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WHERE IS THE RISK? AVAILABILITY, ANCHORING, AND FRAMING EFFECTS ON ENTREPRENEURIAL RISK TAKING

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WHERE IS THE RISK? AVAILABILITY, ANCHORING, AND FRAMING EFFECTS ON ENTREPRENEURIAL RISK TAKING

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ABSTRACT

Although research has emphasized cognition and the use of heuristics and biases by entrepreneurs, the process by which available information influences one’s decision to start a business has yet to be clarified. In this study, we test a model where changes in the available information concerning a new venture impact the perceived risk associated with this venture—ultimately affecting the decision to start it. In our model, two important heuristics influence risk perception and bias decision making: availability and anchoring. Moreover, we suggest that these heuristics have opposite effects, depending on whether the available information is framed in positive or negative terms. Results reveal how different combinations of judgmental heuristics and problem framing may stimulate or inhibit entrepreneurial behavior.

INTRODUCTION

Although research has emphasized the importance of entrepreneurial cognition (e.g., Mitchell et al., 2002; Mitchell et al., 2007) and the use of heuristics and cognitive biases by actual entrepreneurs (e.g., Busenitz, 1999; Busenitz & Barney, 1997; Palich & Bagby, 1995), the process by which available information influence one’s decision to start a business has yet to be clarified. In this study, we focus on how changes in the available information about a new venture influence individuals’ risk perception of this venture and their decision to start it. More specifically, we propose and test a model where changes in the available information concerning a new start up cause changes in the perceived risk associated with this venture, affecting judgments of feasibility and desirability, as well as one’s decision of joining the venture. In our model, two important cognitive heuristics are supposed to influence risk perception and bias decision making: availability and anchoring. Moreover, we hypothesize that these heuristics will have opposite effects, depending on whether the available information is framed in terms of potential gains (chances of success) or potential losses (chances of failure). In conducting this study we contribute to research on entrepreneurial cognition and decision-making by deepening our understanding of how a combination of judgmental heuristics and the framing of situations stimulate or inhibit entrepreneurial behavior.

RISK TAKING, ENTREPRENEURIAL COGNITION, AND JUDGMENTAL HEURISTICS

Psychological approaches in entrepreneurship research benefit from broader developments in the field of the psychology of judgment and decision-making. Actually, it is interesting to note that both fields present parallel developments: while scholars in entrepreneurship have increasingly questioned the validity of trait-based approaches to the entrepreneur, scholars in the field of judgmental psychology have increasingly questioned the validity of models based on expected utility theory that were supposed to describe human behavior (for some historical perspectives in both fields, see, e.g. Adair, 1998; Goldstein & Hogarth, 1997; Mitchell et al., 2002; Munier, 1998; Saporta, 2003). In particular, the research program initially suggested by Herbert Simon and the criticisms raised by psychologists to expected utility theory contributed to the emergence of alternative and more complex models—such as prospect theory (Kahneman & Tversky, 1979)—and in the increasing study of intuitive judgment, with its cognitive heuristics and biases (Kahneman, 2003). From a risk perspective, such developments indicated the effect of cognitive heuristics on risk perceptions and behaviors (e.g., Slovic, Fischhoff & Lichtenstein, 1982),
providing new explanations for the risky ideas entrepreneurs pursue (Busenitz, 1999; Busenitz & Barney, 1997; Keh, Foo, & Lim, 2002; Palich & Bagby, 1995; Simon, Houghton, & Aquino, 2000).

“Heuristics” refers to simplifying strategies that individuals use to assess probabilities, make predictions, and ultimately make decisions (Mitchell et al., 2007; Tversky & Kahneman, 1974). Entrepreneurial cognitions are “the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth.” (Mitchell et al., 2002, p. 97) Knowledge structures and individual perceptions are strongly influenced by cognitive heuristics—such as overconfidence, law of small numbers, availability, etc.—which can in turn affect judgment and bias decision making, producing inconsistent choices (Kahneman, 2003; Kahneman, Slovic, & Tversky, 1982; Tversky & Kahneman, 1974). Cognitive heuristics and biases have been suggested to explain entrepreneurial risk behavior (Busenitz & Barney, 1997; Busenitz, 1999; Palich & Bagby, 1995) and have been shown to considerably affect entrepreneurs’ risk perceptions (Key, Foo & Lim, 2002; Simon, Houghton & Aquino, 2000).

