Surprisingly Stable

An Experiment on Willingness to Bear Uncertainty in Individuals with and without Entrepreneurial Intentions

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SURPRISINGLY STABLE: AN EXPERIMENT ON WILLINGNESS TO BEAR UNCERTAINTY IN INDIVIDUALS WITH AND WITHOUT ENTREPRENEURIAL INTENTIONS.

INTRODUCTION

Uncertainty—defined as the lack of predictive information (Knight, 1921)—is a fundamental variable that entrepreneurs have to manage. Entrepreneurs are often considered more willing than non-entrepreneurs to bear and manage uncertainty because they self-select in an environment where choices have to be taken despite a lack of critical information (e.g., on expected returns, Sarasvathy, 2009). However, prior research provides mixed evidence on entrepreneurs' willingness to bear uncertainty. Some contributions suggest that entrepreneurs are not more willing to bear uncertainty compared to non-entrepreneurs (e.g., McKelvie et al., 2011; O'Brien et al., 2003), while others suggest that differences between these groups are driven by circumstantial factors such as strategic competition (Holm et al., 2013), monetary losses (Koudstaal et al., 2015), and decision framing (Dew et al., 2009). This latter stream of research aims at understanding whether or not entrepreneurs are unique in their decision making under uncertainty, and new contributions in this direction have been encouraged (for a review, see Shane and Ulrich, 2004; Shepherd et al., 2015).

This paper adopts a novel approach to the topic of decision making under uncertainty. First, it acts as a follow-up to prior studies that have argued in favor of a different cognitive approach to uncertainty between entrepreneurs and non-entrepreneurs (Shepherd, 2015). In particular, it has been argued that entrepreneurs are less likely to predict an unknowable future (Sarasvathy, 2009), and accordingly tend to focus less on predictive information. However, the link between willingness to bear uncertainty and the lack of predictive information has not yet been tested within entrepreneurship research. Second, it compares individuals with different entrepreneurial intentions instead of entrepreneurs. Students provide a relevant group of analysis to test whether differences in willingness to bear uncertainty exist before entrepreneurial experience (Birch et al., 2017;

Krueger et al., 2000). Finally, it tests the causal link between behavior and cognition by using an experimental methodology. This methodological approach allows studying entrepreneurship while drawing on theories from a variety of disciplinary perspectives, such as psychology (e.g. cognition), and economics (e.g. uncertainty taking).

A specific research question is formulated: How do individuals with and without entrepreneurial intentions differ in their willingness to bear uncertainty? Answering this research question is important for several reasons linked to management development, defined here as: "any attempt to improve the effectiveness of managers through planned learning" (Howieson and Grant, 2020: p.2). First, willingness to bear uncertainty is positively associated with self-selection into entrepreneurship, a relevant phenomenon to public welfare (Baron and Ensley, 2006; McMullen and Shepherd, 2006; Shane and Venkataraman, 2000). Prior studies have shown that entrepreneurs' alertness to business ideas and willingness to exploit them increases under turbulent business conditions (such as high technological instability and market fluctuation, Yasir et al. 2017). Understanding under which conditions individuals are more willing to bear uncertainty may help public and private stakeholders to support effective entrepreneurial action. Second, research on entrepreneurs' behavior under uncertainty is timely, as public and private institutions (e.g., new venture *incubators* and *accelerators*; Amezcua et al., 2013) currently aim at reducing entrepreneurs' chances of failure by focusing on uncertainty management. Learning plays a central role in uncertainty management, and experiential learning is useful to increase individuals' effectiveness, for example during the startup process (Wolf, 2017). Third, contributions that compare individuals with different entrepreneurial intentions in their behavior under uncertainty are scarce, particularly those that use an experimental methodology (Shepherd et al., 2015).

Fourth, a better understanding of contextual factors influencing entrepreneurs' willingness to bear uncertainty will help stakeholders to align their objectives with their entrepreneurial partners (e.g. investors, Courtney et. al., 2017). Finally, as this paper specifically explores how information on probabilities of success influences willingness to bear uncertainty, it sheds light on a key factor that can help entrepreneurs to assess the feasibility of an investment (McMullen and Shepherd, 2006).

In this paper, two assumptions are made. First, it is assumed that decision makers suffer from cognitive biases and use heuristics to select among available information under uncertainty (Gigerenzer, 2008; Gigerenzer et al., 1999; Kahneman and Tversky, 1979; March, 1994; Shah and Oppenheimer, 2008). In particular, individuals show inconsistent preferences due to different presentations of the same piece of information (Kahneman and Tversky, 1974; Tversky and Kahneman, 1989). This bias is known as the *framing effect*, a violation of the principle of invariance that underlies the rational theory of choice. Individuals suffer from the framing effect in a variety of situations, such as when ambiguity or vagueness are involved (Ellsberg, 1961; Tversky and Kahneman, 1981). As an entrepreneur is someone who exercises business judgment in the face of uncertainty, this paper explores here how a lack of information on probabilities of success affects choices of individuals with and without entrepreneurial intentions differently. It is argued that individuals with entrepreneurial intentions are less subject than individuals without entrepreneurial intentions to the framing effect when information about probabilities is manipulated. In particular, individuals with entrepreneurial intentions exhibit a bias toward opting for an uncertain higher monetary gain (vs. a certain lower monetary gain) regardless of the availability of predictive information.[1] This argument resonates well with the finding

[1] Due to the principle of indifference, individuals can assign the probability 1/2 to the two possible monetary outcomes in the uncertain lottery.

that entrepreneurs frame decisions while paying less attention to predictive information (Dew et al., 2009).

