

'I LIKE HOW YOU THINK:'
THE ROLE OF COGNITIVE SIMILARITY AS A DECISION BIAS

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ABSTRACT

We decompose the decision-making processes of a sample of venture capitalists (VCs), investigating the degree to which ‘cognitive similarity’ (shared patterns of reasoning between the investor and the founder) is related to the VCs’ evaluations of prospective venture ‘deals.’ Employing conjoint analysis and hierarchical linear modeling techniques, we model the VCs’ assessment of a series of venture deals as a function of three attributes: the economics of the opportunity, the human capital of the founder, and the reasoning patterns of the founder. We find VCs prefer to invest in founders who demonstrate patterns of reasoning similar to their own. Further, we find that when cognitive similarity is present, the relative importance of the entrepreneur’s human capital becomes even more important in the VCs’ assessment of the venture deal.

INTRODUCTION

Psychologists have long been interested in the effects of *similarity* as a bias in the decision-making process. Put simply, similarity describes the extent to which there is symmetry or resemblance between two objects, persons, or concepts. Research generally suggests that similarity attracts (Byrne, 1971)¹; and in decision-making contexts, research demonstrates that decision-makers exhibit more favorable attitudes and judgments toward objects, persons, or concepts that resemble (or are consistent with) what they believe to be true about themselves (McPherson, Smith-Lovin, & Cook, 2001). Consistent with the notion that “*birds of a feather, always flock together,*” researchers have focused on how decisions are influenced given similarity in personality (Byrne, Griffitt & Stefaniak, 1967), physical appearance (Feingold, 1988), religion (Kerr, 1995), race (Wade & Bielitz, 2005), demographics (Tsui, Egan & O’Reilly, 1992; Tsui & O’Reilly, 1989) and values (Matusik, George & Heeley, 2006). Much of this research clearly suggests that ‘birds of a feather’ do flock together; decision-makers demonstrate a bias towards individuals similar to themselves across the dimensions cited above, in addition to a host of other attributes (Byrne, 1971; 1997; Harrison, Price & Bell, 1998; McPherson et al., 2001; Pulakos & Wexley, 1983).

While research confirms that similarity effects play an important role in human interaction, the extant research has generally overlooked the role of similarity in cognitive processes – *how people think* – as a dimension that may promote attractiveness between two individuals, and subsequently influence the decision-making process. For example, consider that almost since the advent of political polling one of the most commonly asked questions of voters is their assessment of the extent to which they believe a given candidate ‘thinks like you.’

¹ This correlation between similarity and attraction has been titled the similarity-attraction effect (Byrne, 1971) but will be referred to in this note simply as the “similarity effect.”

Responses to this question have been highly predictive of the likelihood that a voter prefers a given candidate, such that the more a voter perceives a ‘match’ between themselves and a candidate on this dimension, the more likely it is that the voter will cast their ballot for that candidate (Hollander, 2004). And while this question - as framed - serves the needs of political pollsters, its imprecision fails to disentangle the cognitive outcomes (resultant attitudes and judgments) from the underlying *process* or *pattern of reasoning* responsible for those outcomes. Not addressed by the extant research are questions focused on the extent to which shared processes or patterns of reasoning (similarity) influence decision outcomes.

It is the purpose of this study to investigate this question in a conservative decision environment where economic rationality should stand central in the decision process (Hall & Hofer, 1993; MacMillan, Zemann & Subbanarasimha, 1987), and where the espoused decision policies of the principle decision-makers suggest that similarity in reasoning patterns should play an *insignificant* role in determining decision outcomes (MacMillan, Siegel & Subbanarasimha, 1985). Specifically, we investigate the decision policies of a sample of venture capitalists engaged in the process of evaluating the attractiveness of a series of hypothetical venture ‘deals.’ We test the extent to which similarity in reasoning patterns – between the VC and the entrepreneur – relates to the venture capitalists’ investment decisions. Moreover, we test the general hypothesis that cognitive similarity will moderate the influence of economic and other attributes characteristic of the deal, as reflected in the venture capitalists’ evaluations. This study makes three primary contributions.

First, we complement and extend the psychology and management literatures focused on similarity effects as decision biases, incorporating empirical evidence that similarity in cognitive *processes* – such as reasoning patterns – serves to influence decisions. While the overwhelming

majority of research on the similarity effect (especially in management) has focused on similarity across cognitive outcomes like attitudes or judgments (Byrne, 1997; Ferris & Judge, 1991; Harrison et al., 1998), in this study we take a first step toward disentangling those outcomes from their underlying cognitive processes. Attitudes and judgments represent the outcome of some cognitive process. Even though cognitive outcomes like attitudes are related to the cognitive processes that create them, these are still separate and distinct elements. Psychology and management researchers have tended to concentrate on similarity effects associated with outcomes to the exclusion of cognitive processes (Harrison et al., 1998). We attempt to determine if similarity across individuals in *cognitive processing* serves to bias decisions in a manner similar to that demonstrated for cognitive outcomes like attitudes. We suggest that since cognitive processes are separate from cognitive outcomes, this may mean that similarity in processes serves as an independent effect (bias) on resultant decisions.

Second, for management and entrepreneurship scholars, this research has important implications for future research directed toward understanding the relationship between VCs and entrepreneurs over time, in the context of their joint role in growing and developing a new venture. The notion that VCs may demonstrate a bias toward entrepreneurs that reason in ways similar to their own may suggest the manifestation of a ‘consensus-seeking tendency’ over the course of the entrepreneur/VC relationship (Janis, 1989; Park, 1990). In turn, this tendency may represent an impediment to the development of alternative and divergent solutions to problem-solving in the face of an uncertain entrepreneurial environment.

