The core of the data collection occurred over two years of field work from June 2009 to August 2011 after direct contact was made with the angel groups and access was granted in return for copies of aggregate findings to help inform their subsequent decisions. In this period, we observed activities of these groups, attended over 16 monthly meetings, conducted over 80 informal unstructured interviews, observed 18 meetings held between individual angel investors and entrepreneurs targeted for potential investment, and collected documentation for projects (e.g., emails, financial projections, copies of pitch presentations, agendas, and meeting minutes). Notes were taken during each communication and subsequently analyzed and stored.

After developing a preliminary sense of their investment processes, 28 structured interviews with experienced angel investors were conducted in which we specifically probed for why and how they made their investment decisions. We focused on actively investing, experienced angel investors and asked them to relate specific examples of investments they had made and examples of investments they had turned down. Investors were also asked to describe background information, such as how they first got into angel investing, how they thought and felt about investment decisions in the past, and how they currently think and feel about investment decisions. The structured interviews lasted from 40 minutes to over 3 hours, with an average of 65 minutes, and were tape recorded and transcribed.

Data analysis. The initial analytical approach was open ended and inductive (Strauss and Corbin, 1997), but driven by a broad interest in the criteria and specific considerations angel investors relied on to make an investment decision and why these criteria were deemed relevant or important. The data analysis of accounts gathered from interviews, observations, and records data involved an iterative approach of traveling back and forth between data, pertinent literature, and emergent theory (Glaser and Strauss, 1967; Locke, 2001). Comments were sorted into an emergent set of topical categories of important considerations for investment decisions, comparing notes after each set of four to five interviews. In reading the interview transcripts, notes were taken, including reactions to the interviews and thoughts about assessments, judgments, and criteria used in their investment decision-making. Data analysis was completed over a series of repetitions (Miles and Huberman, 1994), including systematic adjustments and confirmatory comparisons between the data and the emergent categories. This process continued until reaching a point of saturation and every relevant comment was assigned to a category or sub-category (Corbin and Strauss, 2008), with immersion at each stage of analysis to examine its fit with the emerging theory. This early analysis focused on uncovering how investors integrated the various considerations found relevant in making their investment decisions. It revealed numerous foci of attention, which could be grouped into two categories: business viability data (dominated by formal analysis and cognition) and perceptions of the entrepreneur (dominated by intuition, with a large affective component).

After making this distinction, axial coding (following Corbin and Strauss, 2008) was conducted to relate emerging findings about the nature of their decisions while consulting theoretical precedents that might help to explain what was being uncovered. The end result was a conceptualization of investor decision criteria as inferred from their statements. We first describe angel investors' investment objectives, and examine why they invest. Next we describe how they

combine analysis and intuition in ways that do not impair intuitive processes, and we analyze how they successfully manage contradictory information in making their investment decisions.

Why Investors Seek Unknowable Risks

A Few Extraordinarily Profitable Investments. Angel investors had a clear objective for their investments; they were not ambiguously feeling their way through the investment decision as has been described by several studying decision making under uncertainty (e.g. Krueger, 2000). These did not appear to be Thompson's (1967) "inspirational strategies" because investors had clear objectives for their investments, as will be discussed below. They sought unknowable risks because they believed those investments would provide them with their best personal potential profits. Experienced angel investors seek these unknowable risks, in order to seek extraordinarily profitable opportunities. We note that there were individual differences in profit objectives, with some angels taking high risks to earn high returns, while other investors sought relatively lower risks and lower returns. However, angel investors who were making decisions under conditions of unknowability shared that they saw these as opportunities to make decisions about something "unlike any others I've seen before." Investors claimed that it allowed them to "spot the diamond in the rough," as one investor said:

My job is to find that underpriced asset... if everything looked great, it would have already been snatched up, and at a much higher valuation. I try and spot the diamond in the rough, which is something so ridiculous that it could actually work, because you have the right person willing to take it from ridiculous to completely disruptive. Like Twitter. People initially thought that it was truly, truly [weak].

These angel investors sought what they called "homeruns." One view of homeruns is a venture characterized by an initial public offering (IPO) or the sale to another company (Prowse, 1998), and carries with it a large return to the investor – generally accepted to be in the order of a 10 times or greater return on investment (Sahlman, 1990; Jegon, 1998). However, there is variance between investors, with some characterizing a homerun to be a three-to-five-times

investment return, and others only considering a venture like eBay, where an investment of about \$7 million harvested about \$2.4 billion in 18 months, to be a home run (Sahlman, 1990; Jegen, 1998). Investors recounted numerous stories about homeruns and described having a gut feel to “go for it.” For example, as one investor put it,

You don't need to avoid uncertainty... the truth of the matter is that nobody is certain. I really feel like part of my success is being the person who says, 'It's OK. Be uncertain. Bear the uncertainty. Embrace it. Go with it. Let that lead you to the interesting stuff.' That's how I make my huge profits.

Similarly, McMullen and Shepherd (2006) use this logic when they discuss entrepreneurs as having a desire to bear great uncertainty because it provides an opportunity to obtain extraordinary profits. Indeed, all investors want to make profitable investments. What distinguishes angel investors is their view that these profits can only be found when risks are unknowable and if they are willing to accept that most of their investments will be total losses.

Expect Most Investments to Be Losses. In their desire to make an investment with extraordinarily large financial returns, investors also acknowledged a willingness to accept numerous failed investment decisions (in the form of investments in opportunities that later ceased to exist). Because they seek to invest in opportunities with potentially extraordinary returns, they expect to lose money in most of their investments. That is, rather than experiencing the behavioral effects of loss aversion (e.g. Benartzi and Thaler, 1993; Tversky and Kahneman, 1991) that typically result in decisions under conditions of unknowability, early-stage investors do not seem to exhibit the commonly observed avoidance behaviors or myopic sensitivity. Put simply, experienced angel investors saw it as their task to invest in homeruns regardless of their overall error rate. As an investor reported:

This is how we deal with the world... we are different from guys investing in stocks where they're looking for .95 batting averages... a hit every time they're at bat. We don't care if we have a .10 batting average because when we go up to bat, we're looking to hit a grand

slam... we know that you gotta swing at a lot of pitches before you get that perfect one that you can hit out of the park...

Investors commonly linked this desire to invest when risks were unknowable with an acceptance of failure. Organizational researchers have found that 90% of later-stage investment decisions indeed result in failures (Aldrich, 1999) and only a small fraction of venture-capital investments are extraordinarily profitable (Prowse, 1998; Knight, 1987). Industry estimates are that only about one to two percent of businesses that venture capitalists invest in become homeruns (National Venture Capital Association, 2010), an additional 18 percent are said to be modest successes, about 20 to 40 percent of their ventures are said to be total losses, with the remainder being partial losses, or barely breaking even, with the odds for angel investments necessarily longer. As another investor put it, "I'll never know if this is the homerun or not... but you miss 100% of the shots you don't take..."

Decision making research rarely addresses contexts in which decision makers expect the vast majority of their decisions to be total losses. Laboratory research lends itself to decisions that are intended to maximize returns but minimize risk (i.e. manage the "loss function") on each decision. Angel investors do not approach their decisions this way. Yet, such decision contexts are not rare; for example recreational betting is based on the same such decision objectives, and as will be elaborated in the Discussion is pursued for the same reasons angel investors invest: the hope of exciting large payoffs with relatively small stakes at risk.

How Investments in Unknowable Risks Are Made

The processes used by these angel investors had components of both intuition and formal analysis. Investors did use data available to them, and referred to these data as "anything that I could collect in written form", or "all the numbers I can crank away on," and subsequently used the data to "run calculations on what I think [the business] is worth". Yet an investor also states:

I always go through a full due diligence process... I check everything out; I put everything into my models. I'm really diligent about collecting bits and pieces; throwing out red herrings. But that only gets you so far...

As another investor describes: "You go through things and check out the numbers... whether you think they're tackling something big... or too big... but then I sit on that..."

The investors describe a process similar to what Dane and Pratt (2007) called the application of complex domain-relevant schemas to their formal analyses, as happens in intuitive decision processes. They processed large amounts of information based on their experience. As one investor noted during a meeting with other angel investors:

The numbers we have check out, we have looked through all the information. But there are other numbers that we just don't have, which change things and make this just seem over the top... and [the entrepreneur] didn't 'wow' me either... he seemed as shifty and dodgy as his numbers did. We know better. We've seen this before, and know what to do with this. We all know enough about how things work in fin-tech [financial technology] to know that this one doesn't look so glossy any more. We've been through this before.

Dane and Pratt (2007) suggested that the combinations of intuition and formal analysis that investors began to speak about are worthy of future study. Here we do find such a combination and seek to understand how investors use what others have considered distinct, and often mutually undermining strategies (Kleindorfer, 2010; Pirsig, 1974; Raiffa, 1968) to make their decisions.

Because we found these decisions to be neither wholly analytic nor intuitive, we adopt our investors' term of art, "gut feeling," for this combination, which encompasses both the analytic and the intuitive nature of their accounts. This term is not new to the organizations literature.

Khatri and Ng (2000) considered gut feel to be one component of intuition (in addition to expertise distilled from experience and quick judgments). Agor (1990), Harper (1988), Harung (1993), Hayashi (2001), Parikh (1994) and Vaughan (1989) all characterized the result of decisions using intuitive processes as gut feel. For example, Harung (1993) called it trusting one's gut-feeling. Our angel investors referred to their decisions to invest as a gut feeling: "... that's

how I make my decisions... I just use my gut feel. I trust my gut. You have to go with your gut, and I've always been glad when I did.”