The second assumption is that both the *locus and logic of control*[2] affect entrepreneurs' discovery and exploitation of opportunities (Lee-Ross, 2015; Nordgren et al., 2007; Sarasvathy, 2001). In particular, while non-entrepreneurs focus more on prediction, entrepreneurs make choices by focusing more on opportunities that they subjectively feel in control of. Furthermore, entrepreneurs focus on controlling possible outcomes instead of their odds of success. These findings hold true for individuals with different entrepreneurial experience (serial entrepreneurs, novice entrepreneurs, and individuals with entrepreneurial intentions; see Sarasvathy et al., 1998). Consequently, it is argued that individuals with entrepreneurial intentions are more likely than individuals without entrepreneurial intentions to choose consistently between two prospects that share everything in common except for information about probabilities.

The research question is approached methodologically by using real money games in a laboratory quasi-experiment.[3] Scholars have recently started testing entrepreneurs' preferences when faced with real monetary incentives, contributing to our understanding of the role of loss aversion and strategic dynamics under risk and uncertainty (Holm et al., 2014; Koudstaal et al., 2015). The paper aims at uncovering the role of information pertaining to probabilities of success when real monetary outcomes are at stake. The sample in this study includes students with different entrepreneurial intentions. Some of these individuals exhibit an active entrepreneurial intention as they have selected into a

[2] Locus of control refers to the extent to which individuals believe they can control events affecting them (Rotter, 1966). The logic of control refers to the individuals' preference to focus on controllable aspects of an unpredictable future (Sarasvathy, 2001)

[3] Compared with a traditional laboratory experiment, a quasi-laboratory experiment lacks the element of random assignment to treatment group or control group, in this case with or without entrepreneurial intentions.

designated entrepreneurship program after their first semester of attending classes. These individuals are motivated by a desire to pursue a career as an entrepreneur, and are similar in many respects (e.g., age, gender, education) to other students except for their entrepreneurial intention. The choice to select a sample of students rather than a random sample from the entire population was motivated by two main reasons. First, using entrepreneurial intentions—defined as the cognitive state that precedes the decision to form a new venture—as a proxy for entrepreneurship is consistent with prior research (Birch et al., 2017; Krueger et al., 2000; Lee et al., 2011; Zellweger et al., 2011). Second, by using individuals possessing entrepreneurial intentions, alternative explanations due to heterogeneity in professional experience are excluded.

The experiment consisted of asking participants to choose between two possible combinations—certainty vs. risk and certainty vs. uncertainty—with real monetary incentives. Monetary combinations were presented in a non-random order and in proximity to each other for the purpose of being able to directly compare preferences between the two groups. Monetary rewards were given to each subject at the end of the experiment. The results revealed that instead of pursuing a certain monetary gain, individuals with entrepreneurial intentions consistently chose the lottery option regardless of whether information about probabilities was given (risk) or not (uncertainty). Such an effect is robust to alternative explanations such as status quo bias, prior gain effect, and degree of risk effect. Overall, these results suggest that differences between individuals with and without entrepreneurial intentions under uncertainty are due to a different level of sensitivity to the presence of predictive information.

The remainder of this paper is organized as follows. Section 2 briefly reviews the relevant literature linking predictive information with uncertainty taking. Section 3 describes data, sample construction, the details of the experiment, and the method for

testing the research question. Section 4 presents the results and discussion. Section 5 concludes and discusses the implications of the findings.

THEORY AND HYPOTHESES

Uncertainty—defined as immeasurable risk (Knight, 1921)—constitutes a conceptual cornerstone in entrepreneurship literature as entrepreneurs face an unknowable future. Entrepreneurship requires judgments to be made about whether to pursue an opportunity or not and, at the individual level of analysis, an entrepreneur is someone who exercises business judgment in the face of uncertainty (Shepherd et. al., 2015). Therefore, it has been suggested that a higher willingness to bear uncertainty is a distinctive characteristic of entrepreneurs, especially when compared to non-entrepreneurs (McMullen and Shepherd, 2006). However, empirical evidence is mixed. On the one hand, recent available findings do not support an overall greater entrepreneurial willingness to bear uncertainty (McKelvie et al., 2011; O'Brien et al., 2003). On the other hand, it has been recently suggested that there is a need to explore how certain specific factors (e.g., a monetary gain or loss; Koudstaal et al., 2015) can trigger entrepreneurs' willingness to bear uncertainty in a way that exceeds the willingness of non-entrepreneurs' (Shepherd et al., 2015). Following this research direction, this paper explores how availability of information affects individuals' willingness to bear uncertainty. Very little is known on whether this greater willingness to bear uncertainty is a product of a learning process due to experience: to control for such a potential explanation, individuals with and without entrepreneurial intentions are compared.