Finally, we contribute to the general body of literature focused on differences between venture capitalists’ espoused versus in-use decision policies. In this study, we capture the decision criteria that VCs profess to be important in the venture investment decision. We

subsequently compare this ‘espoused’ decision policy to the VCs’ ‘in-use’ decision policies in the context of evaluating venture deals, and demonstrate that similarity across cognitive processes plays a significantly larger role in determining decisions than espoused by the decision-maker. This has important ramifications for understanding which variables are relevant in the evaluation of investment decisions. While decision outcomes and observable characteristics of the founder are known to influence VC investment decisions (Franke, Gruber, Harhoff & Henkel, 2006; Shepherd & Zacharakis, 1999; Zopounidis, 1994), we reveal the importance of similarity of cognitive processes between the VC and the founder.

In the next section we briefly review the literature from cognitive and social psychology focused on the influences of similarity on decision-making. We then extend and integrate this literature with the work on decision-making in a venture capital context. Our hypotheses focus on the influences of cognitive similarity on venture capital investment decisions. Finally, the methodology and our results form the basis for a discussion of the role of cognitive similarity in decision-making.

THEORY AND HYPOTHESES DEVELOPMENT

In this paper, we investigate whether similarity across cognitive processes systematically influences decision-making. We establish the theoretical foundation for our argument on the body of work surrounding the ‘similarity effect’. The similarity effect states that as similarity between two individuals increases, so does attraction (Byrne, 1971; 1997; Lazarsfeld & Merton, 1954²; Montoya & Horton, 2004). The similarity effect has been found to be robust across

² Lazarsfeld & Merton (1954) coined the term “homophily” to describe the phenomenon where there is a tendency for friendships to form between those who are alike in some designated respect. We use the term similarity effect in this note because it encompasses homophily as well as other types of similarity-driven attraction.

numerous contexts in social psychology (Byrne, 1997) and has been demonstrated for various different populations (Lydon, Jamieson & Zanna, 1988; Russell & Wells, 1991; Schaubroeck & Lam, 2002). Since ‘similarity’ is such a broad, multi-dimensional construct, scholars have investigated various different axes across which similarity may promote attraction, including demographics (Tsui & O’Reilly, 1989), personality traits (Byrne et al., 1967; Schaubroeck & Lam, 2002), attitudes (Byrne, 1971; Harrison et al., 1998), activity preferences (Werner & Parmelee, 1979) and judgments (Mascaro, 1970). This effect has been consistently replicated (Tsui & O’Reilly, 1989), but not yet examined for similarities across cognitive processes.

Our extension of the work on the similarity effect into the cognitive process domain involves a subtle, but important distinction. The majority of the studies conducted on the similarity effect test elements like attitudes or judgments (Byrne, 1997; 1971; Harrison et al., 1998), both of which we categorize as *outcomes* or end products of some cognitive process of evaluation. While related to the cognitive process, an attitude or judgment is not equivalent to the process itself. Two individuals may have the same attitude about something, but may have reached that attitude by extremely different cognitive processes. For example, imagine a manufacturing supervisor and a marketer, both of whom work at a large food company that makes candy for consumers. Both the supervisor and the marketer approach the company president with a request to begin production of a new line of chocolates. The supervisor does so because his production lines are only running at 75% of capacity, and he reasons that he can smooth out his work shifts and reduce the overall, per unit, fixed costs of his machinery by churning out more output. The marketer recommends increased production because she has conducted focus group research and reasons that consumers want new types of chocolate, which would lead to increased market share for the firm. Both individuals maintain attitudes favoring

increased production, but the cognitive process employed to reach that attitude differs for each. Flipping this example around, two different people at the same food company may both think or reason through a similar series of steps, but reach divergent ending judgments about the whether or not they should tell the president to increase production. Similarity effect research emphasizes the effect of outcome evaluations on decisions (Harrison et al., 1998); hence the two people favoring increased candy production would tend to be attracted to one another. That said, this research remains relatively silent on the influence of the cognitive process considerations in the case where the two people disagree about increasing candy production.

In a management context, the distinction between outcomes and processes is particularly salient. Many management decision-makers (corporate managers, venture capitalists, etc.) make evaluations after viewing both an individual's cognitive process as well as his or her ending attitude or judgment. Business planning, presentations, and continuing conversations with people leading an initiative provide an opportunity for decision-makers to see both their final recommendation (judgment) as well as their cognitive processes used in reaching that end product. Numerous studies in management contexts have analyzed the decision effects of similarities across outcomes like attitudes or judgments (Ferris & Judge, 1991; Harrison et al., 1998; Wexley, Alexander, Greenwalt & Couch, 1980), but have not devoted equal attention to similarity across processes. Does similarity in the process have comparable effects to those associated primarily with similarity in the outcome? If a decision maker had come to a different judgment than recommended by the individual, but finds the method of reasoning similar to their own, it is unclear how the situation will be resolved. Can cognitive process similarity affect the decision related to the current situation? We attempt to investigate the role of cognitive process evaluations on decision-making by drawing from related work in social psychology.