Additionally to the importance of cognitive heuristics, research on the psychology of decision making has also revealed the importance and the impact of the framing of situations on risk taking behavior. In their influential prospect theory, Kahneman and Tversky (1979) proposed that people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty—a tendency that contributes to risk aversion in choices involving sure gains and to risk seeking in choices involving sure losses. Since then, the relationship between risk behavior and problem framing has been extensively investigated and results are, to a certain extent, contradictory (Sitkin & Pablo, 1992).

In the field of entrepreneurship, the effects of problem framing on entrepreneurial decision making have not yet been fully explored. Even though several studies have investigated the impact of heuristics and biases in entrepreneurial settings, little attention has been paid to the combined effects of cognitive heuristics and problem framing. In this paper we address this issue, focusing on two particular heuristics: availability and anchoring.

**PROBLEM FRAMING AND AVAILABILITY OF NEW INFORMATION: BIASING ENTREPRENEURIAL RISK PERCEPTION**

Availability is the judgmental heuristic used when people assess the frequency of a class or the probability of an event by the ease with which instances or occurrences can be brought to mind (Hogarth, 1987; Tversky & Kahneman, 1974). For example, one may evaluate the probability that a given business venture will fail by imagining various difficulties it could encounter. Since more frequent difficulties are usually reached better and faster by our cognitive system than less frequent difficulties, availability is a useful clue that one may use to intuitively assess, in our example, the probability of a business failure. However, availability is affected by factors other that frequency and probability. In our example, the estimated probability of failure given by an individual may be affected by numerous factors that facilitate the retrievability of certain instances in the mind, foster imagination, and support illusory correlations: one’s familiarity with the type of business in question, the simple fact that a similar venture failed recently, one’s subjective assessment of the economical environment, etc. Therefore, judgments relying strongly on availability are generally biased.

Availability is also supposed to affect risk perception, because the ease with which people imagine or remember potential outcomes of a decision in a given situation may determine the perceived risk associated with the decision and the situation. For example, “one particularly important implication of the availability heuristic is that discussion of a low-probability hazard may increase its memorability and imaginability and hence its perceived riskiness, regardless of what the evidence indicates.” (Slovic, Fischhoff, & Lichtenstein, 1982, p. 465) Availability may also enhance the importance of past experience in determining perceived risk, since experienced events are easier to recall and define the situations that one is familiar with. We know in the field of entrepreneurship that past experience and prior exposure to
entrepreneurship significantly influences variables such as self-efficacy, intention, behavior and results of entrepreneurial action (Fayolle, 1996; Krueger, 1993; Peterman & Kennedy, 2003). Certainly, the simple act of considering the option of starting a business as a possible career choice is a cognitive process significantly influenced by the availability heuristic.

“Framing” refers to the judgmental heuristic used when people evaluate outcomes as deviations from reference points or levels of aspiration, thereby “framing” them as losses or gains (Hogarth, 1987; Kahneman & Tversky, 1979). Framing is also generally discussed in terms of the way a situation or a problem is presented, i.e., if the problem is framed in positive or negative terms (Sitkin & Pablo, 1992). These two conceptions certainly overlap, and in this study we use the expression “problem framing” in a way that is consistent with both.

The interactive role of problem framing and availability in entrepreneurial settings has yet to be explored. In particular, these heuristics may influence to a great extent one’s evaluation of a new venture project, the risk perceptions associated with it, and, ultimately, one’s decision to join the project or not. In this study we focus on risk perception, which corresponds to a decision maker’s assessment of the risk inherent in a situation (Sitkin & Pablo, 1992). We also focus on the decision to start a new venture—or, more specifically, to join a new venture project. Since previous research has shown that lower levels of risk perception are generally associated with the decision to start a new venture, and may result from the use of cognitive biases (Keh, Foo, & Lim, 2002; Simon, Houghton, & Aquino, 2000), we expect that risk perception and the decision to start a business will be significantly affected by both availability and problem framing.