The concept of uncertainty in entrepreneurship finds its roots in the seminal work of Knight (1921). He posited that profit is the reward for those willing to bear uncertainty because, unlike risk, uncertainty is defined as inestimable and therefore uninsurable.

Uncertainty has been under theoretical examination both in economics and psychology. Whereas economic theories of entrepreneurship focus on explaining what must occur (e.g., uncertainty bearing) for the economy to function, psychological theories try to explain why entrepreneurs are more willing than their counterparts to bear uncertainty. A multi-level definition of uncertainty follows from both of these theoretical perspectives.

The first multi-level definition of uncertainty distinguishes between three distinct types: state, effect, and response (McKelvie et al., 2011; Milliken, 1987). *State uncertainty* is defined as the inability to assign probabilities to the likelihood of events; *effect uncertainty* is defined as the lack of information about cause–effect relationships; and finally, *response uncertainty* is defined as the inability to predict accurately what the outcomes of a decision might be. Milliken's framework implies that these three types of uncertainty influence individuals in the context of action and should be treated separately.

Uncertainty impacts entrepreneurial action in different ways depending on the type of uncertainty faced by the individual. In a recent empirical test, state uncertainty was, surprisingly, found to be a relatively low impactful hindering factor of entrepreneurial action (McKelvie et al., 2011).[4] It is argued here that state uncertainty might not impede entrepreneurial action because entrepreneurs accept it as a given variable in the environment. This also resonates well with the arguments advanced by Sarasvathy (2009) and Dew et al. (2009), as entrepreneurs are seen as individuals who use an effectual logic.

State uncertainty and entrepreneurial action

State uncertainty refers to the "perception by an individual that a particular component of the environment is unpredictable; more specifically, that one does not

[4] McKelvie et al. (2011) specifically use the rate of technological change and the rate of demand change as proxies for environmental (state) uncertainty.

understand how the components of the environment are changing" (Milliken, 1987:. 137). As state uncertainty increases, it becomes increasingly difficult to understand and predict the future state of the external environment. This ultimately translates into an aversion toward this type of uncertainty (Ellsberg, 1961) and an impediment to entrepreneurial action (McKelvie et al., 2011). State uncertainty takes the form of doubt, which prevents action by undermining the prospective actor's beliefs. It is detrimental to entrepreneurial action because the individual-level properties that it fuels, such as hesitancy, indecisiveness, and procrastination, are thought to lead to missed opportunities (McMullen and Shepherd, 2006).

Cognition is defined here as the process that help individuals selecting from among available information, ultimately preventing doubts and encouraging action (Mitchell et al., 2007). These cognitive mechanisms include, in particular, biases and heuristics. While cognitive biases refer to "thought processes that involve erroneous inferences or assumptions" (Forbes, 2005: 624), heuristics are "rule-of-thumb" decision-making "toolsets" that are "frugal." An individual using such means is able to select pieces of available information and ignore others (Gigerenzer, 2008; Gigerenzer and Goldstein, 1996).

Entrepreneurs are more biased in their decision making than non-entrepreneurs. Specifically, compared to non-founders, entrepreneurs tend to evaluate equivocal business situations more optimistically (Cassar, 2010; Dushnitsky, 2010; Palich and Bagby, 1995), overestimate their ability to make correct predictions (Simon and Shrader, 2012; Cooper et al., 1988), overgeneralize from limited information at hand (Busenitz and Barney, 1997; Forbes, 2005; Simon et al., 2000), focus more on their own competencies while neglecting the competitive environment (Wu and Knott, 2006; Moore et al., 2007), select previously chosen alternatives disproportionally more often (i.e., status quo bias; Burmeister and

Schade, 2007), and expand their firms despite negative market feedback (i.e., escalation bias; McCarthy et al., 1993).

Information selection and individuals' willingness to bear uncertainty are tightly linked. In particular, individuals' willingness to bear uncertainty—and, consequently, action-driven behavior—is positively influenced by both individual knowledge and motivation (McMullen and Shepherd, 2006). While motivation pertains to the desirability of obtaining possible outcomes, knowledge pertains to the assessment of the feasibility of obtaining such outcomes. As both motivation and knowledge decrease, willingness to bear uncertainty decreases as well. Even so, the question of whether a lack of knowledge about probabilities of obtaining outcomes decreases entrepreneurs' willingness to bear uncertainty remains an open one. This is because entrepreneurs often use effectual reasoning and do not attempt to predict an unknowable future, but actually create their own future through their own actions, knowledge, skills, and available means (Sarasvathy, 2009). Uncertainty may not meaningfully impede entrepreneurial action, because such uncertainty is assumed a priori by entrepreneurs.

Entrepreneurs facing state uncertainty: The framing effect

Entrepreneurs combine desires (utilities, personal values, etc.) and beliefs (expectations, knowledge, etc.) to choose a course of action (Hastie, 2001). Individuals do not behave as choice statistical optimizers (e.g., finding the best solution), but rather choose the first option that exceeds an aspiration level (Gigerenzer, 2008; March and Shapira, 1992). Given the uncertainty associated with entrepreneurship, founders must make decisions when they frequently lack adequate information. In particular, this is the case for individuals such as novice entrepreneurs or individuals with entrepreneurial intentions.