Recent research surrounding regulatory focus theory indicates that decision-makers can incorporate both process and outcome criteria into evaluations. Regulatory focus is a self-regulation orientation that differentiates between being motivated to achieve positive outcomes or to avoid negative ones (Higgins, 1998). Regulatory fit is achieved when an individual pursues a particular goal in a manner that matches his or her regulatory orientation (Cesario, Grant & Higgins, 2004; Higgins, 2000). Regulatory fit studies have shown that individuals evaluate the same outcomes differently, depending on the regulatory process involved. Across the studies, when the regulatory process associated with an object under evaluation matches the regulatory orientation of the individual conducting the evaluation, the perceived value is higher. Conversely, when there is no fit between processes, the evaluation is less favorable. While we are not concerned specifically with regulatory focus theory in this paper, this research indicates that cognitive processes have important effects on evaluations.

Importantly, consistent with the logic of similarity effect theories, this research indicates that individuals tend to give higher evaluations to outcomes reached by processes that match their own preferred approach towards some ending evaluation (Higgins, 2000). By integrating work on the similarity effect with that on cognitive processes in regulatory fit, we argue that decision makers will use both cognitive and outcome information in their decision making efforts. We draw on the similarity effect to hypothesize a direction for this effect as well: decision-makers will tend to more favorably evaluate individuals who demonstrate similarity with their own cognitive processes. Thus,

H1: Venture capitalists will prefer investment opportunities represented by individuals whose pattern of cognitive reasoning is similar with their own, as opposed to those whose pattern of cognitive reasoning is not similar with their own.

While we argue that cognitive process is an important consideration in decision-making, outcome information also plays a crucial role in evaluations. Scholars have established a long and distinguished line of research examining the outcome decision criteria employed by venture capitalists during investment evaluation (Franke et al., 2006; Hall & Hofer, 1993; MacMillan et al., 1985; MacMillan et al., 1987; Matusik et al., 2006; Muzyka, Birley & Leleux, 1996; Shepherd, 1999; Tyebjee & Bruno, 1984; Zacharakis & Meyer, 1998; Zacharakis & Shepherd, 2005; Zopounidis, 1994). One primary conclusion from this body of research is that the human capital of the founder is paramount (Matusik et al., 2006; Shepherd & Zacharakis, 1999; Zopounidis, 1994). Human capital of the founder is often judged by examination of his or her relevant experience in both the new venture's industry and with previous start-ups (Bailey & Helfat, 2003; Castanias & Helfat 2001), as well as the founder's network of references. In general, VCs appear to mitigate investment uncertainty by backing individuals with superior human capital, exhibited by strong references and valuable experience (Franke et al., 2006; Shepherd, 1999).

Not surprisingly, the economic details of a prospective deal are also critical to the evaluation of venture capitalists (Hall & Hofer, 1993; MacMillan et al., 1985; MacMillan et al., 1987; Tyebjee & Bruno, 1984). The economics of a deal include items such as financial rates of return, market growth, and competitive intensity. As one might expect, VCs tend to prefer deals

characterized by higher rates of return, greater market growth, and some degree of protection from competitive rivalry (MacMillan et al., 1985; Shepherd, 1999; Shepherd & Zacharakis, 1999). Given this robust body of research touting the importance of the outcome criteria of human capital and economic factors in investment decisions, we propose that VC's will prefer investments characterized by more proven founders and more favorable economics. Thus,

H2: VCs will prefer investment opportunities represented by founders possessing superior human capital factors rather than developing ones.

H3: VCs will prefer investment opportunities characterized by superior economic indicators rather than average economic indicators.

We represent our three direct effect hypotheses below. In combination, these effects allow us to evaluate the role of cognitive similarity on decision-making, even in a situation where economic factors and human capital traits provide critical cues regarding the prospects for the new venture. In other words, we examine the effects of cognitive process similarity while controlling for other outcome factors known to be important in VC decision making.

 Insert Figure 1 about here

In addition to the three main effects proposed, there are likely to be two important moderating effects involved in a VC's evaluation of investment opportunities. First, we argue that cognitive similarity between the VC and the founder will positively moderate the effect of

human capital factors on investment decisions. Just as no investment can be viewed truly “objectively” due to the inherent and persistent biases of the evaluator (Franke et al., 2006), the perception of a founder’s ability to exploit an opportunity successfully (a key consideration of deal evaluation) likely depends to some extent on whether or not cognitive similarity is present.

Cognitive similarity between the VC and the founder indicates resemblance in reasoning patterns or thought processes. Higgins (2000) shows that individuals who identify a similarity between their own preference for a cognitive process and the manner in which an object is presented for evaluation tend to give higher ratings to the object. Likewise, Cesario, Grant and Higgins (2003) show that the same characteristics of an object under evaluation are viewed more positively when cognitive similarity (operationalized as “regulatory fit” in their study) is present, versus when it is not. Thus, cognitive similarity acts to change the perception of an object. According to information integration theory (Kaplan & Anderson, 1973) and cognitive evaluation theory (Montoya & Horton, 2004), these effects occur in interpersonal contexts because individuals infer that similarity implies positive traits. Said otherwise, when a VC perceives a founder is similar to herself, she tends to infer that the founder possesses other positive characteristics which are attractive, and this inference results in a better evaluation.

In the context of venture evaluation, we contend that cognitive similarity will work through these same mechanisms to influence the perception of the founder’s human capital contribution to the investment opportunity. A founder who demonstrates cognitive similarity with a VC is more likely to be perceived in a positive light, and viewed as better positioned to make effective use of his or her human capital. Thus, cognitive similarity not only directly effects investment evaluation, but it positively moderates the influence of other human capital factors by altering their perceived influence on the investment opportunity. Thus,

H4: The importance of human capital factors, as reflected in the VC's decision to invest, will become more positive when cognitive similarity is present between the founder and the venture capitalist.