Investors' describe their gut feel about an investment as a holistic judgment based on two components: information provided from both *business viability data* (BVD) and *perceptions of the founding entrepreneur* (EP). Investors were able to easily group their information into these two primary components. Each is an important category of factors in the investment decision, but in addition, the compatibility of information from business viability data and perceptions of the entrepreneur was extremely salient to them.

Business Viability Data. Business viability data comprised “hard data,” or information gathered from the business plan and financials, or their own research. Investors attended to any numerically measurable information, such as potential market size (in billions of dollars), industry growth projections (e.g. 20% year on year growth), or the entrepreneur's background (e.g. worked for a top pharmaceutical company for ten years), to assess the potential profitability of an investment, consistent with the work on later-stage venture capitalists (MacMillan, Zemann, and Subbanarasimha, 1987; Zacharakis and Meyer, 1998). Business viability data was defined by investors' ability to “measure [the business] in numbers” and subject that information to subsequent calculations, numerical analysis, and cognitive deliberation.

Entrepreneur. Angel investors also relied on their personal observations of the founding entrepreneur¹. Consistent with Bower's (1970; 1986) observations of executives in large corporations, angel investors considered their assessment of the entrepreneur to be the most important component of their decision to invest, and investors reported relying heavily on their intuitive assessments of the entrepreneur. As one investor said, “you notice right away, sometimes

¹ At the early stages in which angel investors invest, there is most often just a founding entrepreneur and not yet a team. Indeed, financial capital from angel investors is often used to subsequently hire key team members (Forbes, Borchert, Zellmer-Bruhn, and Sapienza, 2006).

within 5 seconds of meeting the entrepreneur, how you feel about them and what your overall sense is for them as a person.” These perceptions of the entrepreneur also provided distinct frames for action:

He had a good business, but what really got me to sign the [investment] check was when [the entrepreneur] said to me: ‘I was sitting outside one day, thinking that I was three months behind in our house payment, I had three employees I couldn’t pay, and I ought to get a real job... but then I thought, No, this is your dream. Get back to work.’

Accordingly, investors appeared to link their assessments of the entrepreneur with signals of legitimacy derived from the entrepreneur’s personal credibility (Zott and Huy, 2007), such as symbols of preparedness (Chen, Yao, and Kotha, 2009), commitment (Korsgaard, Schweiger, and Sapienza, 1995), or trustworthiness (Maxwell and Lévesque, 2011), for example. This is supported by the work of scholars who have demonstrated that symbolic actions signaling these types of personal characteristics impact resource acquisition (Zott and Huy, 2007). Angel investors commonly linked their intuitive perceptions of the entrepreneur with a functional attribution (i.e. the entrepreneur was highly committed) that resulted from their symbolic perception (i.e. provocative actions taken on the part of the entrepreneur, such as forgoing mortgage payments) – to serve an implicit, yet interpretive, purpose under conditions of unknowability about the opportunity.

Emotion-Cognitions Based on the Entrepreneur and Business Viability Data.

Investors believed that a positive assessment of both business viability data and perceptions of the founding entrepreneur combined to foster a positive gut feel about the investment, and allowed them to make the most confident decisions. This was based on automatic, yet sophisticated and complex domain-relevant processing (Dane and Pratt, 2007) and pattern matching (e.g. Elsbach and Kramer, 2003). When both business viability data and perceptions of the entrepreneur were

strong they mapped neatly into their experience-based schemas, and resulted in a positive gut feel about the investment: "... sometimes it just all comes together, and you know. You just know."

In some instances investor gut feel appeared to be driven predominantly by their perceptions of the entrepreneur, where a greater weight was placed on perceptions of the entrepreneurs overshadowing data on business viability. For example, an investor described:

I don't care about the financials... the business plan... as much as I care about the entrepreneur. My most successful deals have come when I trust my gut feelings... when I trust only what my gut tells me about the entrepreneur, and filter everything else out.

In other instances, business viability data figured more prominently. One investor noted a desire to "get a general sense for how this is going to disrupt the market" and "how the product addresses a pain point," while still "getting a read for the [entrepreneur]." Thus, angel investor gut feel was a weighted assessment of business viability data and perceptions of the entrepreneur, and the relative significance of business viability data or perceptions of the entrepreneur differed based on individual differences between investors and differences in distinct investment opportunities. Evidence from extant literature supports this notion that investors' gut feel integrates disparate elements such as business viability data and perceptions of the entrepreneur into a holistic judgment (Inbar et al., 2010), relying on their experience-based expertise (Dane and Pratt, 2007; Dane, Rockmann, and Pratt, 2012; Hammond et al., 1987; Klein, 2003; Salas, Rosen, and Diaz-Granados, 2009).

Because angel investors used both formal analysis and intuitive processes, there remained the question of how investors successfully reconciled, and used, the two (Kleindorfer, 2010; Pirsig, 1974; Raiffa, 1968). When there was consistency between strong business viability data and positive perceptions of the entrepreneur, investors described having a gut feel to "leap" towards investment and most often did invest. For example, as one investor put it, "It's like I'm sitting on a jackpot. It's a win-win and I want to go all in. There's always a chance of something

going wrong, but my gut tells me that I have it under control.” Thus, consistency between strong business viability data and positive perceptions of the entrepreneur enabled decision makers to feel in control even under conditions of unknowability. Similarly, consistency between weak business viability data and negative perceptions of the entrepreneur fostered a sense of control: they could confidently reject the investment opportunity. As an investor put it, “it definitely was not going to work, and I’m not made of enough money to be investing in that one...” Consistent assessments of business viability data and the entrepreneur fit into clear schemas of either a homerun or likely total loss; in these cases the investors felt the confidence described by Dane and Pratt (2007).

When assessments of business viability data and perceptions of the entrepreneur were in conflict, on the other hand, this created dissonance. This was the case where business viability seemed weak, but the investor had positive perceptions of the entrepreneur; or vice versa, strong business viability, but a negative perception of the entrepreneur. As one investor recounted:

Those are the deals that really make you sweat... the ones where you start saying ‘on the one hand, how can I not..., and on the other hand, how could I possibly...’ He was playing in a \$65 billion dollar market, and I believed that what he was trying to do could capture a really large chunk of that market. But there was something about him that reminded me of why I lost [a large sum of money] on [a prior investment]. He had that same zany glare in his eyes as [prior entrepreneur], and was using the same ‘if... then’ statements that just took me back to my past nightmare and told me to back away from this one... back away from a \$65 billion dollar market... who does that? It was one of the most painful choices and I lost a lot of sleep over that one.

Several studies have shown that similar feelings of psychological tension or discomfort (e.g., Aronson, 1992; Festinger, 1957, Olson, Fazio and Hermann, 2007) arise when individuals hold inconsistent cognitions (or in our case, emotion-laden cognitions). Individuals have a motivational drive to reduce this dissonance, and do so by employing tactics that range from simply changing their mind (e.g. Zanna and Cooper, 1974), to affirming or denying content to create a consistent set of cognitions (Gruenfeld and Wyer, 1992), to a reliance on their emotions to help reduce and justifying their discomfort (Aronson, 1997; Cooper and Fazio, 1984). One way

they reduced dissonance was to remind themselves of the unknowability of their investment decisions. An investor explained,

What do you do when one aspect looks great and the other awful... you feel conflicted, confused, totally directionless at first... and somehow [you acknowledge that chaos; accept it], and it starts to feed you some clues.

Once investors acknowledged the intrinsic unknowability in their decision context, two sets of behaviors were found to take place to reduce this dissonance and produce an investment decision. First, investors relied heavily on their prior experience and previous investments (their existing schemas) to draw parallels. And second, angel investors most often reacted by discounting the business viability data and prioritizing their intuitions about the entrepreneur. They did this by using their past experiences and investments to create a narrative about the relatively low importance of business plans for these unknowable types of decisions when there was inconsistency between business viability data and their perceptions of entrepreneurs:

[Business viability data] always look like 'hockey sticks' [referring to the shape of a financial graph of expected revenue over time] and mean nothing. They're just the hopes and dreams of the entrepreneurs, so they always look beautiful. If I relied on my gut feel for those things, then I would be wrong nine times out of ten and be making stupid decisions. But what I will never be able to quantify is... the founder. I don't have a formula for that, and... the founder... that 'leads me right' nine times out of ten.

Past research supports this notion that investors themselves may assert that formal business-plan data are not sufficient in explaining their decision-making (e.g. Aernoudt, 1999; McKaskill, 2009). Aernoudt (1999) finds that this is particularly the case for early-stage investors such as angels, in contrast to later-stage investors such as venture capitalists: later-stage investors emphasize more the formal return criteria, while angels are more driven by the subjective aspects that they cannot fully capture, nor describe. Others who have studied investment decision-making in situations with much more available information also often downplay the importance of formal numerical projections. Bower (1970) reported that executives in large corporations based internal

investment decisions on combinations of the project and the person presenting the project. He found that these corporate executives felt they could not depend on quantitative projections because "... any manager worth having can produce numbers that will make a project look good (p. 14)." Bower (1970) found that the formal corporate financial projections were accurate only within 10%. Executives learned which particular managers tended to be overly optimistic, and adjusted their investment decisions accordingly. We could expect angel investors would have even less confidence in financial projections, since there is less basis for those projections under conditions of unknowability rather than in the known and uncertain types of decisions Bowers' executives evaluated. Further, angel investors work under the handicap of evaluating strangers, not managers with whom they are familiar:

It's so easy to draw overly simplistic parallels. And that's where I've made my biggest mistakes. Rather than seeing [the founder] for who he was and what I thought he could do, I saw that he was creating an e-commerce storage solution and my mind immediately panicked over that last e-commerce storage solution that tanked and lost me a bundle. And this guy, he ended up creating the cream-of-the-crop solution. But the truth is, you just don't know.