In order to empirically investigate this issue, we observe how changes in the available information concerning a new venture project impacts individual’s perceptions of the risk inherent in the project, as well as their decision to join it or not. Asymmetries of information have been suggested as one of the reasons why entrepreneurs’ risk perceptions differ from others’ (Janney & Dess, 2006). In this study we empirically test the impact of new information on the perceived risk of a venture project.

Of course, the way information is presented has a great impact on judgments of risk (Slovic, Fischhoff, & Lichtenstein, 1982). For example, the simple fact of presenting data concerning the effects of different cancer treatments in terms of probability of dying versus probability of living enhance different and contradictory preferences for alternative therapies (McNeil, Pauker, Sox, & Tversky, 1982). Even the simple choice of presenting data in raw numbers or in probability terms may impact significantly people’s perceptions and judgment (Hogarth, 1987).

Thus, we hypothesize that the effect of additional information on risk perception and decision making depends on whether this information is framed in positive or negative terms. New information framed in negative terms may enhance risk perception, because the mere allusion to the potential negative outcomes of a decision may foster the recovering of other negative outcomes in memory and stimulate imaginability of undesirable consequences of this decision, enhancing fear (Slovic, Fischhoff, & Lichtenstein, 1982). Moreover, additional information concerning a new venture project influences the way in which the project is perceived. If this information is framed in negative terms, it may place the project below one’s aspiration level, increasing the likelihood that the individual will frame the venture project as a loss vis-à-vis other projects that may represent more sure gains.

**H1:** Availability of new information framed in negative terms (as chances of failure) increases the perceived risk associated with a new venture, reducing individuals’ willingness to start this venture.

Inversely, additional information framed in positive terms may reduce the perceived risk associated with a new venture project, by enhancing optimism and stimulating perceptions of opportunities. This new information may also impact the way individuals frame the project, placing it above aspiration levels and increasing its attractiveness vis-à-vis other projects.
**H2:** Availability of new information framed in positive terms (as chances of success) decreases the perceived risk associated with a new venture, increasing individuals’ willingness to start this venture.

**PROBLEM FRAMING AND ANCHORING EFFECTS: BIASING ESTIMATES OF NEW VENTURE SUCCESS**

Anchoring is the phenomenon that occurs when people make estimates by starting from an initial value that is adjusted to yield a final answer, adjustments being insufficient to compensate estimates’ bias toward the initial values (Tversky & Kahneman, 1974). A typical example of anchoring in the corporate world consists in making a sales forecast by taking the last year’s sales and adding, say, 5% (Hogarth, 1987). The initial value may be suggested by the formulation of the problem, or it may be the result of a partial computation. In either case, although adjustments are made to allow for the circumstances of the present situation, they are typically insufficient—the final estimates remain too close to the initial value (Tversky & Kahneman, 1974).

An interesting relation between anchoring and risk perception emerges when people evaluate conjunctive and disjunctive events. Probabilities of conjunctive events are often overestimated, whereas probabilities of disjunctive events are frequently underestimated (Tversky & Kahneman, 1974). This has interesting implications when transposed to entrepreneurial situations, especially because the launch of a new venture can be framed both as a series of conjunctive or disjunctive events.

If we frame the entrepreneurial process that leads to the launch of a new venture in positive terms and as a series of conjunctive events, it is likely that the overall probability of success will be overestimated. This happens because “the successful completion of an undertaking, such as the development of a new product, typically has a conjunctive character: for the undertaking to succeed, each of a series of events must occur. Even when each of these events is very likely, the overall probability of success can be quite low if the number of events is large.” (Tversky & Kahneman, 1974)

An entrepreneurial undertaking—such as the launch of a new venture—is a process whose overall success depends on several individual tasks that are connected to each other. If we frame this process in terms of a sequence of critical events—for example, identifying an opportunity, developing a prototype, raising capital, etc.—the overall success of the new venture will depend on the individual successes of each critical event. Since the number of events that must occur in order to assure the successful launch of a new venture may be considerably large, but the probability of success for each single event may also be relatively high, people are likely to overestimate the overall probability of success if they use the probability of a single event as the starting point for their estimation. Since adjustments tend to be insufficient, the final estimate remains too close to the initial value. Thus, the fact that entrepreneurs usually overestimate their chances of success may be due to an anchoring bias that is accentuated when the events necessary to the successful launch of a new venture are presented in positive terms.