The second important moderator we propose is the effect of human capital factors on the economic factors involved in overall deal evaluation. Research surrounding decision-making in highly uncertain contexts like new venture investing indicates that the weight placed on the abilities and skills of the founders leading the new ventures is extremely high (Muzyka et al., 1996; Zopounidis, 1994). VCs base their decisions on expectations that the founder will be able to mold, shape and exploit the economic elements of the environment in a way that benefits the new firm (Rutherford & Wand, 2006). Thus, decision criteria like economic factors are rarely evaluated in isolation, but are viewed in relation to the founder who will operate in that environment (Fried & Hisrich, 1994). Haynie (2005) shows that decision-makers in uncertain environments rate economic factors differently depending on their own experience and competencies, with greater similarities between personal and industry experience leading to higher evaluations. Thus, we expect that VCs ascribe more weight to economic elements when they perceive the founder in question has superior human capital to exploit those elements in favor of the start-up.

H5: The importance of economic factors, as reflected in the VC's decision to invest, will become more positive when the opportunity is also characterized by superior human capital factors.

Insert Figure 2 about here

METHODS

In this study, a conjoint methodology was employed to determine VCs' decision policies in the context of their evaluating a hypothetical founder and the associated venture. Conjoint methods allow for the decomposition of individual decisions into relevant attributes to determine which factors play significant roles in focal decisions (Shepherd, 1999; Shepherd & Zacharakis, 1999). As such, this methodology is particularly well-suited for the investigation of the relative influence of different decision factors like the outcome and process elements which are the focus of this study. A conjoint experiment is a technique that "requires respondents to make a series of judgments, assessments or preference choices, based on profiles from which their 'captured' decision processes can be decomposed into its underlying structure" (Shepherd & Zacharakis, 1997: 207). Conjoint analysis was developed from empirical research focused on how people actually make decisions (Green, 1984) and "is based upon rigorous research of information processing in judgment and decision making" (Broonn & Olson, 1999). As we hypothesize that decision-makers will use a contingent decision policy, a conjoint methodology is a highly appropriate method to investigate the evaluation policies of the sample without relying on the participants' introspection, which has been found to be often biased and inaccurate (Fischhoff, 1982; Priem & Harrison, 1994).

Data Gathering Method and Sample

For this study, we recruited participants who were actively involved as partners or associates at venture capital firms. Individuals were contacted by phone and by email to solicit their participation. Two methods of data collection were used: 1) experiments were collected in person by the authors, and 2) experiments were administered via a web-based tool. Since the VCs recruited for this study were geographically dispersed across the country, it was not possible to administer the experiment in person to every participant. The different manners of data collection were coded to control for any method biases, and sub-group analysis was conducted on the two groups to confirm there were no significant differences between the groups.

Forty-nine VCs representing twenty different venture capital firms completed the experiment. This sample size is comparable to other studies employing a conjoint methodology to evaluate VC decision-making (Franke et al., 2006; Muzyka et al., 1996; Riquelme & Rickards, 1992; Shepherd, 1999; Shepherd, Zacharakis & Baron, 2003), and meets the general criterion of sufficient sample size laid out by Shepherd and Zacharakis (1999). The mean years of experience in the VC industry represented by our sample was 6.3 years, and the mean age range of the participants was 35-44 years. 82% of our sample was male, and 73% of the sample reported formal education at the master's degree level or higher.

Attributes, Levels and Variables

Since the focus of our study aims at the influence of process and outcome factors on decision-making, we asked participants to evaluate multiple investment opportunities given different sets of information. Each investment opportunity was described in terms of three attributes, each with two levels: (1) cognitive processes of the founder, (2) human capital

characteristics of the founder, and (3) economics of the opportunity. These three attributes were selected because of their demonstrated relevance in venture evaluation (Shepherd & Zacharakis, 1999), and the levels were chosen to reflect the variation typical of venture capital environments (Shepherd, 1999). We developed our attributes and level descriptions by reviewing extant literature on VC decision-making. A description of each attribute is provided below, and the associated literature can be seen in Table 1.

Cognitive Characteristics: We operationalize cognitive processes through causal and effectual patterns of thinking (Sarasvathy, 2001a). Our scenarios attempt to highlight the extent to which the participant balances predictive decision making with control-oriented decision making (Wiltbank, Dew, Read & Sarasvathy, 2006). Prediction involves efforts to position the new venture for success based on forecasts for the development of that venture's market: estimating probabilities and consequences and even forming portfolio strategies with multiple options. Control, on the other hand, refers to efforts by the entrepreneurs that attempt to directly create or shape important market elements, often involving new product forms and functions, influencing customer preferences, and forming new market structures (i.e. channels, technical standards, common practices).

Although there are numerous alternatives by which to operationalize cognitive processes, we selected the causal/effectual dimension because of its proven applicability in uncertain decision environments like entrepreneurship. Sarasvathy (2001b) asserts that expert entrepreneurs tend to favor effectual versus causal cognitive reasoning when discussing how to overcome certain hurdles in a new venture scenario. If founders are likely to employ and differ along this dimension of cognition, we reason that VCs are likely to be familiar with these cognitive differences. As such, the causal/effectual distinction appears valid for testing because

it is specifically relevant to individuals engaged in new venture activities (Sarasvathy, 2001b). We are not aware of similar research which empirically establishes other cognitive processes being salient like this in the new venture realm.