It is argued that when individuals with entrepreneurial intentions lack information about probabilities, they are less likely than individuals without entrepreneurial intentions to change their aspirations and, ultimately, their behavior. To test this argument, the paper draws on Tversky and Kahneman's (1981) framing effect—a cognitive bias. The authors showed that individuals exhibit inconsistent preferences depending on how the same opportunity is presented; e.g., in a loss scenario vs. a gain scenario. In this paper, Tversky and Kahneman's definition of the framing effect is extended to the context of uncertainty. This is done assuming that, for the principle of indifference, a decision maker can assume, given $n > 1$ possible events that are mutually exclusive and collectively exhaustive, a probability of $1/n$ to each event. As individuals are uncertainty averse (Ellsberg, 1961), it is expected that they shy away from a prospect that does not contain information about probabilities (state uncertainty) as compared to a prospect within which probabilities are explicitly stated (Knightian risk). However, entrepreneurs differ in this aspect when compared to non-entrepreneurs (Sarasvathy et al., 1998). In particular, entrepreneurs possess (or perceive to possess) valuable insights and information that others do not (known as "information asymmetry", Janney and Dess, 2006). Information asymmetry may translate into an optimistic perception of opportunities (Simon and Shrader, 2012). As a consequence, individuals rely more heavily on subjective metrics such as their abilities and aspirations, instead of objective metrics such as predictive information. Information asymmetry represents both an opportunity and a threat. On the one hand, it encourages entrepreneurial action (e.g. new venture start). On the other hand, it may lead to failure in signaling new venture quality, and in increasing founder credibility (Courtney et. al., 2017). This problem is particularly relevant as individuals lack relevant experience in the eyes of investors (e.g. novice entrepreneurs in crowdfunding). The hypothesis is that individuals with entrepreneurial intentions will exhibit a greater willingness to bear state uncertainty

compared to individuals without entrepreneurial intentions due to their lower sensitivity to information regarding probabilities of success.

H1: The willingness to bear state uncertainty is higher for individuals with entrepreneurial intentions than individuals without such intentions due to a lower sensitivity to the lack of information about probabilities.

DATA AND METHOD

Sample

The sample consists of students with different entrepreneurial intentions. Students were enrolled in a general business economics undergraduate program at a major European business school. Although they were enrolled in the same study line, the students presented different entrepreneurial intentions. All students in the study line of general business were offered, at the end of their first semester, the possibility to enter a specialized program designed to address entrepreneurship topics in detail. Interested students were required to apply by handing in a motivation letter. Forty-nine students applied for the program and all were accepted, mitigating concerns for selection bias. Each of the 49 students had specified within their motivation letters that they had an active interest in starting a firm, and thereby showed entrepreneurial intentions. Students not applying for the entrepreneurship program represented the population of individuals without entrepreneurial intentions. Overall, the sample allowed for comparing individuals who were similar in several demographics and yet different in their entrepreneurial intentions, thus limiting possible alternative explanations due to the factor of prior entrepreneurial experience.

Subjects from the two populations – with and without entrepreneurial intentions – were invited to sign up for a laboratory experiment. The specific purpose of the

experiment—namely, to test differences in cognition and behavior under uncertainty between individuals with different entrepreneurial intentions—was not specified in the sign-up call. Individual emails and a specific website were used for this purpose. Eighteen subjects from the population of individuals with entrepreneurial intentions (N=49) and 27 from the population of individuals without entrepreneurial intentions (N=550) signed up, and were invited to participate making up a sample of 45 individuals in total. In order to control for sample selection bias, both samples were checked in the degree to which they were representative of the respective populations. Main demographics (age, gender, nationality) were considered and no overall differences were found.[5]

Table 1 compares the two sample groups in some of their key demographics, providing evidence of small differences between the groups in all but one dimension: willingness to start a new venture within three years. Among entrepreneurship students, 66.7 percent (12) intended to start a firm within the next three years, while only 14.8 percent (4) of the non-entrepreneurship student sample had such intentions.[6]

Insert Table 1 about here

Overall, the data suggest that the sample groups are both comparable and representative of their respective population.

[5] Among entrepreneurship students: Age (sample mean 21.5; population mean 21), Female student (sample proportion 22%, population proportion 18%), Nationality/International student (sample proportion 11%, population proportion 15%). Among non-entrepreneurship students: Age (sample mean 21.5; population mean 21), Female student (sample proportion 22%, population proportion 31%), Nationality/International student (sample proportion 6%, population proportion 9%). All tests for differences were non-significant at the 5% level.

[6] As a robustness check, subjects who have mixed entrepreneurial intentions were excluded from the empirical analysis (e.g., not in the entrepreneurial concentration but willing to start a firm in the next three years). The results held overall.

Experiment

In this study, an experiment based on a real money games experiment is used. In particular, individuals were assigned to computers randomly, communication among students was strictly forbidden, and individuals were individually paid at the end of the experiment.