**H3:** When the events necessary to the successful launch of a venture are framed in positive terms (high individual probabilities of success), individuals overestimate the venture’s overall probability of success.

However, when the events necessary to the successful launch of a new venture are framed in negative terms (probabilities of failure) a structure very similar to a disjunctive one emerges. In a disjunctive structure, failure in one of the components may cause the failure of the entire structure. Typical examples of disjunctive structures are complex systems, such as a nuclear reactor or a human body, which will malfunction or even collapse if any of its essential components fails (Slovic, Fischhoff, & Lichtenstein, 1982; Tversky & Kahneman, 1974). In disjunctive structures overall probabilities of failure are often underestimated, because the probabilities of failure of their components are usually small. Now, if we frame the process of creating a new venture as a complex system in which each activity (raising initial
funding, assuring a certain level of cash flow, etc.) is essential to the survival of the new firm, a structure similar to a disjunctive one definitely emerges. This can be done by reversing the framing introduced in hypothesis 3, i.e., by presenting low probabilities of failure for each of the tasks necessary to the successful launch of the new venture.

**H4:** When the events necessary to the successful launch of a venture are framed in negative terms (low individual probabilities of failure), individuals underestimate the venture’s overall probability of failure.

See Figure 1.

**METHODOLOGY AND RESEARCH DESIGN**

**Sample**

Two hundred fifty six students that were enrolled in management courses at Miami University, Simmons School of Management, University of Wisconsin Eau Claire, and Western Washington University (127 men, 129 women), participated in our study. The students were aged between 18 and 56, with a median age of 21 (mean of 22.14 and std. deviation of 4.65 years). Data were collected between November and December 2006, and all participants were taking entrepreneurship classes during this period. The vast majority of participants received course credit for taking part in the study.

**Research Design**

Participants completed a web-based survey in which they were presented four scenarios in a repeated-measures experimental design (Chow, 2002; Cook & Campbell, 1979; Pedhazur & Schmelkin, 1991). In the introduction of each scenario, respondents were encouraged to put themselves vividly in each situation. All scenarios presented a situation where the respondent was invited by a friend to join him in the process of starting a new venture. In a 2 by 2 design, scenarios differed only in the current employment status of the respondent (“You just finished college and are looking for a job” versus “You have a job that gives you a reasonable salary and good perspectives of being promoted in the long run”) and in the way the option of starting the venture was presented (emphasizing possible positive outcomes and the probability of success versus emphasizing possible negative outcomes and the probability of failure). In all scenarios, the probability of success/failure “estimated by the friend” was “being around 50%.”

Participants were then asked to indicate the level of risk they perceived in the option of joining the friend, and whether or not they would do it.

After that, additional information was given for each scenario. The respondent was told that, after talking with the friend and reading his business plan, the estimated probability of:

- Having a prototype successfully developed (not having a prototype successfully developed) was 90% (10%);
- Receiving adequate funding (not receiving adequate funding) was 80% (20%);
- Having enough cash flow to stay in business (not having enough cash flow) was 85% (15%);
- Be the first one in the market (arrive too late in the market) was 80% (20%).

Then, subjects were asked to consider this information and indicate the level of risk they now perceived in the option of joining the friend, and whether or not they would do it. In addition, they were asked to indicate the estimated probability of success (failure) of the new venture.
We report in Appendix 1 one of the scenarios we used, in which the option of starting a new venture is initially presented in positive terms and the additional information given is also presented in positive terms. Appendix 2 presents another scenario, in which the option of starting a new venture is initially presented in negative terms and the additional information given is also presented in negative terms. Although we used four scenarios in total, the additional information given after the first measurement of perceived risk always followed the initial description of the situation, i.e., scenarios initially described in positive terms received only additional information in positive terms, whereas scenarios that were initially described in negative terms received only additional information in negative terms. This is justified because we are interested in variations of perceived risk (and decisions) within each scenario, and not between scenarios. Thus, even though we used multiple scenarios, for the purposes of this study our approach is limited to a pretest-posttest design (Pedhazur & Schmelkin, 1991).