As this report suggests, downplaying business viability data while prioritizing the qualities of the entrepreneur (either positive or negative) reduced dissonance. This served to both affirm (in the case of positive intuitions about the entrepreneur) and deny (in the case of their analysis of the business viability data) content to create a consistent set of cognitions (Gruenfeld and Wyer, 1992). By placing greater focus on the qualities of the entrepreneur who would execute on the business plan, they could give themselves a sense of increased confidence and positive feelings around their decision (Aronson, 1997; Cooper and Fazio, 1984).

Accordingly, formal analysis and intuitive assessments were entrenched and inextricably linked as holistic emotion-cognitions for the investors. Business viability data were necessary to help frame assessments of the entrepreneur at each stage, and "how the decision feels":

I need the numbers and the narrative – the business plan makes sense alongside the fellow who wrote the plan, and the fellow will only make sense alongside the business model and the value proposition he thinks he is worth offering to me... how else do I know how the decision feels... whether he's got that unfair advantage or not... I may decide later that there's nothing worth a penny in the plan, but that doesn't mean that I don't want to see it and that it doesn't matter in the decision.

Hence, these were genuinely dual process decisions providing input into experience based schemas, in a process that combined intuitive process and formal analyses, not heretofore studied in any depth. In exploring the components of their schemas we found that they combine these two different decision processes by discounting the business viability data when they conflict with their positive assessments of the entrepreneurs. And, we found that this is in contrast to the fears expressed by those analyzing the unknowability in other finance decision-making contexts who propose that analysis can undermine experience-based intuition and lead to worse decisions (Kleindorfer, 2010; Prinz, 2004; Wilson, 2002).

Discussion

Taken together, the inductive findings in this study suggest a number of extensions to existing theory. First, rather than being undesirable, unknowable risks are sought and play a strategic role in early-stage investment decisions. These experienced angel investors believe their primary task is to make decisions about opportunities that are “unlike any others they've seen before”, with innovative, disruptive technologies that may challenge existing ways of thinking. Investors did not seek to maximize each decision but instead sought extraordinarily profitable opportunities and welcomed a high failure rate. They made small stake investments fully expecting to lose their entire investment in most opportunities because they saw that as the only way to invest in that one or two extraordinarily profitable investment. This approach is a potentially viable approach to succeeding in the face of unknowable risks.

Second, we found that formal analysis did not undermine intuitions (Prinz, 2004; Wilson, 2002). In the context of unknowable risks, experienced angel investors discounted the formal analyses to privilege their assessments of the entrepreneur when there was dissonance. Angel investors believe their experience-based intuitive assessments of the entrepreneur are a more reliable source of information to investors than their analyses of the business viability data, when the two conflict. Accordingly, Kleindorfer (2010) wrote: “In contrast to the choice under risk, ambiguity and uncertainty require attention be paid to the belief formation process, including the choice of appropriate models/theories that can be used to guide action (p. 169).” These experienced investors did not fall prey to assuming that which can be measured is necessarily more important. Rather, in the case of unknowable risks and with objectives of identifying homeruns, these investors relied on intuition to identify entrepreneurs who could build extraordinarily profitable companies. Further, these angel investors rarely decided in consultation with others, but made individual decisions, and following Heath and Tversky (1991) these angel investors have confidence in their own expert judgments. They place more weight on their own assessments of the entrepreneur, in the case of inconsistencies between their formal analysis and intuition, which will trump any business data they may have.

Nevertheless, Study 1 is based on angel investors’ own accounts of the bases for their gut feel about investments. It is possible that these accounts are dominated by retrospective sense-making, faulty memory, and other biases characteristic of such accounts. Particularly with so many failures and so much that is unknowable about why one investment is extraordinarily profitable and most fail, it is important to test their reports in a more rigorous fashion. Therefore, in Study 2 we test their claims that their assessments of the entrepreneur trump their assessments of business-based formal data when the two conflict, and later in Study 3 we conduct a

longitudinal test of the accuracy of their entrepreneur-dominated gut feel in predicting extraordinarily profitable investments.

STUDY 2: TEST OF THE DOMINANCE OF INTUITION OVER FORMAL ANALYSES

We conduct an experiment to test whether or not our Study 1 angel investor reports are reflected in actual investment recommendations. In particular, when business viability data are promising but their assessment of the entrepreneur is poor, will angel investors decline to invest as those individuals in Study 1 report? When the business viability data are weak but their assessments of the entrepreneur are strong, will they intend to invest as reported? In other words, are their reports of how they manage conflicting analytics and intuition reflected in their investment decisions?

In Study 1 we found that angel investors primarily rely on information that they gained through personal observations of the founding entrepreneur, consistent with what other scholars have proposed (MacMillan, Siegel, and Narasimha, 1986). Investors may rely on these types of assessments of entrepreneurs for several reasons. First, we know from the person-perception literature that this would allow investors to quickly formulate impressions in an ambiguous situation (Bruner and Tagiuri, 1954; Gilbert, 1998; Ross and Fletcher, 1985; Tagiuri, 1969). Social psychologists' find that through non-verbal cues, such as the perception of facial features, individuals make assessments about whether a person is naïve, sweet, honest, and competent (e.g., Zebrowitz-McArthur and Montepare, 1992), and that felt emotion acts as an input in making these assessments (Forgas, 2000; Forgas and George, 2001).

Second, investors relying on a gut feel that heavily weights intuitions about the entrepreneur may attribute successful investments to their own experience and skill in judging entrepreneurs and failed investments to bad luck and the inherent unknowability. Thus, this

reinforces beliefs in the perceived unknowability of business viability data and reinforces support for investments made based on assessments of the entrepreneur.

Third, others have found that perceptions of individuals can accurately predict performance (Todorov et al., 2005; Mueller and Mazur, 1996; Rule and Ambady, 2008). For example, in the military, early assessments of another's dominance can accurately predict subsequent rank for cadets (Mueller and Mazur, 1996), and in studies of chief executive officers, early perceptions of their power are positively associated with later outcomes such as number of deals being made and company profits (Rule and Ambady, 2008). Personal characteristics of the entrepreneur – such as their optimism (Hmieleski and Baron, 2009), trustworthiness (e.g. Maxwell and Lévesque, 2011), or how much passion they demonstrate for the idea (e.g. Chen, Yao, and Kotha, 2009; Cardon et al., 2009) give the investors a sense for how other important stakeholders, such as potential customers, suppliers, and partners will perceive the entrepreneur, and whether the entrepreneur can follow through and deliver on the venture's potential (Low and MacMillan, 1988; Zahra, Sapienza, and Davidsson, 2006). When risks are unknowable experience-based intuitions about the entrepreneur are quicker and can be based on more relevant data than business viability data.

Hypothesis 1: Experienced angel investors will invest more in opportunities when they have a positive assessment of the entrepreneur and weak assessments of the business viability data than they will in opportunities with weak assessments of the entrepreneur and strong assessments of the business viability data.

Method

Data and Procedure. One-hundred thirty-five experienced angel investors, different from the angel investors in Study 1, were presented with the full business plan of an investment opportunity. We again focused our sample on actively investing, experienced angel investors to remain phenomenologically consistent with the descriptions, schemas and prototypes we unearthed in Study 1. These investors had an average of 10.17 years (SD = 6.24 yrs) of investment

experience, with a minimum of four years and a maximum of 25 years, and recruitment of these investors was conducted in a similar fashion to the prior study where in return for their participation aggregated findings were provided to help inform their own investment processes. The average number of investments that had been made by these investors was eight investments (SD = 8.92; min = 3; max = 47 investments). In addition, these angel investors had screened many more investment opportunities, and could draw from their experience-based prototypes in judging the entrepreneurs and their ventures. Investors read a business plan that included a two page executive summary, with information on prior market due diligence, as well as a section that included excerpts of statements made by the entrepreneur from prior pitch presentations and conferences, created with elements from examples of investments provided by the angel investors in Study 1 (for information on pretest procedures, see Appendix A). Investors were then asked to complete a questionnaire.

Experimental Conditions. Investors were randomly assigned to one of four versions of the executive summary in a 2 (strong vs. weak plan-based business viability) x 2 (elicited perceptions of positive vs. negative perceptions of the founding entrepreneur) experimental design, such that each investor received one of four possible versions of the briefing: strong BVD-positive EP; weak BVD-negative EP; strong BVD-negative EP; or weak BVD-positive EP. The former two created conditions of consistency in assessments, whereas the latter two created conditions of assessments in conflict and dissonance.

Manipulations. To manipulate strong vs. weak business viability, information on financials, market, and stage of product prototypes were varied (see Appendix A for information on equivalence of conditions). For instance, to show strong business viability data, investors read that the product was "... fully functional and operational at the moment", and to show weak business viability data, investors learned that the project was instead "...very rudimentary at the

moment, and there is still work to be done...” (see Tyebjee and Bruno, 1984, for example, on data shown to affect assessments of business viability; Appendix B for additional examples of manipulations used in the study).