The subjects were confronted with binary gamble decisions, for a total of 24 decisions. Subjects were not informed about the number of decisions to be made. Gambles presenting different combinations of certainty, risk, and uncertainty were presented to the individuals. In this paper, only two types are considered (certainty vs. risk and certainty vs. uncertainty), providing a total of 10 unique decisions for individuals to choose from. This provided a total of 450 observations[7] (10 choices for 45 individuals) available to the investigation. In the "certainty vs. risk" type, the subjects were presented with options between a certain gain and a risky choice, with an equal chance (50%) of either a greater gain or a smaller gain. The value of the certain gain and the expected value of the risky gamble were identical and kept constant throughout the experiment (at 14 Danish Krone, or $1.89). The "certainty vs. uncertainty" type was identical to the "certainty vs. risk" type, except that it did not include information about probabilities of obtaining monetary gains, thereby resulting in an uncertain option vis-à-vis a certain one. The combined use of risk and uncertain gambles is a necessary feature for testing the effect of availability of information. Despite the difference in availability of information about probabilities, choices in the "certainty vs. risk" and "certainty vs. uncertainty" gambles can be compared in the experiment, as in both cases a 50% chance probability distribution could be assumed. The 10 different gambles are specified as depicted in Table 2.

[7] These observations are not independent. Standard errors are therefore clustered in the regression analyses.

Insert Table 2 about here

Throughout the different decision rounds, alternative cognitive mechanisms driving choices (e.g. the prior gain effect and the degree of risk effect) were controlled for in the main regression. An individual's payoff is attributable to random draws and does not reflect their abilities.

Main variables

The main dependent variable was a dummy indicating whether the individual in each gamble chose uncertainty as opposed to certainty. Descriptively, the uncertain choice was chosen in 26 percent of the gambles. Individuals with entrepreneurial intentions chose uncertainty for about 27 percent (24 out of 90 decisions) of the gambles. Similarly, individuals without entrepreneurial intentions chose it for about 25 percent (35 out of 135 decisions). These numbers were not significantly different, as shown in Table 3.

Insert Table 3 about here

The main independent variable to test the hypothesis was a dummy indicating group belonging (individuals with and without entrepreneurial intentions). As choices with and without predictive information were presented, a second dummy was added indicating whether individuals chose an option where probabilities were specified (risk) before choosing an option where such probabilities were not specified (uncertainty). The two

groups did differ in their choice of risk (χ^2 = 4,1446, *p*-value = 0.042), with individuals with entrepreneurial intentions choosing it for about 44 percent of the gambles (40 out of 90 decisions) versus approximately 31 percent (42 out of 135) for individuals without entrepreneurial intentions.

Controls

Among controls, the model includes a check for a prior gain effect (Thaler and Johnson, 1990). This is done by adding a dummy that indicated whether the individual experienced a monetary gain greater than the certain option in the previous gamble. Individuals with entrepreneurial intentions experienced a greater gain than expected about 66 percent (60 out of 90) of the time, while the corresponding number for individuals without entrepreneurial intentions was only 51 percent (69 out of 135). This was significant at a 5% level using a Chi-square test. Individuals with entrepreneurial intentions were "luckier" than individuals without such intentions in their immediate initial risk gambles. Furthermore, a variable was created to control for the degree of risk faced by the subjects in a given choice (Fox et. al., 2015). As choices were compared in pairs of gambles (certainty vs. risk and certainty vs. uncertainty), and such pairs had different degrees of risk, pair number was controlled for.[8] Pair number and order was strictly exogenously given by the gamble design.

Several personality and demographic factors were used as controls. First, the big-five personality traits item was used (John et al., 1991; John et al., 2008; Zhao and Seibert, 2006). Big five have been shown to characterize entrepreneurs, and are important in choice behavior (e.g., entrepreneurs' higher degree of "openness to experience"). The results of

[8] As shown in Table 2, pair number 3 has the lowest degree of risk, while pair number 1 and 4 present a medium degree of risk. Finally, pair number 2 and 5 present the highest degree of risk.

the factor analysis can be found in Table A1 in the Appendix. Second, overconfidence, a cognitive bias that encourages risk taking particularly in entrepreneurs is included in the model (Busenitz and Barney, 1997; Koellinger et al., 2007). The paper followed Fischhoff et al.'s (1977) operationalization of overconfidence by checking individuals' level of confidence in answering a series of two-choice questions about health statistics in Denmark (based on World Health Organization 2010 data). Third, pathological gambling was controlled for, as this might have increased individuals' willingness to choose uncertainty (Stinchfield, 2000; Winters et al., 1998). A series of five questions were asked about how frequently the subjects gambled (e.g., "gambling in casinos" and "buying lottery tickets"). Finally, a series of demographic variables were controlled for (age, gender, nationality, parental entrepreneurship, income, part-time job) that were proven to be significant in explaining entrepreneurship.

Method

The experiment was designed to predict the binary choices of two groups. For this reason, a logistic regression technique was chosen. Clustered standard errors were used to account for repeated choices by the same subject. The main exogenously inflicted manipulation was the presence of information about probabilities—separating risk from uncertainty. Prior risk choice, prior gains, and degree of risk were included as controls for taking into account their main effects on subsequent choices. For prior risk choice, a possible interaction effect was checked, as in this paper it is argued that individuals with entrepreneurial intentions are more likely to bear uncertainty due to their lower sensitivity to the lack of predictive information. To account for the potential bias due to unobservable factors and non-random assignment of individuals, a random effect specification of the logistic regression was included.