Measures

Risk perception was measured twice in each situation: the first measure was completed just after an initial brief description of the scenario; the second measure was completed after the additional information was given (see Appendix 1). Participants rated the amount of risk they perceived in the option of starting the venture in a 9-point Likert scale ranging from 1 = “Not risky” to 9 = “Very risky.”

Decision to start the new venture was measured by a yes-or-no question that asked respondents to indicate whether or not they would actually join the friend (“Yes, I would join him” versus “No, I would keep looking for a job” or “No, I would keep my job”).

Participants were also asked to give their estimation of the overall probability of success/failure of the venture. This measurement was taken right after the additional information was given. Respondents gave a single estimation of the overall probability of success for scenarios that were framed in positive terms, and a single estimation of the overall probability of failure for scenarios that were framed in negative terms (see measurements on Appendix 1 and 2).

ANALYSIS

Testing Availability Effects

In order to test our hypotheses 1 and 2, we adopted the regression approach suggested by Pedhazur and Schmelkin (1991) to analyze designs involving premeasures and postmeasures. In this approach, the postmeasure is regressed on the premeasure and on one or more vectors representing the treatments and the interactions between the treatments and the premeasure. In our case, only one vector is necessary to represent the framing of the additional information (we used effect coding, so -1 = new information presented in negative terms, and 1 = new information presented in positive terms).

For the first analysis, the dependent variable is the perceived risk measured after the addition of new information in the scenario, while the independent variables are the initial perceived risk (given for each scenario), the coded vector representing the framing of additional information, and another vector that represents the interaction between the initial perceived risk and the framing of new information. Perceived risk was centered before inclusion in the regression (as suggested by West, Aiken, & Krull, 1996) and multiplied by the vector representing framing in order to generate the interaction term. Tables 1 and 2 summarize the results of this first regression analysis.

As expected, the interaction between the framing of the additional information and the perceived risk measured before this additional information was given is not significant (R Square Change for the interaction = 0.001; F Change = 1.181; Sig. F Change (1, 1019) = 0.277). Table 2 reports the coefficients for this first regression equation, showing that the framing introduced in each scenario has a significant impact on risk perception. Moreover, it appears that the relationship between risk perception and the
framing of the situation (B = -0.713) is as we expected: positive framings (coded as 1) have the effect of decreasing risk perception, while negative framings (coded as -1) have the opposite effect.

In order to further explore these results, we compared the means of perceived risk measured before and after the additional information was introduced in the scenarios. Means were significantly different, however, to our surprise participants’ perceived risk decreased after the addition of new information, regardless of the framing adopted. Accordingly to our hypotheses, we expected reduction of perceived risks after the introduction of additional information framed in positive terms, but not after the introduction of additional information framed in negative terms.

The second step in our analyses was to consider changes in the decision to start a venture or not. Here again, we were initially surprised with the results. As shown in table 3, when comparing decisions before and after additional information was introduced, the number of decisions favorable to start the new venture (1 = “Yes, I would join him”) increased, regardless of the framing adopted for the new information. Although this is consistent with the reduction detected on risk perception, it was not expected. These apparent mixed results will become clearer when we analyze the effects of anchoring in the next section.

**Testing Anchoring Effects**

In order to test anchoring effects in our experiment, we have to look in detail at the additional information that was given to participants. For scenarios positively framed, the additional information was as follows:

“Now suppose you talk further with your friend and actually read his business plan. You realize that he is already developing a prototype for a very innovative product. There is a 90% chance that this prototype will be successfully developed. Moreover, there is an 80% chance that the business will receive adequate funding in order to launch the new product. There is a probability of 85% that this new venture will have enough cash flow to stay in business during its first years, and finally, there is a probability of 80% that the firm will be the first one to arrive in the market, having an important first mover advantage.”