To elicit positive vs. negative perceptions of the entrepreneur, investors read quotations and statements in the executive summary that were made by the founder during conferences, pitch presentations, and subsequent Q&A sessions. These statements were used verbatim from original sources. For example, to elicit positive perceptions of an entrepreneur, investors read about an entrepreneur stating the following : “I was sitting outside one day, thinking that I was three months behind in our house payment, I had three employees I couldn’t pay, and I ought to get a real job... but then I thought, No, this is your dream. Get back to work” (see Appendix B).

Investment Decisions. Investor propensity to invest was measured using a 1-5 Agree-Disagree Likert scale, on which investors assessed the extent to which they were presented an opportunity that they would likely invest. In addition, we measured an assessment of probable investment amount based on the current state of the venture. Investors used a sliding scale with dollar amounts ranging from \$0 to over \$20,000.

Results

As an internal validity check we examined whether these investors indicated they would be more likely to invest and invest more when the information was consistently positive rather than consistently negative (see Appendix A for information on post-study manipulation checks). Consistent with Study 1 theorizing, an analysis of variance (ANOVA) revealed that propensity to invest was significantly affected by treatment condition, $F(1, 133) = 12.58, p < .001$, as was the case for investment amount, $F(1, 133) = 4.75, p < .01$. Planned contrasts further revealed that when investors viewed strong business viability and were provided with positive information about the entrepreneur they were significantly more likely to invest (mean = 3.59, S.D. = .70) than

were investors in the weak business viability and negative perceptions of the entrepreneur condition (mean = 2.42, S.D. = .93); $p < .01$.

In support of Hypothesis 1, a two-way ANOVA and a contrast test between individual cells demonstrated that when an entrepreneurial opportunity demonstrates weak business viability data, but an investor has positive perceptions about the entrepreneur, an investor will be more likely to invest than when an entrepreneurial opportunity demonstrates strong business viability data and an investor has negative information about the entrepreneur. As seen in Figure 1, positive perceptions of the entrepreneur, even in the weak business viability data condition, conferred a higher propensity to invest ($M = 2.82$, $SD = 1.03$) than the strong business viability – negative perceptions of the entrepreneur condition ($M = 2.60$, $SD = .92$), $t = 6.72$, $p < .05$. Similarly, as seen in Figure 2, angel investors with positive information about the entrepreneur, even in the weak business viability data condition, conferred a higher investment amount ($M = \$8,100$, $SD = \$1,900$) than the strong business viability – negative perceptions of the entrepreneur condition ($M = \$7,100$, $SD = \$1,250$), $t = 5.18$, $p < .05$, in full support of Hypothesis 1. Therefore, these angel investors recommended investment if they received a positive assessment of the entrepreneur but negative business viability data, but were significantly less likely to invest if the business viability data were positive but the assessment of the entrepreneur was negative.

[INSERT FIGURES 1 AND 2 ABOUT HERE]

Discussion

Study 2 showed that an independent sample of experienced angel investors indeed prioritized positive assessments of the entrepreneur over weak assessments of the business viability data in their investment recommendations. Also consistent, negative assessments of the entrepreneur and strong assessments of the business viability data resulted in significantly fewer recommendations to invest. It appears that angel investors' criteria are at least partially conscious

– they were able to accurately articulate the two components of their gut feel for an investment decision and accurately predict how other experienced angel investors would view investments. In a context of unknowable risks, formal analytics does not impede intuitive processes for experienced investors. Focusing our field experiment sample on experienced investors, we found that under these conditions, the quantifiable does not drive out intuition among those confident in their experience-based schema.

Yet, it is possible that angel investors agree that assessments of the entrepreneur are the most important contribution to the decision to invest, but that this nevertheless leads to poor decisions. After all, most of their decisions result in total loss of their investment. While they attribute these losses to the unknowability of their risks, it could be that these are rationalizations for their reliance on bias-plagued intuitions of the entrepreneur. The primary goal of Study 3 was to examine whether their entrepreneur-dominated gut feel accurately forecasts extraordinarily profitable investments.

STUDY 3: ACCURACY OF ANGEL INVESTORS' PREDICTIONS OF HOMERUNS

It is possible that a strong weighting on assessments of entrepreneurs for their investment decisions may not be an effective predictor of extraordinarily profitable investments. Investors may have an inflated sense of their own skill in judging entrepreneurs, and may attribute failed investments to bad luck and unpreventable business conditions, thus over-emphasizing the importance of their intuitions about entrepreneurs (Gilovich, 1983) – an instance of retrospective sense-making.

However, to build a successful organization, entrepreneurs will need to work with many important stakeholders, such as potential customers, suppliers, and partners. Assessments of whether the entrepreneur will win their confidence may be a critical predictor of a new venture's success. Further, Low and MacMillan (1988) and Zahra, Sapienza, and Davidsson (2006) argued

that whether the entrepreneur can follow through and deliver on the venture's potential is critical to the venture's success. Accordingly, we test the effectiveness of their entrepreneur-dominated gut feelings in their stated objectives of predicting extraordinarily profitable investments.

Hypothesis 2: Experienced angel investors' positive assessments of entrepreneurs will significantly predict investment homeruns.

Methods

Participants and Procedure. Ninety experienced angel investors (different investors than those queried in Studies 1 and 2) were asked to assess entrepreneurs who were making pitch presentations and give their perceptions of both the entrepreneur and the business viability of the opportunity. These investors averaged 14.26 years ($SD = 7.19$ years) of investment experience (minimum of six years and a maximum of 32 years), and had an average of 10 angel investments to date ($SD = 6.52$ investments), with a minimum of four investments and a maximum of 28 investments. Similar to the previous two studies, these angel investors were all actively investing, experienced angel investors and thus had screened many more investment opportunities, and could draw from their experience-based schemas in judging the entrepreneurs and their ventures. Each of the investors predominantly vetted opportunities in new tech ventures, so that their expertise was relevant to evaluating the sampled pitches.

They rated recordings of entrepreneurs' presentations, or pitches, videotaped within a three-year time period, at three top technology pitch competitions in the United States, as rated by various technology forums and leading technology and entrepreneurship magazines. These pitch competitions consist of entrepreneurs who have founded their own start-up ventures, and who give a 5- to 10-minute pitch to a panel of angel investors. Angel investors judge these pitches for the quality of the idea and its investment potential, and award prize money to the winners on the basis of the pitch.

Each pitch was professionally videotaped by the pitch competition's video services department, resulting in high quality sound and picture, and subsequently stored as an electronic video file. To test Hypothesis 2, a sample of 30 "winning entrepreneurs" (i.e. entrepreneurs who were winners of the pitch competition), and a sample of 60 "losing entrepreneurs" (i.e. entrepreneurs who were not competition winners) were randomly selected, stratified by competition, so that the proportion of losing firms and winning firms sampled was equal across competitions (i.e. there were twice the number of losing entrepreneurs as winning entrepreneurs from each competition). This created a total of 90 pitches that were watched by the angel investors; each pitch was watched three times by three distinct investors. Investors were blind to the outcome of the pitch (i.e. whether or not the entrepreneur ultimately won or lost the competition), and assessed entrepreneurs who were making pitch presentations to give their assessments of both the entrepreneur and the business viability of the opportunity (for more information on investor assessments and study procedures, see Appendix C).

Measures

Perceptions of the Entrepreneur. Experienced angel investors were asked to rate "the extent to which you have a positive perception about the entrepreneur" (inter-rater $r = .86$) and "the extent to which you have a negative perception about the entrepreneur" (inter-rater $r = .85$) on a 1-5 Disagree-Agree Likert scale.

Business Viability Data. Strong business viability was coded based on "the extent to which this opportunity has strong business viability" (inter-rater $r = .71$) and weak business viability was coded based on "the extent to which this opportunity has weak business viability" (inter-rater $r = .75$).

Control Variables. Age and gender were collected from each of the coders, as demographic variables that have been shown to have an impact on making assessments on

entrepreneurs (e.g. Brooks et al., 2014). We also control for prior experience of the investor (in years), as a robustness test.

Funding Decision. Funding decision (i.e. whether an entrepreneur received funding by the competition judges) was based on real outcomes from the pitch competitions. A value of 1 was assigned to all entrepreneurs who received funding from the pitch competition, and a value of 0 was assigned to all entrepreneurs who did not receive funding from the pitch competition.

Venture Performance. As is the case in most entrepreneurship research, assessing the performance of nascent firms is a significant challenge because in most cases ventures are small and recently formed, and traditional measures of outcomes such as revenues or profits are not comparable across firms, nor is performance information such as sales or product introductions readily available. Therefore, following Kerr, Lerner, and Schoar (2011), three categories of outcomes were used to measure entrepreneurial performance: venture survival, venture growth, and venture financing².

Venture Survival was measured as a binary indicator variable as of March 2014, four years after the funding decision from pitch competitions. To determine survival, we first attempted to directly contact as many ventures as possible to learn their current status. We then conducted a search to examine the existence of every venture's website and cross-checked each venture (as existence of a website may not be sufficient in being assured of survival) with evidence of the ventures' continuing operations through industry databases and newswires (such as CorpTech, VentureXpert, Dun & Bradstreet, and Hoover's) as well as early-stage entrepreneurship databases and forums (such as Gust, TechCrunch, and AngelList). We found evidence that 78 (out of the 90 ventures) had survived, while 12 showed no evidence of survival.