RESULTS

Table 4 contains descriptive statistics and correlation coefficients between all considered variables. None of the correlations in Table 4 are of a magnitude causing concern in terms of potential multicollinearity.

Insert Table 4 about here

Table 5 illustrates the results of the first regression analysis, where the dependent variable was a dummy indicating the choice between certainty and uncertainty. The first column only includes the control variables and the dummy for group belonging (with and without entrepreneurial intentions). The second column reports the results when only including the group dummy and the variable indicating individuals' prior choice in an identical gamble with information about probabilities (prior risk). Column 3 introduces the interaction between the entrepreneurship dummy and prior risk. As this was included, the entrepreneurial intentions dummy became significant at a 10% level, indicating that individuals with entrepreneurial intentions are less likely to choose uncertainty as opposed to certainty in general. Yet Column 3 also reveals that individuals with entrepreneurial intentions are much more likely than individuals without such intentions to choose the uncertain lottery after they have chosen the risk lottery (estimate = 1.675, *p*-value = 0.013). An initial interpretation of this result follows the arguments for the hypothesis; that is, individuals with entrepreneurial intentions do not seem to be affected in their choices by the absence of probability information as much as individuals without such intentions, but rather by monetary outcomes. This result gives early support for the hypothesis: *Entrepreneurs are less sensitive to the lack of information about probabilities compared*

to non-entrepreneurs. The results hold in Column 4, which presents a full model with controls. It is noteworthy to mention that while the main negative effect of the "entrepreneurial intentions dummy" was insignificant, the interaction term kept its strength and significance. Furthermore, results were robust after performing a log-likelihood test comparing the interaction model with the full model, as a significant improvement was found in the full model's predictive power (Chi2 = 20.259, *p*-value < 0.000). In the random effect specification of the logistic regression[9] (Column 5), the interaction coefficient decreased in significance but kept both sign and magnitude.

Insert Table 5 about here

The interaction term reported in Column 4 was investigated further by considering the marginal effect of prior risk on willingness to choose uncertainty. This is depicted in Figure 1. The marginal effect was contrasted between the groups of individuals with and without entrepreneurial intentions. Figure 1 provides further support for the hypothesis, as the marginal effect of prior risk on entrepreneurs' willingness to choose uncertainty was significantly higher for individuals with entrepreneurial intentions than for individuals without such intentions.

Insert Figure 1 about here

In terms of the control variables, the results tend to be consistent with the predicted associations.

[9] I A random effect specification was chosen after controlling for fit with a Hausman test (vs. fixed effects, Chi2 = 6.03, *p*-value = 0.05).

Overall, the results were confirmed when using a random effects specification, although this was with weakened significances for some of the estimates (Column 5 in Table 5). The random effects specification allowed for a brief look at the inner group correlations in order to assess the nature of the consistency of choices made by the subjects. The rho of the random effect specification was 0.16, indicating a relatively low correlation between the choices of the subjects after controlling for the observables. Table 6 reports some intra-class statistics at the 1st, 25th, 50th, 75th, and 99th percentile of propensity toward choosing uncertainty as opposed to certainty. At the median propensity, the marginal probability of choosing uncertainty was 0.210, while the corresponding number for joint probability of any two given choices was 0.060. These numbers vary greatly across the percentiles, with only a 0.001 joint probability at the 1st percentile of observed propensity, while the corresponding number was 0.631 for observations at the 99th percentile of propensity toward choosing uncertainty. At the median, these numbers suggest that there is a 1.697 times greater chance of someone choosing uncertainty, given that they chose risk previously, than someone who did not choose risk in the previous round.

Insert Table 6 about here

Robustness checks

In the first robustness check, the results presented in Table 5 were expanded by redefining the dependent variable. The new dependent variable takes into account all the possible choice combinations between gamble pairs. In each pair of gamble combinations (certainty vs. risk and certainty vs. uncertainty), individuals can exhibit four distinct patterns of choice (certainty, certainty; certainty, uncertainty; risk, certainty; risk, uncertainty). What is of interest is to see how individuals differ in their choice patterns

depending on the group they belong to. In order to investigate this issue, a multinomial logistic regression was used with a dependent variable that proxied individual pair choice pattern with four possible values. It was assumed that under risk and uncertainty aversion, individuals would prefer a certain option as compared to a risky or uncertain gamble with the same expected value. Therefore, the baseline outcome was the pattern "certainty, certainty." Before interpreting the results, it was checked if the IIA assumption was violated by looking at the Suest-based Hausmann Test: The results confirmed the null hypothesis of independent odds for alternatives in the logistic regression. The results are presented in Table 7.