Notice that only probabilities of success are given, and that all range from 80% to 90%. Notice also that for the new venture to be successful all the activities and events described above have to happen, i.e., having developed a prototype does not guarantee success, it is also necessary to receive adequate funding to launch the new product, as well as to have enough cash flow to stay in business, and so on. Other events could be added to this list, which ultimately represents only what the fictitious “friend” is telling to the respondent. As presented above, the activities necessary to the launch of the new venture form a series of conjunctive events. Consequently, the overall probability of success for the venture described above should be calculated multiplying the probabilities of success given for the events composing this conjunctive structure (48.96%). Actually, if one considers that the list of events given by the problem is not exhaustive, estimations should be below 48.96%. Table 4 shows the descriptive statistics of the estimations given by students in our sample.

As is shown in table 4, the mean probability of success estimated by participants after receiving the piece of information above is 76.73%. Notice that it is close to the range of probabilities given by the problem, and significantly far from the probability respondents would give had they calculated the product of individual probabilities ($t(508) = 49.50; p<0.05$). This result supports hypothesis 3, showing that individuals in our sample did overestimated the venture’s overall probability of success when the events necessary to its successful launch were framed in positive terms (using high individual probabilities of success).

Now let’s turn to the situations in which additional information was framed in negative terms:
“Now suppose you talk further with your friend and actually read his business plan. You realize that he is already developing a prototype for a very innovative product. There is a 10% chance that this prototype will never be successfully developed. Moreover, there is a 20% chance that the business will not receive adequate funding in order to launch the new product. There is a probability of 15% that this new venture will not have enough cash flow to stay in business during its first years, and finally, there is a probability of 20% that the firm will arrive too late in the market, with the window of opportunity having already closed due to market changes.”

First, notice that this piece of information was generated by simply reflecting the additional information given in positively framed scenarios. Accordingly, here only probabilities of failure were presented, ranging from 10% to 20%. In this piece of information, the series of events introduced form a disjunctive structure, i.e., failure in one of the events may represent the failure of the new venture. In this type of structure, the total risk of failure should be calculated as the sum of the individual probabilities given for each event, in our case 65%. Again, the list presented being not exhaustive, 65% is the lowest estimation one should make for the overall probability of failure of this venture. Table 5 summarizes students’ estimations for the overall probability of failure of the new venture in situations that were negatively framed. The average estimation (49.95) is significantly below the “correct” value ($t(507) = -12.77; p<0.05$), indicating that anchoring effects also bias estimations of chances of failure when the events necessary to the successful launch of a venture are framed in negative terms. Hypothesis 4 is therefore supported.

**DISCUSSION**

**Summary of Results**

Overall, results show that the responses given by the participants in our experiment support our hypotheses concerning anchoring effects and their interplay with problem framing. As predicted, when faced with conjunctive events necessary to the launch of a new venture, respondents overestimated its chances of success. When faced with a disjunctive structure of events that may threaten the survival of a new venture, respondents underestimated its risk of failure. These findings reveal that cognitive heuristics and problem framing are not independent: indeed, our results clearly demonstrate that the framing of a situation may induce biases through anchoring.

In addition, such biases affect risk perception. Now that we have exposed the results concerning the effect of anchoring in estimates of success and failure of the new venture, it is clear why results did not support our first hypothesis. In our experiment, anchoring and availability played against each other in terms of their effects on risk perception. Availability of new information framed in negative terms should enhance risk perception, but the probabilities of failure presented were small enough to anchor individuals’ judgment, yielding estimates that were biased towards those small values. Chances of failure were underestimated and consequently risk perception decreased.

In the light of these findings that reveal the preponderance of anchoring effects in our experiment, we conclude that hypotheses 3 and 4 were supported. Hypotheses 1 and 2, on the other hand, were only partially supported by the results of our regression analysis, which indicates that indeed positive framings tend to decrease risk perception, whereas negative framings tend to increase it. Such tendencies, however, seems to have been overcome by the effects of anchoring.

**Limitations**

This study has several limitations that need to be acknowledged. The first one concerns the design of our hypotheses. Hypotheses 1 and 4 were set up in a very special manner: while hypothesis 1 asserted that negatively framed information would enhance risk perception, hypothesis 4 asserted that the same information would generate underestimated probabilities of failure. We purposefully designed this
research and these hypotheses in that manner because we wanted to identify inconsistencies among judgments and choices. However, as our results show, individuals in our sample gave pretty consistent answers. Thus, the mixed results we found concerning hypotheses 1 and 2 are a consequence of our design.