We manipulated the cognitive process attributes in the investment profiles to reflect founders who think about the opportunity in a primarily causal or effectual manner. In a questionnaire administered to each participant after s/he had completed the conjoint instrument, we assessed his or her own use of prediction and control for comparison to the descriptions of the founders. When the participant emphasized predictive decision-making, a ‘similarity’ with the founder occurred in the instances when the approach of the founder was also predictive. The opposite was also considered similar, i.e. when the participant emphasized control oriented decision-making, they ‘matched’ the founders that were described as using similar control approaches to creating and pursuing their new venture. Cognitive similarity was operationalized as a continuous variable, with positive scores indicating a match and negative scores indicating a mismatch, between the dominant pattern of reasoning of the participant and each of the 16 investment scenarios. A detailed explanation of the operationalization of this variable is presented in appendix B.

Human Capital Characteristics: Human capital is often assessed empirically by analyzing an individual’s work experience (Castanias & Helfat, 2001). As such, human capital in our instrument was indicated through creation of a ‘personal’ attribute that described the founder’s experience and professional characteristics. This attribute captured how the founder was referred to the VC as well as the general industry and managerial experience of the founder. This variable was represented at two levels; *Developing*: the VC was made aware of the deal via a local networking event, and described an entrepreneur who was highly committed, and lacked

experience in a start-up, and *Proven*: which described a deal that was referred to the VC by a trusted associate, and described an entrepreneur who has experience managing a start-up and is of high integrity. We limit the entrepreneurial management team in our stimuli to a single person to simplify the comparison of cognitive processes.

Economic Characteristics: Just as the human capital factors matter, the economics of the venture and market potential are important decision factors. We include an ‘economic’ variable in this study to encapsulate consideration of these characteristics. This is represented at two levels; *Solid*: describes an industry with significant growth potential and average profit, as well as a market with several legitimate competitors, and *Superior*: describes an industry with high growth potential and above average profit, as well as an opportunity with a defensible competitive position in the market.

Appendix A contains the detailed descriptions used for each of the above three variables. All combinations of the two possible states for each of the three variables (cognitive, personal, and economic) formed the backbone of the study.

 Insert Table 1 about here

Control Variables: We included several control variables in our analysis to account for different sources of variation. Gender, founder status, experience, and the type of data collection method used (in-person versus web-based) were all assessed. In addition, we controlled for each participant’s age and years of experience working in the venture capital industry.

Dependent Variable: The dependent variable in this study is the probability that the decision-maker or VC would invest in the deal. After reading the elements encompassed by the

cognitive, personal and economic factors which characterize each nascent venture, the VCs were asked to indicate how likely they would be to invest in that particular opportunity. A seven-point Likert scale was used to collect information on the dependent variable, with anchors set at “high” or “low”.

Research Instrument and Experimental Design

The research instrument contained instructions to the participants, the conjoint instrument, and a post-experiment questionnaire which was used to gather data on participant demographics, characteristics of their firm, and their predominant cognitive approach. Once they had read the directions, participants evaluated each venture description and provided a rating on a seven-point Likert scale for the dependent variable – the probability of investment.

In the conjoint experiment, participants evaluated 16 different opportunities. Each opportunity was described by the combination of the three attributes (cognitive process, personal, economic) at one of the two possible states, creating an orthogonal full factorial design of eight profiles. For example, one opportunity would be described by the superior economics details in combination with the details for the proven human capital characteristics and the details of the effectual cognitive process. If the VC shared that effectual cognitive approach (a match), our hypotheses anticipate that s/he would evaluate that opportunity very favorably, relative to an opportunity of solid (not superior) economics, developing (not proven) human capital details, and a causal (not a match) cognitive process. Those eight possible combinations were replicated, creating the 16 total opportunities to evaluate, in order to test for individual consistency in evaluation across the identical opportunity descriptions.

The instrument was validated with in-depth interviews with venture capitalists and academics prior to executing the full study. All individuals confirmed the face validity of both the attributes and the levels employed. We also conducted a pilot test using a sample of 30 undergraduate students to validate our research instrument as well as our testing procedure. Results from the pilot sample indicated our instrument was effective in eliciting the decision policies of individuals with respect to investments. During administration, these 16 profiles were randomized to avoid order effects. We also randomized the presentation of attributes in the profiles across the participants to address order effects specific to the attributes.

RESULTS

Individual Level Results

82 percent of the individual models of the VCs' evaluations explained a significant proportion of variance ($p < .05$) with a mean R^2 of .72. These results are consistent with Choi's and Shepherd's (2004) mean adjusted R^2 of .78. This indicates that the attributes (cognitive, personal, economic) provided in the experimental design were the primary drivers of the investment decisions captured in the dependent variable. Reliability analysis was performed between each participant's evaluation of both the original and the replicated decisions within the conjoint experiment. The resultant alpha of .88 for the dependent variable is indicative of a high degree of judgmental consistency across the replicated profiles, and provides assurance that the conjoint task was performed consistently by the VCs.

Aggregate Results

The experiment provides 784 observations total (sixteen observations per participant). To control for any autocorrelation, because each set of 16 observations is nested within one

individual, we employed hierarchical linear modelling (HLM) during the analysis. Since the research design assures there is zero correlation between the independent variables, testing and subsequently reporting two models (main-effects and full) is neither necessary nor appropriate (Priem, 1994; Priem & Rosenstein, 2000). Thus, we report only the full model, with main and interaction effects shown together. This is consistent with other studies using orthogonal factorial designs for metric conjoint analyses (cf. Priem, 1994; Priem & Rosenstein, 2000).

Table 2 contains the results of our analyses, and the discussions of the specific hypothesis tests are reported below.