Insert Table 7 about here

At the start is a comparison of mixed preferences—a combination of a certain option with either a risky or uncertain option—with the baseline. Columns 1 and 2 contain results for the combination "certainty, uncertainty," while Columns 3 and 4 contain results for the combination "risk, certainty." The entrepreneurial intentions dummies' estimates were insignificant in both combinations, leaving the researcher uninformed about the existence of differences between groups in their preferences toward mixed strategies as compared to the baseline, "certainty, certainty." The control variable estimates were in line with the findings presented in Table 5, and their interpretations did not change.

In Columns 5 and 6, the combination of choices "risk, uncertainty" with the baseline "certainty, certainty" were compared. The results confirmed the findings in Table 5. In particular, entrepreneurs were found to be more consistent in their choices among a risk gamble (with information about probabilities) and an uncertain gamble (without information about probabilities). These results provide further evidence that *individuals*

with entrepreneurial intentions are less sensitive to the lack of information about probabilities compared to individuals without entrepreneurial intentions, as they do not shy away from uncertainty but rather choose it more consistently than individuals without entrepreneurial intentions.

DISCUSSION

The results offer novel insights that in part confirm, and in part complement prior empirical findings. A new perspective on uncertainty taking based on causality and cognition is offered.

Consistent with prior literature, the results confirms that individuals with entrepreneurial intentions do not exhibit a lower overall uncertainty aversion compared to individuals without entrepreneurial intentions (McKelvie et al., 2011; O'Brien et al., 2003). Instead, individuals differ in their cognition. In particular, the willingness to bear state uncertainty is significantly higher for individuals with entrepreneurial intentions than individuals without such intentions due to a lower sensitivity to the lack of information about probabilities.

By confirming the hypothesis, this paper contributes to extant research in several ways. First, it provides evidence supporting the usefulness of a cognition-based investigation of entrepreneurship (Shepherd et al., 2015; Shepherd, 2015). This timely research stream brings novelty by being multi-disciplinary in nature, as it unites elements from different disciplines such as psychology and economics. Second, it is based on a laboratory experiment to analyze entrepreneurial decision making under risk and uncertainty. Experiments are particularly suited to test the effect of causal mechanisms on behavior, and have been successfully used in entrepreneurship research in recent years (Holm et al., 2013; Koudstaal et al., 2015). Third, it tests a specific causal mechanism –

namely the presence/lack of probabilities – which represent an important element in the entrepreneurial environment. State uncertainty is clearly defined in this paper as the complete lack of information about probabilities. As this environmental condition is faced by the majority of entrepreneurs, state uncertainty in this paper holds both internal and external validity. Finally, it contributes by accounting for alternative explanations grounded in entrepreneurship and cognition research. With respect to the former, entrepreneurial experience is excluded as the paper uses a relevant sample of people with and without entrepreneurial intentions. With respect to the latter, the status-quo bias is also excluded as an alternative explanation. People suffering from the status-quo bias select previously chosen alternatives disproportionally more often than others (Burmeister and Schade, 2007). This could have caused the observed stable behavior under uncertainty among individuals. To control for this bias, the presence of streaks was checked for; namely, a pattern of seven or more repeated identical choices out of a total of 10 possible choices. The results within and across groups proved insignificant (Fisher Exact Test, *p*-value = 0.395).

The main results held after controlling for several control variables. However, the statistical significance of some control variables' estimates suggests that when choosing risk and uncertainty, other personal factors become important. International students in our sample seemed to be more likely to choose uncertainty than nationals. Also consistent with previous research on personality traits, it was found that individuals who scored higher on openness to experience and lower on conscientiousness were more prone to choosing uncertainty (Hodson and Sorrentino, 1999). In particular, lower conscientiousness and higher agreeableness are positively associated with risk taking and acceptance of uncertainty (but are usually associated with a non-entrepreneurial personality; Zhao and Seibert, 2006). The "pathological gambling" aggregate was negative, which might reflect

two possible mechanisms at play. On the one hand, one possibility is that individuals who are habitual gamblers might have an aversion toward gambles where expected values cannot be calculated easily. On the other hand, another possibility is that as habitual gamblers show increased impulsiveness in decision making (Tom et al., 2008), they might reflect a preference for a certain monetary gain. Finally, females are less likely than males to choose consistently between risk and uncertainty.

Overall, the results add novelty by showing a surprisingly stable choice behavior under uncertainty when probabilities are manipulated. After expressing a preference toward a risky gamble where probabilities are clearly shown (vis-à-vis a certain gain), individuals with entrepreneurial intentions remained more consistent than individuals without entrepreneurial intentions in their choice preference when dealing with a lack of information on probabilities.

CONCLUSION

In this paper, the following research question has been addressed: How do individuals with and without entrepreneurial intentions differ in their willingness to bear uncertainty? Despite entrepreneurs perceiving themselves as better able to cope with and take decisions under uncertainty than non-entrepreneurs, empirical evidence has been mixed. Motivated by recent calls for understanding the role of contextual factors in uncertainty taking by entrepreneurs (e.g., McKelvie et al., 2011; Shepherd et al., 2015), this paper explored the role of information about probabilities of success in driving differences between individuals with and without entrepreneurial intentions under state uncertainty.