Second, the external validity of this study also has its limitations. We used a sample of students who were asked to imagine themselves in hypothetical situations, not real entrepreneurs actually running a business. Although we can argue that this may be an adequate sample to investigate and an adequate method to study how people think when faced with the decision to become an entrepreneur, it is important to keep the distinction in mind and avoid overgeneralization.

Finally, we restricted our examination to a limited set of factors. On the one hand, this allows for more control, enables a more detailed investigation of the variables observed, and facilitates inferences involving causality. On the other hand, we are clearly not taking into account innumerable other variables that ultimately influence risk perception in entrepreneurial settings and the decision to start a business.

CONCLUSION

Our results reveal the complex interplay between cognitive heuristics and problem framing in determining the perceived risk associated with entrepreneurial behavior. Such cognitive mechanisms may bias risk perception in ways that encourage or discourage entrepreneurial risk taking and action. Awareness of such mechanisms may help entrepreneurs to avoid and reduce the actual risks of missing an opportunity and/or doing poorly—the risks of “missing and sinking the boat” (Dickson & Giglierano, 1986; Mullins & Forlani, 2005). A better understanding of these cognitive mechanisms may also help entrepreneurship educators to support students’ entrepreneurial endeavors in an effort to avoid judgmental biases that may prevent them from trying an entrepreneurial path, or, instead, that may push them towards a bad entrepreneurial experience. Cognitive heuristics influence not only students’ risk perceptions and estimations of probability, but also the way they learn. Understanding mechanisms such as availability and anchoring may help entrepreneurship educators to better choose the type of feedback students need. In addition, awareness of such heuristics may also be helpful in teaching specific topics like negotiation and risk management.

This study contributes to research on entrepreneurial cognition and decision making by deepening our understanding of how the framing of situations may stimulate or inhibit entrepreneurship. Our results show that cognitive heuristics are not dissociated from the situational context and, moreover, they are not dissociated from each other. In our experiment, anchoring effects overcame availability effects in risk perception. In real life, individuals are embedded in a net of perceptions, heuristics, intuitions, thoughts, and feelings, which are difficult to penetrate and even harder to understand. Entrepreneurs are also embedded in their psychological nets, with one additional detail: the situations which they face tend to be more complex than average. The decision to become an entrepreneur is itself a very complex one. Our study brings a small but significant contribution to the question of how people think when faced with this decision. A question that precedes, at least in time, the one addressing how entrepreneurs think.

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REFERENCES


APPENDIX 1: A Scenario Framed In Positive Terms

Initial description:

You just finished college and are looking for a job. A friend of yours, who is currently in the process of starting a new venture, invites you to join him in this adventure. He says that if the new business succeeds, both of you will be extremely rich. In addition, he emphasizes the incredible opportunities of learning in this new business, as well as the advantages of being self-employed: independence, flexibility in terms of work schedule, etc. Even though there is a chance of the venture not succeeding, he argues that this experience (and the skills you will develop) will be invaluable to your career and overall employability. He estimates the probability of success being around 50%.

Initial measurement (independent variables):

You evaluate the option of joining him. How risky is this option for you? (9-point scale, ranging from 1 = “Not risky” to 9 = “Very risky”)

Would you join him, or would you keep looking for a job? (Choice between “Yes, I would join him” or “No, I would keep looking for a job”)

Additional information:

Now suppose you talk further with your friend and actually read his business plan. You realize that he is already developing a prototype for a very innovative product. There is a 90% chance that this prototype will be successfully developed. Moreover, there is an 80% chance that the business will receive adequate funding in order to launch the new product. There is a probability of 85% that this new venture will have enough cash flow to stay in business during its first years, and finally, there is a probability of 80% that the firm will be the first one to arrive in the market, having an important first mover advantage.