Insert Table 2 about here

As seen in table 2, a number of our control variables were significant. First, the finding that gender is significant in our model indicates that female participants tended to rate the opportunities more positively than did male participants. Next, the significant effect of education indicates that the venture capitalists with more advanced degrees in our sample tended to rate investment opportunities more positively. The significant negative coefficient on “prior start-up experience” shows that more experienced participants in start-ups gave lower evaluations to the opportunities, i.e. they were less likely to be attracted to invest in the opportunity. Lastly, the significant coefficient for the survey method control variable indicates that venture capitalists who participated in the web-based version of our survey were less likely to evaluate investments positively. This possible method bias concerned us, so we conducted sub-group analyses on the in-person vs internet-based experimental groups. Our analyses

confirmed that there were no significant differences on the independent variable effects across the two groups, the models and their significance were statistically equivalent.

Each of the independent variables, “cognitive similarity”, “economic”, and “human capital”, had positive coefficients, indicating that VCs tended to assign a higher probability of investing to opportunities with stronger descriptions. More specifically, where founders demonstrated a cognitive similarity to the participant’s own reasoning pattern they were significantly more likely to invest in that opportunity, supporting H1. Similarly, H2 and H3 were supported; opportunities exhibiting superior (vs average) economic traits and founders possessing proven (vs developing) human capital characteristics were more highly rated as “likely to invest” by the participants.

In an attempt to further investigate the role of cognitive similarity in VC decision making, we analyzed the espoused importance of this factor among our participants. Each VC was asked to rate, on a seven-point Likert scale, the importance of cognitive similarity, economic, and human capital factors during investment evaluation. Paired samples t-tests between these responses confirmed ($p < 0.05$) that the VCs in our sample rated cognitive similarity as the least important factor among the three investment criteria (cognitive similarity: $M = 3.90$, $SD = 1.56$; economic factor: $M = 5.31$, $SD = 0.93$; human capital factor: $M = 5.14$, $SD = 1.25$). A paired samples t-test between the economic and human capital factors found no significant difference ($p = 0.38$).

The VC decision process is also characterized by interactions. As hypothesized H4, the relationship between human capital characteristics of founders and VC investing probabilities, is more positive when the founders and VCs think alike (cognitive similarity). Being a proven founder influences investment decisions more positively when the founders *also* use similar

reasoning patterns to the VC. Thus, H4 was supported. In addition, the relationship between economic factors of the opportunity and probability of investing is more positive when the founder is proven rather than developing, supporting H5.

DISCUSSION AND CONCLUSION

Similarity matters. Even in venture capital decisions, where observable characteristics like personal experience, referrals, and economic factors specific to the evaluation of opportunities are expected to dominate (Hall & Hofer, 1993; Zopounidis, 1994), similarity in cognitive processes between the investor and the entrepreneur significantly increases the probability that the VC will invest. Existing research on the similarity effect in other settings suggested that this would be the case. However, empirically testing this hypothesis in the venture investing setting uniquely demonstrates the robustness of the effect. What makes the effect particularly important is that we evaluated the effect of similarity not between outcomes, (i.e. attitudes, judgments, traits) but between cognitive processes. The similarity we are talking about is not between type of college, or age, or attitudes toward a particular industry, etc., but the process by which the investor and founder make decisions about building a new venture. At times, this similarity effect is written off as a bias around factors not relevant to a particular decision, but driving attractiveness and affecting the decision nonetheless (Harrison et al., 1998). When one takes into account cognitive similarity, however, the dimensions can be much more tightly connected to the decision itself as it relates to the process by which the decision may be executed. Continuing to explore cognitive similarity on dimensions extremely relevant to different decision situations may make the relevance of this tendency more apparent and less about 'biases'.

In our case, we evaluated the effect of similarity between the investor and the entrepreneur based on their cognitive approach to making decisions in the uncertain new venture setting. The dimensions of effectuation and causation are very relevant to the venture investing setting, and can provide useful insights into how the investors and founders may jointly (or not) pursue opportunities. As a result, it can be particularly meaningful to understand how a potential partnership, like that between an entrepreneur and a VC, will deal with the emphasis on prediction versus control oriented efforts at growing the business (Wiltbank et al., 2006). In other situations, the similarity of cognitive factors could be usefully characterized by an entirely different distinction, but again connect to important factors in the execution of the decision that the similarity effect may influence.

The interaction of these cognitive similarity effects with the perception of more ‘objective’ criteria is also a very interesting aspect of this study. We find that VCs do not evaluate investment opportunities uniformly, rather their evaluations tend to be affected systematically in the direction of their similarities with others. Specifically, our finding that VCs tend to prefer individuals who think in manners similar to themselves is important not just because it affects their decisions, but because it affects their perception of the other observable personal and economic characteristics. This finding provides further corroboration of the small, but growing, body of literature which contends that interaction biases are important considerations in decision-making (Franke et al., 2006; Matusik et al., 2006).

Also remarkable are the details for the effects of our three main variables on the probability of investing. Based on our reading of the venture capital literature, we had expected cognitive match to be overwhelmed by the human capital factors and the economic descriptions of the opportunities, and thus consider the test of the cognitive similarity to be a “high hurdle” in

this setting. This reasoning is confirmed by the opinions of the VCs in our study who, as a group, rated cognitive similarity as the least important of the three investment criteria. The fact that cognitive similarity significantly influenced the attractiveness of investment opportunities, while controlling for both human capital and economic factors, provides a fascinating point of embarkation for additional investigation.