² Each performance indicator was used independently, rather than creating an aggregate score for overall venture performance, as there is wide variation on which metrics are most indicative of general entrepreneurial performance during on-going operations (Kerr, Lerner, and Schoar, 2011).

Venture Growth was measured based on growth in terms of number of employees from 2011 to 2014. Using the sources described above for venture survival, we identified employment levels for each of the ventures – either an exact figure for number of employees, or when employment ranges were given, they were transformed into point estimates by assigning the average of the reported range (e.g. when the reported range was 10-50 employees, an employment level of thirty was assigned)³. A binary indicator variable was assigned based on whether the venture had demonstrated growth in number of employees⁴, with 39 ventures having no evidence of growth in number of employees and 51 ventures showing growth.

Venture Financing was measured as a binary indicator variable based on whether the venture received venture financing using data collected from the sources described above (including VentureXpert, CorpTech, and Gust), press-reports and media notices from public searches, as well as direct cross-checking with as many ventures as possible. We found no evidence that 44 ventures had received financing, while 46 ventures had received some type of financing outside of self-investments or friends and family money (i.e. SBIR funding, seed round funding, or venture capital Series A and Series B funding).

Homeruns. In entrepreneurship research and among investors there is great variance between what investors characterize as a homerun. Generally, any venture that has undergone a successful exit, either from a successful acquisition or by going public (IPO) can be characterized as a homerun (Prowse, 1998), or any venture that carries with it a large return to the investor, such

³ We also examined venture growth by identified employment levels for each of the ventures using the same method described above, and then compared the log ratio of the number of employees in 2011 to that in 2014. This allowed us to measure the magnitude of increase and decline in number employees. For any ventures that had not survived, a zero value was given. No significant differences in results were observed.

⁴ As growth in number of employees may represent only one form of growth, we also conducted a test of growth through Web traffic performance. We collected Web traffic data by using cached data from September 2011 and September 2013. Absolute levels of Web traffic and rank were collected and the log ratio of the Web rank in 2011 was compared to that in 2013 to measure the magnitude of increase and decline in traffic. No significant differences in results were observed when using this measure of venture growth in our analyses.

as in the order of 10 times or greater return on investment (Sahlman, 1990; Jegen, 1998). We used these cutoffs (e.g. successful acquisition, IPO, or >10x return) on all 90 firms in our sample to identify homeruns. We again used data collected from the sources described above and tried to make direct contact with as many of the ventures as possible. Through this process, we identified 6 ventures that qualified as homeruns by these criteria (coded as 1 with the others coded as 0; all coding was completed retrospectively).

As a robustness check, we provided aggregated information on each of these 6 ventures that were identified as homeruns, as well as a randomly selected sample of 6 ventures that had not been identified as homeruns, to be evaluated by a small subset of angel investors different from those participating in Study 3. There was 100% agreement from the investors on which ventures were homeruns.

Results

Table 2 provides means, standard deviations, and correlations for all Study 3 variables. Of particular interest is the correlation between their ratings of the business viability data and perceptions of the entrepreneur, which is a nonsignificant $r = .12$, indicating that each component of investor gut feel was sufficiently distinct in this third sample of experienced angel investors, and consistent with what Study 1 angel investors expressed in the interviews. This also provides evidence of discriminant validity in ratings of business viability data and perceptions of the entrepreneur.

[INSERT TABLE 2 ABOUT HERE]

Table 3 reports the results for pitch funding, each of the three performance measures, and homeruns. Hierarchical binary logistic regression was used in the analyses. Positive angel investors' assessments of the entrepreneurs significantly predicted investments with extraordinary returns, or homeruns (Model 5), supporting Hypothesis 2. Positive angel investors' assessments of

the entrepreneurs were not found to predict the general performance measures of venture survival or venture growth, and only marginally predicted venture financing.

As a robustness check, and due to the observed tail event of only 6 homeruns, a rare event logit (relogit) regression was also conducted to examine the homeruns⁵. Relogit is a modification of the ordinary logistic regression, but unlike logistic regression and other standard regression techniques, relogit produces unbiased estimates when one of the values of the dependent binary variable greatly outnumbers the other (King and Zeng, 2001). Another difference from logistic regression is that relogit is not a likelihood technique, so measures of model fit based on the likelihood have no equivalents in relogit. There were no significant differences in results when a relogit regression analysis was conducted. In an additional robustness check, we ran all of these analyses with investor experience as a control. Consistent with our intention to sample only angel investors with developed experience-based schema, range of experience was restricted, was statistically nonsignificant, and did not change any results.

[INSERT TABLE 3 ABOUT HERE]

As expected from Studies 1 and 2, business viability data did not predict pitch funding, venture survival, venture growth, subsequent venture financing or homeruns. This provides a confirmation of the Study 1 inductive theorizing that angel investors seek a few extraordinarily profitable investments, not conventionally profitable investments. It appears that angel investors' reports of how they combine criteria (Study 2) and why (Study 3) they do so can be trusted.

⁵ Prior to conducting the rare event logit regression, we also conducted a robustness estimation using an ordinal probit model. In ordered probit, an underlying score is estimated as a linear function of the independent variables and a set of cutpoints. Ordered probit allowed us to define the dependent variable such that there is a floor and a ceiling, but the absolute distance between outcomes need not be symmetric. As such, the dependent variable was coded as 0 = failure, 1= no growth, 2= growth, 3= venture financing, and 4 = homerun. We found that the results remain robust; however, due to the small number of homeruns and possible concerns with the functional form assumptions, we also conducted the relogit robustness check and place greater confidence on both this analysis as well as our main reported analysis.

Discussion

In the third study we found that experienced angel investors' assessments of the entrepreneur did accurately predict which investments would be extraordinarily profitable four years later, whereas they were not good predictors of mere venture survival, growth or future financing. Further, business viability data did not predict survival, growth, future financing or homeruns; that is business viability assessments were not predictive of either extraordinarily profitable or ordinarily profitable investments. This supports our inductive theory from Study 1 that under conditions of unknowability decision makers seek a few extraordinarily profitable investments, rather than manage a loss function or seek to maximize returns on each decision. We found that angel investors' intuitions about entrepreneurs significantly predicted extraordinarily profitable investments four years later. Investors' articulation of their entrepreneur-focused gut feel is meaningful for their predictions when risks are unknowable.

GENERAL DISCUSSION

Drawing on an inductive theory building study, an experiment with experienced angel investors and a longitudinal field test, this research contributes to our understanding of how decisions are made by those seeking unknowable risks, and provides a more complete understanding of early-stage investment decisions and the use of emotional-cognitive gut feel in these decisions. Here, we summarize our empirical findings and our contributions to the literatures of decision making, intuition and entrepreneurial finance.

Our empirical findings show that early stage investors use both intuition and formal analysis to develop what they call their "gut feel" to identify extraordinarily profitable investments, and that these assessments best predict their stated goal of identifying the few extraordinarily profitable investments. In the inductive theory-building Study 1, we found that angel investors reported that they sought extraordinarily profitable investments, and did not seek

to maximize returns in each decision, which motivated their use of both intuition and formal analysis. We focused on experienced investors to test the idea that investors rely on this blend of analysis and intuition to manage unknowable risks, and that they are able to do so without having the analytics overwhelm the application of their experience-based intuitive schemas that weight assessments of the entrepreneur more heavily in these earliest stage investment decisions. We found empirical support for their own reports in an independent sample of experienced angel investors, and further, found support that these assessments significantly predicted which investments would be extraordinarily profitable four years after entrepreneurs' funding pitches. We summarize the contribution of these findings to three literatures detailed below.

Decision Making When Risks Are Unknowable

Our findings contribute the notion that a contextualized approach is needed to understand decision making. When those who seek decisions with unknowable risks are experienced and seek extraordinary returns, they approach their decisions differently than those making decisions under uncertainty (where risks can be identified a priori). Prior research in judgment and decision making has described how decision makers under conditions of uncertainty might enact strategies to avoid losses or reduce risk (Bazerman, 2006; Denes-Raj and Epstein, 1994; Hammond, Keeney, and Raiffa, 1998; Tversky and Kahneman, 1983). Here, we found that experienced investors welcomed a high failure rate because they believe it aided them in their quest to identify extraordinarily profitable investments that could only be found in this early period of entrepreneurship with unknowable risks.

This decision period, although societally important, has been under-researched precisely because it is laden with unknowable risk, creating challenges in empirically measuring the criteria that investors say they use (Zacharakis and Meyer, 1998). We have aimed to enrich the entrepreneurship literature by answering the question of what this "mystery factor" (Hisrich and

Jankowicz, 1990) for early-stage investment decisions might entail. Building on those such as Bower (1970) and MacMillan, Siegel, and Narasimha (1986), we found that perceptions of the entrepreneur were trusted more than analytical data in making unknowable-risk investments, thereby articulating how investors manage unknowable risk through a set of dynamic emotion-cognitions that provides them with a mechanism for implicitly applying experienced-based schemas when there is dissonance between formal analysis and their intuition. Investors call this their gut feel. Rather than being entirely feelings driven, we find that those experienced in decision-making under conditions of unknowable risks have developed sophisticated schemas and the “feel” of their gut feel describes investors’ ability to effectively reconcile dissonance between formal analysis and intuitions. This allows them to prioritize their intuitive assessments of the entrepreneur and symbolic meaning from these assessments (Zott and Huy, 2007) as a means for addressing unknowable risks in their decision making.