Second measurement (dependent variables):

Now, what do you believe is the overall probability of success of this venture? _____% (give your personal estimation, there is no "right" or "wrong" answer) (Respondents gave a single probability)

You re-evaluate the option of joining your friend in this new venture. How risky is this option for you now? (9-point scale, ranging from 1 = “Not risky” to 9 = “Very risky”)

Considering the additional information given above, would you join your friend in this new venture, or would you keep looking for a job? (Choice between “Yes, I would join him” or “No, I would keep looking for a job”)

APPENDIX 2: A scenario framed in negative terms

Initial description:

You just finished college and are looking for a job. A friend of yours, who is currently in the process of starting a new venture, invites you to join him in this adventure. He says that if the new business succeeds, both of you will be extremely rich. However, failure may be costly, since both of you will
have spent money, time, and a significant amount of personal effort in the project. He estimates the probability of failure being around 50%.

**Additional information:**

Now suppose you talk further with your friend and actually read his business plan. You realize that he is already developing a prototype for a very innovative product. There is a 10% chance that this prototype will never be successfully developed. Moreover, there is a 20% chance that the business will not receive adequate funding in order to launch the new product. There is a probability of 15% that this new venture will not have enough cash flow to stay in business during its first years, and finally, there is a probability of 20% that the firm will arrive too late in the market, with the window of opportunity having already closed due to market changes.

**Measurement of estimation of probability of failure:**

Now, what do you believe is the overall probability of failure of this venture? ______% (give your personal estimation, there is no "right" or "wrong" answer)

(Respondents gave a single probability)
Figure 1: Our Proposed Model

![Diagram showing the proposed model with Problem Framing: Positively Framed Information and Problem Framing: Negatively Framed Information.]

Table 1: Model Summary for PerceivedRisk2 as Dependent Variable

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R Square Change</td>
</tr>
<tr>
<td>1</td>
<td>.447a</td>
<td>.200</td>
<td>.199</td>
<td>1.87526</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.560b</td>
<td>.313</td>
<td>.312</td>
<td>1.73827</td>
<td>.113</td>
</tr>
<tr>
<td>3</td>
<td>.560c</td>
<td>.314</td>
<td>.312</td>
<td>1.73812</td>
<td>.001</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>F-Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
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</thead>
<tbody>
<tr>
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<td>254.916</td>
<td>1</td>
<td>1021</td>
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<tr>
<td>2</td>
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<td>1</td>
<td>1020</td>
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<td>1.181</td>
<td>1</td>
<td>1019</td>
<td>.277</td>
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</table>

a. Predictors: (Constant), PerceivedRisk1centered

b. Predictors: (Constant), PerceivedRisk1centered, Additional Information

c. Predictors: (Constant), PerceivedRisk1centered, Additional Information, FRAMINGxPRISK1
Table 2: Regression Equation for PerceivedRisk2 as Dependent Variable

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
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<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
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<tr>
<td>1</td>
<td>(Constant)</td>
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<td>.059</td>
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<td></td>
<td>PerceivedRisk1centered</td>
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<td>.034</td>
<td>15.966</td>
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<tr>
<td>2</td>
<td>(Constant)</td>
<td>5.273</td>
<td>.054</td>
<td>97.031</td>
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<td>PerceivedRisk1centered</td>
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<td>.032</td>
<td>15.073</td>
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<td>Additional Information</td>
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<td>-12.972</td>
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<tr>
<td>3</td>
<td>(Constant)</td>
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<td>PerceivedRisk1centered</td>
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<td>Additional Information</td>
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<td>.055</td>
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<td>FRAMINGxPRISK1</td>
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<td>.032</td>
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</tbody>
</table>

a. Dependent Variable: PerceivedRisk2

Table 3: Frequencies for Decision Before(1) and After(2) Introduction of New Information

<table>
<thead>
<tr>
<th>Decision1 * Decision2 * Additional Information Crosstabulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
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<tr>
<td>Additional Information</td>
</tr>
<tr>
<td>negatively presented</td>
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<tr>
<td>Total</td>
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<tr>
<td>positively presented</td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Note: 1 = Yes; 2 = No

Table 4: Participants’ Estimations of the Probability of Success of the New Venture (Positively Framed Situations)

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>PROBFS</td>
</tr>
</tbody>
</table>

Table 5: Participants’ Estimations of the Probability of Failure of the New Venture (Negatively Framed Situations)

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>PROBFS</td>
</tr>
</tbody>
</table>