Our findings also have implications for future research on decision-making evaluations of all kinds: investment decisions, as in this study, but also executive decision-making broadly, perhaps even at the level of employee evaluation. While the effect of similar demographics, attitudes, education, and so forth may already be out in the open (Franke et al., 2006; Harrison et al., 1998; Tsui & O'Reilly, 1989), these process similarities may be more subtle and thus overlooked in some situations that we research. More explicitly considering the effects of cognitive similarity on attractiveness as well as on the perception of other characteristics, appears to be an important aspect to understanding decision-making wherever selection is involved.

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TABLE 1
Attribute Elements

Attributes	Elements	Literature Source
Opportunity Economics	Industry growth potential	Tyebjee & Bruno (1984); MacMillan et al., (1985); MacMillan et al., (1987); Hall & Hofer (1993); Fried & Hisrich (1994); Muzyka et al., (1996); Zacharakis & Meyer (1998)
	Industry profit margins	Tyebjee & Bruno (1984); Hall & Hofer (1993)
	Scalability of business	Personal interviews with three venture capitalists
	Exit strategy	Tyebjee & Bruno (1984); MacMillan et al., (1987); Fried & Hisrich (1994); Muzyka et al., (1996)
	Competitive position of opportunity	Tyebjee & Bruno (1984); MacMillan et al., (1985); MacMillan et al., (1987); Hall & Hofer (1993); Fried & Hisrich (1994); Muzyka et al., (1996); Zacharakis & Meyer (1998); Shepherd (1999)
Entrepreneur's Personal Characteristics	Referral nature of opportunity	Tyebjee & Bruno (1984); MacMillan et al., (1987); Hall & Hofer (1993); Fried & Hisrich (1994); Wiltbank & Sarasvathy (2006)
	Commitment level of entrepreneur to venture	MacMillan et al., (1985); MacMillan et al., (1987)
	Reputation of entrepreneur	MacMillan et al., (1987)
	Industry experience of entrepreneur	MacMillan et al., (1985); MacMillan et al., (1987); Hall & Hofer (1993); Muzyka et al., (1996); Zacharakis & Meyer (1998); Shepherd (1999)
	Managerial experience of entrepreneur	Tyebjee & Bruno (1984); MacMillan et al., (1985); MacMillan et al., (1987); Fried & Hisrich (1994); Muzyka et al., (1996); Zacharakis & Meyer (1998); Franke et al., (forthcoming)
Entrepreneur's Cognitive Processes	Causal vs Effectual	Sarasvathy (2001a, 2001b, 2005)

TABLE 2
Conjoint Results

Evaluation Criteria	Coefficient	Std. Error	t-ratio
CONTROL VARIABLES			
Cognitive Process of Participant	-0.01	0.09	-0.05
Gender	0.25	0.07	3.86**
Age	0.17	0.14	1.28
Education	0.29	0.14	2.12*
Founder Status	-0.04	0.07	-0.52
VC Experience	0.02	0.02	0.54
Prior Start-Up Experience	-0.21	0.09	-2.40*
Survey Method	-0.57	0.11	-4.98**
INDEPENDENT VARIABLES			
Cognitive Similarity	0.35	0.05	6.87**
Cognitive	0.06	0.05	1.15
Economic	0.33	0.04	7.58**
Human Capital	0.65	0.06	11.14**
Cognitive Similarity * Human Capital	0.08	0.02	3.25**
Human Capital * Economic	0.13	0.03	4.62**
Intercept	4.34	0.08	54.21**

n = 784 decisions nested in 49 VCs

*p < .05

**p < .01

FIGURE 1
Main Effect Hypotheses

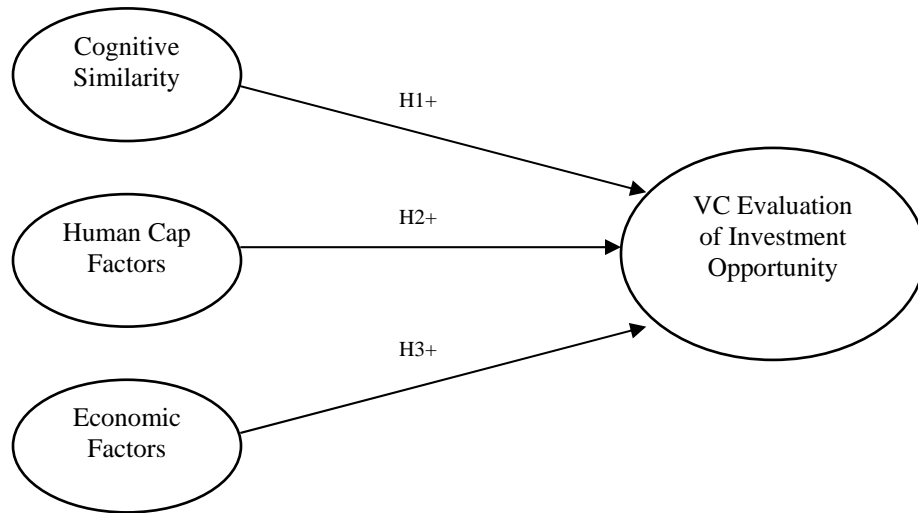
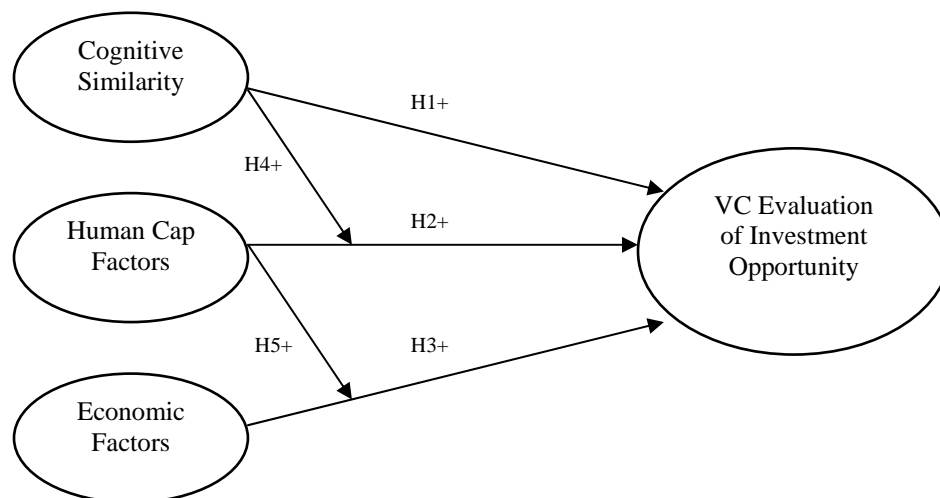