The value of prior experience is that it sets early-stage decision makers along a different path for opportunity search and realization, while also honing their schemas and prototypes about the entrepreneur. These investors accumulate decision outcomes which, regardless of successes or failures, begin to cement the unknowability of early-stage investments as scenarios where there is also often little data regarding the industry and market, especially with respect to high-tech startups that are attempting to launch radical innovations into markets and industries that current do not exist. Simultaneously, experiences with intuitive decisions are absorbed and over time, investors sharpen their ability to perceive perceptual data on individual attributes and rely on their gut feel as useful information – rather than formal analyses. Put simply, experience leads to better decisions for early-stage investors because embedded into their gut feel is a level of ease with the unknowability and the built belief that this unknowability is the conduit for extraordinary profits.

We posit that Prinz (2004), Wilson (2002) and Kleindorfer's (2010) assertions that analysis drives out intuition may apply only to circumstances where decision makers must justify their decisions to third-parties, because formal analysis is thought to carry more weight and be more socially respected (Morgan, Frost, and Pondy, 1983). Prior research has argued that under conditions of uncertainty, interventions designed to shift people from System 1 thinking (i.e. intuitive processing) to System 2 thinking (formal analysis) create more social belief in optimal results (Bazerman, 2006). We focused on angel investors who invested their own money and did not need to justify themselves to anyone. As Gigererzer and Gaissmaier (2011) suggested, experienced decision makers trust their intuitions, and these self-reliant angel investors placed confidence in their intuitions about the entrepreneurs and their beliefs that these perceptions contained more useful information than any numbers. Advocating that analytics undermine intuition may be applicable only when decision makers need a rationale more socially persuasive than "my gut feel tells me this is right", and is not a feature of how experienced decision makers actually make decisions when they are accountable to themselves alone. That is, decision makers who face unknowable risks will use both intuition and formal analysis to achieve their investment objectives; however, when intuition and formal analysis are in conflict, decision makers who are not accountable to others for their decisions will be more likely to rely on their intuitive assessments of the entrepreneur rather than discounting these intuitions in favor of formal analyses.

This has important implications for those early-stage investors who work in teams, or for investors who stay with entrepreneurs as they progress through financing rounds (e.g., seed stage, Series A, Series B) that are suited for later-stage investors such as venture capitalists. Once investors are answerable to others they may lean more heavily on formal analyses that may discount their more informative intuitions and so perhaps undermine their ability to identify

extraordinarily profitable investments. These differences might shape the outcomes of investments, or even impact how prior investment experience hones an investors' ability to rely on, and apply, their intuitions over time. Therefore, important next steps for this research would include empirical examinations of circumstances in which affective evaluations might be moderated by the need to justify them to others.

Understanding Intuition

These studies also contribute to what has been called the “affective turn” in entrepreneurship (e.g. Baron, 2008, Chen, Yao, and Kotha, 2009, Cardon et al., 2009). Here, our research supports the work of those who have shown that in ambiguous situations individuals rely on their feelings (Bodenhausen, 1993; Bower, 1991; Clore, Schwarz, and Conway, 1994; Forgas, 2000; Loewenstein, 1996; Schwarz and Clore, 1996; Zajonc, 1998).

Our interviews with the experienced early-stage investors in Study 1 suggest that they address extreme uncertainty by relying on their affective evaluations, which they map onto certain data in order to enable successful intuitive judgments. These judgments represent experience-based prototypes of entrepreneurs that they have encountered in the past, who may engender feelings the entrepreneur may be trusted (Maxwell and Levesque, 2011), or that the entrepreneur is committed (Korsgaard, Schweiger, and Sapienza, 1995) and passionate (Chen, Yao, and Kotha, 2009). These same affective evaluations provide implicit information that serve as proxies in the due diligence process and provide data such as the normative value or trustworthiness of the financials or the likelihood of the entrepreneur remaining committed to the business model. Turning to the possible categories and sub-categories that underlie investors' evaluations, it would be worthwhile to investigate specific attributes, like passion or trustworthiness, to examine when, why, and how the individual gut feel components work together and drive gut feel judgments. The initial tests here did not allow for investigation of how individual attributes combine and interact.

Future research that bridges the psychology of persuasion and the elaboration of the attributes deemed salient to investors, with the entrepreneurial investment literature will likely prove useful in theory development for this line of inquiry.

However, intuition can have a large cognitive component, and what investors described as their gut feel reflects their holistic cognitive-affective judgment and how they have reconciled inconsistencies between their emotions and cognitions. Thus, our studies also build on work of Izard (2009) and others that emphasize that affect and cognition cannot be easily separated into distinct emotion or cognition categories. While we found that assessments of the entrepreneur trump business plan data when they conflict, it does not mean that the assessment of the entrepreneur was wholly based on affect – cognitions about the capability of entrepreneurs, their commitment and integrity are inherently a part of any assessment of individuals. We found that these decisions were truly emotion-cognition interactions.

In this way, our findings also provide additional theoretical richness to Dane and Pratt's proposal that intuition is affectively-charged through our contextualized examination of intuitive decision making under conditions of unknowable risk. We extend their work by detailing how intuition can be built upon formal analyses as well as affect-laden cognitions, and suggest there would be important implications for how and why learning and experience might influence the effectiveness of intuitive decision making outside of those that they propose. That is, we found that in early-stage entrepreneurial investment decisions, intuition is affect-laden cognition, with the affective component a reaction to how confident the decision maker feels in the decision rather than an indication of a dominant role of emotions in the decision. Early-stage investors use both formal analyses and intuition, with a positive intuition about the entrepreneur being necessary and developed through experience. Formal analyses gave them additional confidence, but could not compensate for a poor assessment of the entrepreneur. Given the presumed unreliability of

business plan data at this earliest stage, the angel investors privileged their intuitions of the entrepreneur, while still attending to formal analyses. Therefore, when risks are unknowable, formal analyses might contribute additively to the confidence in other types of intuitive decisions (e.g., moral decisions; see Dane and Pratt, 2007), and further research would shed light on when, where, and how these factors would lead to more effective decision making.

Finally, we propose that others may have overemphasized the role of affect in such decisions. We found that angel investors reported greater confidence in their decisions if the business viability data were positive, and we know that intuitions about the entrepreneur are developed through experience-based assessments of capability and integrity (e.g. Zott and Huy, 2010). We propose that gut feel in decision making when risks are unknowable may be more cognitive than others have acknowledged, with the affect perhaps a reaction to how confident they feel in their decisions. When forced to describe why they have made these decomposable decisions they fall back on language about how “it feels” even though affect may play only a partial role in their assessments. Affect certainly plays a role, as it would in all emotion-cognitions, but this research suggests it may more be a reflection of their good feelings about their confidence in the decision than based on affect per se.

Earliest Stage Investing with Unknowable Risks

We further found that decisions in the face of unknowable risks are not avoided, but in the case of angel investors, are actively sought. Because they believed these investments provided their best opportunities for extraordinary profits, experienced angel investors developed successful approaches to such decisions, willingly accepting that most of their investments would fail. We posit that they may seek out unknowable risks under two conditions: the promise of extraordinary profitability, and (relatively) small stakes at risk for each individual decision. The minimization of risk in each decision is not the most important consideration for these investors, however.

Currently assessments of risk hold a central place in investment models, to the point that measures of risk (“betas”) are part of standard investment analyses and reporting. This may well hold for those making investments under uncertainty in firms with known products, services, markets and financial track records. However, earliest-stage investors do not shun volatility but rather embrace it for the potential profitability it promised. These investors were not irrational, but had developed sophisticated schemas that predicted extraordinary returns. In contrast, much of decision-making and finance theory assumes decision makers try to maximize the returns on each and every decision, whereas in many contexts numerous decisions are made over a greater expanse of time and experience. When risks are unknowable a focus on maximizing returns on each individual decision would induce paralysis. Here, decision makers developed experience-based schemas to help them identify those opportunities for extraordinary returns, and we find that a focus on the possibility of extraordinary returns and risk seeking is more central to many more decisions than is reflected in prior literature.

In addition to the potential for extraordinary returns, our findings provide a more nuanced understanding of angel investors that make many small (relative to their own net worth) investments in the face of unknowable risks. Risking on the unknowable does not seem to be confined to those with a “spread-your-risks” strategy: individual entrepreneurs risk their homes and savings while similarly ignoring the unknowable risks they face in search of extraordinary success. Angel investors also do not spread their bets and face unsystematic risk, since they usually concentrate on industries where they have expertise and so face risks that could affect those particular industries. Rather, we posit that there is a psychological attraction to great, life-changing gain that leads people to approach unknowable-risk decisions in ways that cannot easily be studied in the laboratory, because life-changing gains cannot be offered in those settings. Our

findings suggest that more contextualized research is needed to understand the role of seeking inordinate gains.

Finally, we aimed to advance the literature on entrepreneurial investments. Angel investors lack inside information and the more detailed types of business viability data that venture capitalists have access to, yet angel investors can build and successfully predict based on their experience-based gut feel. Angel investors actively seek out investments with unknowable risks because they believe those provide opportunities not available to others for extraordinary profitability. They do not seek to minimize investment risks as much as they seek out extraordinary opportunities, and we found that investors seeking the few extraordinarily profitable investments are most successful when they base their decisions on their intuitions about the quality of the entrepreneur. Further, Studies 2 and 3 support previous work on the reports of early-stage investors by demonstrating that their reports are not mere retrospective sense-making, and that the reasons they have provided for investing do describe their approaches and are predictive. In practical applications, we can provide more assurance to experienced angel investors that reliance on their intuitions about entrepreneurs does significantly predict extraordinarily profitable organizational investments. This also suggests that future research might profitably explore cross-national and cross-cultural differences in active groups of angel investors; it may be differing attitudes toward risk and how it can be managed may be a factor in these cultural differences in entrepreneurial funding. At the earliest stages of the investment process, angel investors face unknowable risks, yet decisions in the face of the unknowable are probably more common than is widely acknowledged. As Zeckhauser (2010) stated, "...in a unknowable world... unknowable situations are widespread and inevitable... Most investors – whose training, if any, fits a world where states and probabilities are assumed known—have little idea of how to deal with the unknowable (p. 306)."

Conclusion

This research offers a deeper appreciation of the challenges of making investment decisions under unknowable risks. Rather than simply facing decision contexts where individuals aim to manage risk, these are situations where risk is embraced as a core component of the decision. Intuitive schemas are central to understanding such decision processes, yet what has been thought of as a subconscious, affectively-charged assessments may be a richer type of dynamic emotion-cognition that specifically addresses the unknowability. Entrepreneurship scholars have focused on the criteria for investment decisions, both formal and informal, while our research unpacks how investors combine formal analyses and more informally gathered information in making their decisions. We hope this research will help advance theory that explores the contexts of many other types of decisions made in field settings that do not conform to the constraints inherent in laboratory research. Using three distinct studies with experienced angel investors we provide a model of a systematic approach to studying the difficult-to-measure decisions with unknowable risks.

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Figure 1. The Effect of Perceptions of the Entrepreneur on Propensity to Invest, Study 2.

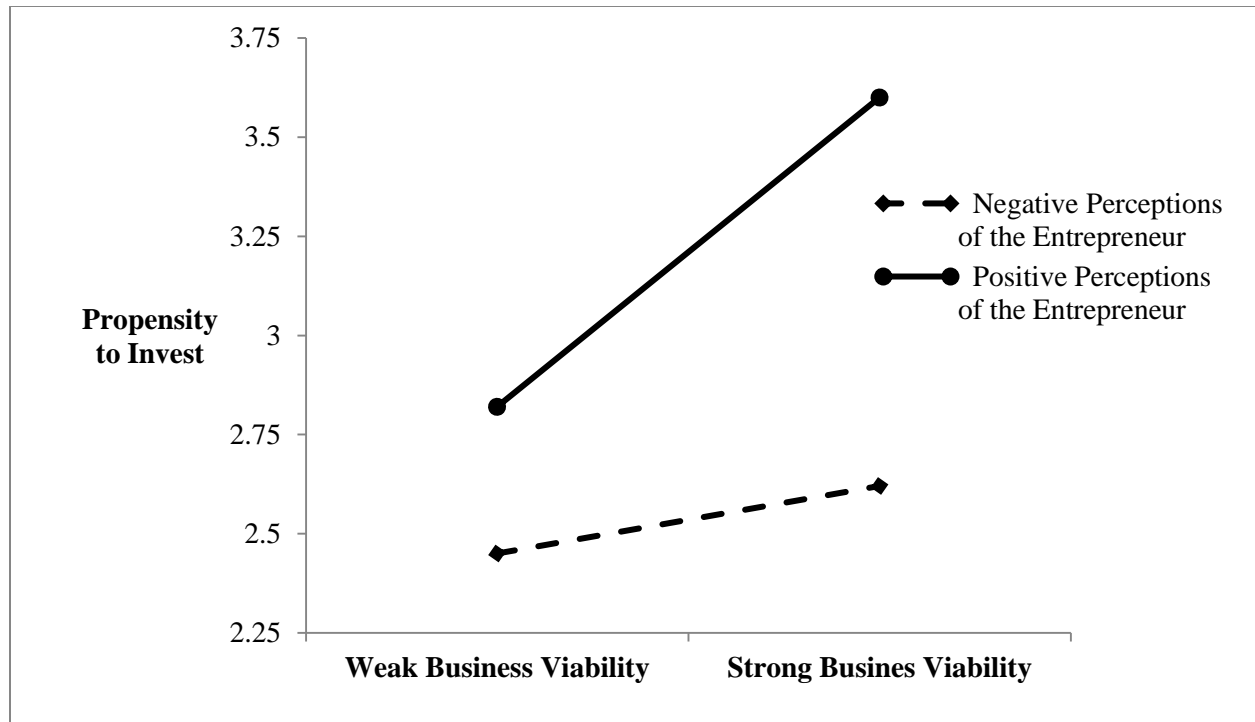


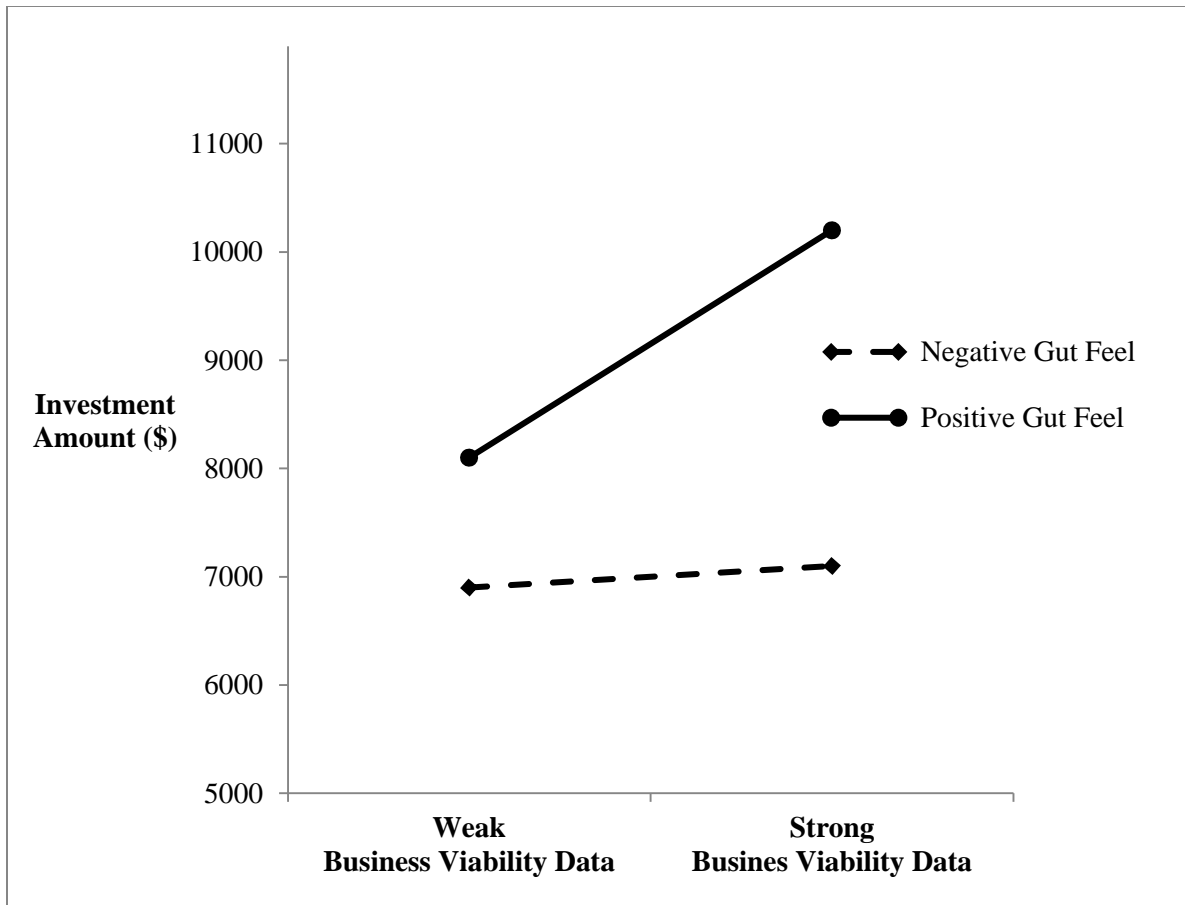
Figure 2: The Effect of Perceptions of the Entrepreneur on Amount of Investment, Study 2

Table 1. Summary of Studies and Overview of Empirical Design

	Primary method of data collection and analysis	Summary of Key Findings	Empirically Examined Contrasts of Investor Gut Feel			Role in Empirical Design
			<i>Emotion-Cognitions in Judgments</i>	<i>Entrepreneur Perceptions vs. Business Viability Data</i>	<i>Effect on Homeruns vs. Intermediate Venture Performance Outcomes</i>	
Study 1	Inductive Field Study: Interviews, observations of investor group meetings, angel-provided secondary source data; Inductive theory-development through iterative, exploratory content analysis	Investors have a clear objective of extraordinarily profitable investments Loss aversion not an overwhelmingly salient consideration – losses are expected and unknowable risks are sought Use of emotion-cognition, holistic judgments, with a reliance on both formal analysis and intuitive processes Dominance of experience-based intuitive assessments of the entrepreneur	X	X	X	Unpacks the early-stage entrepreneurial investment decision process and highlights the nuanced ways in which experienced angel investors have confidence in their own expert judgments
Study 2	Experimental Study: Experienced angel investors; 2x2 design of manipulated business viability data and perceptions of the entrepreneur	Angel investors prioritize intuitive assessments of the entrepreneur over the business viability data in their holistic emotion-cognition judgments	X	X		Cross-validates findings from Study 1; A test and confirmation of the interplay between emotion and cognition; A test of investors' claims of the dominance of experience-based intuitive assessments of the entrepreneur
Study 3	Longitudinal Field Test: Three measures of entrepreneurial performance and homerun outcomes; Angel investors' reported investment criteria four years after the funding decision	Angel investors' assessments of the entrepreneur accurately predict which investments would be extraordinarily profitable		X	X	Validates the outcomes of findings from Study 1 and Study 2; A test of the accuracy in prioritizing intuitive assessments of the entrepreneur over the business viability data in the holistic emotion-cognition judgments of experienced angel investors