FIGURE 2
All Hypotheses



Appendix A: Attribute and Level Descriptions, as presented to participants

Economics of the Opportunity:

SUPERIOR : This opportunity is in an industry with high growth potential (high relative to other investments currently in your portfolio) and strong profit margins. The venture business plan is scalable, and has a clear exit strategy. In addition, the competitive position appears very defensible.

SOLID : This opportunity is in an industry with significant growth potential and average profit margins (meaning this opportunity meets your minimum requirements). It is not entirely clear at the moment how this business will scale up and what the exit strategy is. In addition, it appears that there will be several legitimate competitors.

Personal Characteristics of the Entrepreneur:

PROVEN : This deal was referred to you by a trusted associate who has referred good prospects to you in the past. The entrepreneur seems extremely committed to the venture, and has a reputation for unquestionable integrity and character. He has worked extensively in the industry of this new venture, and has some experience managing a start-up firm.

DEVELOPING : This deal evolved after you happened to meet the entrepreneur at a local networking event. The entrepreneur seems extremely committed to the venture, and has worked extensively in the new venture's industry, but has never worked in a start-up firm.

Entrepreneur's Thought Processes Concerning the Opportunity:

SHAPING : The entrepreneur began the business in cooperation with personal contacts, building it in relatively small steps. The current marketing approach for growing the business is based on his deep experience in this particular industry and imagining what can be most effective. Although the opportunity is still very uncertain, he is convinced that his business model creates value by exploiting that uncertainty and shaping the competitive landscape in a way favorable to his firm. Product development is guided by a combination of the entrepreneur's unique view of how this problem can be solved, and collaboration with customers. The entrepreneur clearly understands the forecasts of where the market is heading, and believes they are incomplete because they don't incorporate the impact of this firm's innovations.

PLANNING : After detailed research into the market and competition related to this opportunity, the entrepreneur has focused in on an interesting position for the venture. His understanding of the market is deep as a result of this research. The marketing approach is primarily built around anticipating competitive responses in the market. Although the opportunity faces significant uncertainty, he believes his business model can accommodate several of the most likely scenarios for the future of the market. Product development efforts have achieved several important benchmarks vs. competing solutions, and a "road map" is laid out for the next few years. He is convinced in his ability to plan for multiple likely directions the market may take.

Appendix B: Creation of the “Cognitive Similarity” Variable

Operationalizing Cognitive Similarity as a Difference Score:

Cognitive Similarity was operationalized in the following manner. Each participant answered a post-experiment survey which assessed their relative preference for causal or effectual reasoning in a new venture environment. We scored their surveys, and then subtracted their causal score from their effectual score. Positive scores indicated a preference for predominantly effectual reasoning and negative scores indicated a preference for causal reasoning. Next, we coded the conjoint experiment manipulations a ‘+1’ for effectual descriptions and a ‘-1’ for causal descriptions. Finally, we multiplied the conjoint experiment manipulation code (+ or – 1) by the difference score computed from the participants’ post-experiment causal/effectual surveys. The resulting variable was labeled “cognitive similarity”, and provided both an indication of the directionality and intensity of a cognitive match for each participant across each conjoint manipulation.

For example, if an individual’s difference score from the causal/effectual post-experiment surveys was a +1, this indicates that the individual tends to prefer effectual reasoning in new venture contexts. Multiplying this score by the conjoint manipulations provides us with a ‘+1’ value for the cognitive similarity variable across all the effectual manipulations, and a ‘-1’ value for the cognitive similarity variable across all the causal manipulations. Similarly, for an individual whose difference score was a ‘-1’, this indicates that this person tends to prefer causal reasoning in new venture contexts. Just as we did for the first individual, we multiplied this difference score by all the conjoint manipulations, and obtained a ‘+1’ for the cognitive similarity variable when the manipulation matched the person’s preference for reasoning, and a ‘-1’ when there was not a match. Hence, the sign of the cognitive similarity variable indicates the valence of match vs mismatch. This sign was positive whenever the conjoint manipulation matched the preferred pattern of reasoning of the participant.

The cognitive similarity variable also captures the intensity of matches between the reasoning patterns of participants and the conjoint manipulations. For example, if one individual’s difference score is a ‘+4’ vs another individual who has a ‘0’ (indicating no preference for causal vs effectual reasoning), our cognitive similarity variable still integrates these variations. By multiplying the difference score by either a positive or negative one, we manage to maintain the integrity of differences in causal vs effectual preferences of the participants.

As a final note, we treated cognitive processes along a single bipolar dimension (effectual vs causal) instead of as two separate dimensions because of the strong negative bivariate correlation exhibited by our sample (-0.747, significant at 0.00).