Table 2. Means, Standard Deviations, and Correlations, Study 3

Variable	Mean	S.D.	1	2	3	4	5	6	7	8
1. Pitch Funding	.33	.47								
2. Age	41.32	4.29	-.04							
3. Gender	.78	.42	-.02	-.27**						
4. Entrepreneur (EP)	4.37	.79	.40**	-.08	-.03					
5. Business Viability Data (BVD)	4.06	1.25	.18*	.08	.02	.12				
6. Venture Survival	.87	.34	.07	-.01	-.13	.13	-.07			
7. Venture Growth	.57	.50	-.05	-.07	-.09	.06	-.09	.32**		
8. Venture Financing	.51	.50	.08	-.09	-.04	.18*	-.03	.34**	.76***	
9. Homerun	.07	.25	.01	-.03	.04	.44***	-.12	.11	.23**	.26**

* p < .05; ** p < .01; *** p < .001
^aFor funding, 0 = “no,” 1 = “yes.” For gender, 0 = “female,” 1 = “male.”

Table 3: Logistic Regressions Predicting Venture Funding, Venture Performance, and Homeruns^a

Variable	Pitch Funding Model 1	Venture Survival Model 2	Venture Growth Model 3	Venture Financing Model 4	Venture Homerun Model 5
Constant	-6.44* (3.10)	1.61 (4.77)	2.35 (2.76)	.21 (2.79)	-11.99 (6.12)
Age	.01 (.06)	-.03 (.09)	-.04 (.05)	-.04 (.06)	-.01 (1.32)
Gender	-.05 (.60)	-1.33 (1.13)	-.56 (.56)	-.29 (.54)	-.08 (1.32)
Entrepreneur (EP)	1.15** (.33)	.46 (.45)	.16 (.28)	.48 [†] (.29)	2.21*** (.71)
Business Viability Data (BVD)	.10 (.19)	.15 (.26)	-.14 (.18)	-.07 (.18)	-.39 (.35)
Observations	90	90	90	90	90 ^b
Log likelihood	99.84	66.98	120.69	120.67	26.83
Chi-squared	14.70**	1.66	2.48	4.05	17.26***
Degrees of freedom	2	2	2	2	2

[†] p < .10; * p < .05; ** p < .01; *** p < .001,

^a Rare Event Logit Model of Homeruns

^b Venture Firms = 90, Observed Tail Event = 6

^c Robust standard errors in parentheses

Appendix A. Study 2 Methods Appendix: Pre-Testing and Post-Hoc Manipulation Checks

Pretest Procedures – Main Study

Extensive pretests were conducted over the course of several months on both undergraduate participants (four rounds of pre-testing and re-framing of scenarios) as well as experienced angel investors (an additional two rounds of pre-testing and re-framing of scenarios), to determine relative levels of strong or weak plan-based business viability, and relative levels of positive and negative perceptions of the entrepreneur, respectively. In total, pre-tests were conducted on a non-overlapping sample of 202 participants (160 undergraduates; 42 angel investors). In the early stages of pre-testing, participants were presented with multiple versions of the same scenario meant to manipulate strong business or weak business viability, or versions meant to manipulate positive or negative perceptions of the entrepreneur. Participants rated each version of the scenario on a 7-point measure of business viability or perceptions of the entrepreneur. Each of the versions was then re-framed, and this process was repeated through four rounds with undergraduates, for a total of 68 versions tested. Versions were then chosen that participants rated as having the strongest business viability data (mean = 6.07, S.D. = 1.34) and the weakest business viability data (mean = 1.57, S.D. = 0.84), and eliciting positive perceptions of the entrepreneur (mean = 5.76, S.D. = 1.2) and negative perceptions of the entrepreneur (mean = 5.59, S.D. = 0.90), and each version was integrated into the final scenarios that represented a two (strong- or weak- plan-based business viability) by two (positive or negative perceptions of the entrepreneur) factorial of four experimental conditions. An additional two rounds of pre-testing on these four scenarios was conducted with experienced angel investors, and further pretests were conducted to ensure internal validity and that commensurate levels of plan-based business viability were matched with corresponding levels of perceptions of the entrepreneur in each scenario (mean_{strong business viability data} = 5.98, mean_{weak business viability data} = 1.97; mean_{positive perceptions of the entrepreneur} = 5.87; mean_{negative perceptions of the entrepreneur} = 5.65) to arrive at the final manipulations.

Post-study Manipulation Checks

To ensure the effectiveness of the relative levels of strong or weak plan-based business viability, manipulation checks were conducted, asking participants to evaluate business viability. ANOVA results showed that the participants in the strong-business viability condition perceived stronger business viability (mean = 3.47) than those in the weak-business viability condition (mean = 1.42; $F_{1, 129} = 7.92$, $p < .01$). These results suggest that the scenario was effective in inducing participants' perception of business viability. To ensure the effectiveness of the elicited perceptions of entrepreneurs, a post-study check was conducted demonstrating that participants in the positive perceptions of the entrepreneur condition gave significantly higher scores (mean = 3.40) than those in the negative perceptions of the entrepreneur condition (mean = 1.68; $F_{1, 133} = 27.70$, $p < .001$). Finally, a within- and between-cell test was conducted to compare between each condition and test for heterogeneity; no significant differences were found between cells in terms of investor experience, education, and functional background.

Appendix B. Study 2 Methods Appendix: Sample Study Manipulations

A: Strong business viability	A': Weak business viability
<p>A1: 'Atmospad is a fully functional and operational at the moment. With additional capital, it has the potential to grow very quickly.'</p> <p>A2: 'We already generate significant revenue from Google ads, and also have an affiliate advertising promotion on the site to receive additional revenue.'</p> <p>A3: 'significant technological advantage.'</p>	<p>A1': 'Atmospad is still very rudimentary at the moment, and there is still work to be done to make the whole experience more consumer-centric, but the technology does work and with additional capital, it has the potential to grow very quickly.'</p> <p>A2': 'We tried to generate revenues from Google ads, but with this technology, all traffic originates from one IP address, so that's not possible. We have a promotion on the site so we do get a portion of the revenue if our customers click on an ad.'</p> <p>A3': 'small but immediate technological advantage.'</p>
B: Positive Perceptions of the Entrepreneur	B': Negative Perceptions of the Entrepreneur
<p>B1: 'We are all very committed to making Atmospod a huge success. For me, I knew that I wanted to take Atmospad from a small idea to a huge reality a few months ago. I was sitting outside thinking about the initial start-up, thinking that I was three months behind in our house payment, I had three employees I couldn't pay, and I ought to get a real job... but then I thought, 'No, this is your dream. Get back to work.' So I re-mortgaged my house, took out more loans, and got back to work.'</p> <p>B2: 'We were given some capital to fund three rounds of testing. And then someone suggested that we take the capital and use it fund our own developments, and do a cheaper form of testing for the partner. But I just felt like that was dishonest; I wanted to honor the agreement I had made. It might have been the wrong choice financially, preventing us from a huge short-term financial boost which we desperately needed, but I had to do what I thought was right.'</p>	<p>B1': 'We have so many things going on at one time and we are trying to figure out which to set aside time for, which to fine-tune, and which to push the eject button on, and we're not sure we have to know and have a clear answer. This is the beauty of what we have going on... that we're flying by the seat of our pants, figuring out what that third leg of our tripod is going to be. You learn as you go.'</p> <p>B2': 'During some pilot testing with a partner, the first round of testing did not show a clean integration and I don't know what happened. I'm not sure we really wanted to do pilot testing with them. Or maybe we did, and maybe we should have spent our energy on integration strategies.'</p>

Appendix C. Study 3 Methods Appendix

Investor Sample

Investors were sampled from one of three angel investing networks in the United States, and were distinct from the angel investors participating in either Study 1 or Study 2. Pitch videos were randomly assigned so that investors were equally likely to see videos from any competition and were equally likely to see any combination of “winners” and “losers”, as well as controlling for biases associated with primacy and recency.

Pitch Sample and Procedures

To participate in the pitch competition, each entrepreneur was pre-screened and selected on the basis of required submissions of documents and materials, such as a business plan and financial statements. Thus, each firm that was selected to attend the competition passed through an intensive screening selection, where entrepreneurs were identified, on paper, as having a threshold level of business viability data. The entire exercise took an average of 30 minutes for each angel investor to complete and consisted of: (1) watching the first pitch, (2) completing a short questionnaire on their perceptions of the entrepreneur and the business viability of the opportunity, (3) watching a 30-second commercial composed of pre-tested neutral material to limit contamination, (4) followed by a second pitch, completion of a second questionnaire, (5) watching another 30-second commercial, (6) watching a third pitch, and finally (7) completion of the questionnaire and providing demographic information.