Cognitive biases and heuristics are an essential part of entrepreneurial decision making under uncertainty. Entrepreneurs face uncertainty in terms of absence of relevant

pieces of information in nearly every stage of their business action. Prior literature has shown that entrepreneurs use biases and heuristics to select relevant pieces of information and discard others (Pellegrini et al., 2016). However, it is necessary to study the contextual mechanisms that drive decisions in order to address which pieces of information matter the most to entrepreneurs facing uncertainty, thereby permitting controlling for endogeneity, as choices are often influenced by unobservable elements.

A quasi-laboratory experiment was performed that shed light on this matter. The experiment had a number of unique characteristics. First, the results were based on repeated individual decisions with real monetary incentives. This feature is particularly unique, as each choice per individual had a real monetary gain. Second, the presence of information about probabilities of success was manipulated, leaving other characteristics constant. Third, individuals with different entrepreneurial intentions were compared, thereby controlling for entrepreneurial experience as a possible explanation of the results. Both groups were enrolled in the same study program but had contrasting entrepreneurial intentions. The two groups were very similar in terms of demographics and experience, but were clearly distinct when considering their career focus. Lastly, information on a variety of additional background characteristics—both psychological and attitudinal—was collected. This made it possible to control for a variety of otherwise unobservable characteristics, such as cognitive biases, that affect decision making.

In line with previous studies, individuals with and without entrepreneurial intentions were not found to be significantly different in their general propensity to bear uncertainty (Holm et al., 2013; Koudstaal et al., 2014). However, individuals with entrepreneurial intentions did exhibit a lower sensitivity to the presence of predictive information in comparison to the group without such intentions. It is argued that the *framing effect* does not influence the two groups in the same way, as the propensity to

choose uncertainty is higher for individuals with entrepreneurial intentions after having chosen a risky option compared to individuals without entrepreneurial intentions. These results are in tandem with the work by Sarasvathy et al. (1998) and McMullen and Shepherd (2006), which looked at the role of, respectively, information on probabilities and motivation in guiding entrepreneurs' decision making. At the same time, the results of this study contribute to the extant literature by experimentally demonstrating the nature of entrepreneurs' sensitivity to information about probabilities. The results hence provide further specific evidence of the circumstantial nature of entrepreneurs' propensities to choose uncertain monetary opportunities.

Limitations and implications for management development

This paper presents two important limitations—namely, external validity and a narrow definition of uncertainty. With respect to external validity, it is acknowledged that using a sample of individuals with different entrepreneurial intentions provided advantages in terms of comparability of considered groups, but also limited the potential generalizability to entrepreneurs with limited experience (e.g., novice entrepreneurs). With respect to uncertainty and its definition, this study looked only at state uncertainty, one of the three possible types of uncertainty according to Milliken's (1987) categorization. Future research may explore also the role of effect and response uncertainty between entrepreneurs and non-entrepreneurs, giving a comprehensive overview of entrepreneurial behavior under uncertainty.

Several implications for management development emerge from the findings. First, higher education institutions should consider the cognitive characteristics of students enrolling in entrepreneurship programs in order to increase the effectiveness of planned learning. This paper shows that when making decisions with monetary incentives,

individuals with entrepreneurial intentions cognitively weigh available information about probabilities less than individuals withoutentrepreneurial intentions. A practical suggestion is to discuss the impact of cognitive bias and heuristics towards uncertainty, particularly in courses with a focus on entrepreneurial financial resource management (McLarty 2005; Johnson et al. 2006). Second, effective decision making for individuals with entrepreneurial intentions goes beyond possessing high opportunity alertness (Yasir et al., 2017; Ilozor et al., 2006) as we show stable preferences towards uncertainty. In real life, entrepreneurs often face environments and investments that do not provide information regarding their chances of obtaining the monetary objectives they aspire to achieve (e.g., due to institutional and political uncertainty, Feng and Wang, 2010). The absence of information about their odds of success may lead them to tolerate the uncertainty of starting a new entrepreneurial venture in the pursuit of a monetary return. Finally,stable preferences may help entrepreneurs becoming leaders in highly dynamic environments (Mitchell et. al. 2011). The primary role of leaders is to establish a direction, and create a shared vision among stakeholders involved with a venture (Uhl-Bien and Arena, 2018). The insights that the findings offer allow investors, business partners, employees, and others to better understand and manage the entrepreneurs with whom they do business. This paper offers evidence that suggests certain circumstances under which these stakeholders may be alerted to an elevated tendency on the part of the entrepreneur to make choices under uncertainty (i.e., any time the monetary objective is desirable and within reach). This may indeed prove useful to any stakeholder who looks to manage the relationship with their entrepreneurial partner.

APPENDIX

Insert Table A1 about here

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TABLES

Table 1:Descriptive Statistics and Test of Differences Between Individuals with and without Entrepreneurial Intentions (N = 45)

	With entrepreneurial intention	Without entrepreneurial intention	χ^2	Sig.
Male	14 (31.1)	21 (46.7)		
Female	4 (8.9)	6 (13.3)	0.000	
Danish	16 (35.6)	26 (57.8)		
International	2 (4.4)	1 (2.2)	0.952	
$50.000 < income < 300.000$	15 (33.3)	24 (53.3)		
$0 < income < 50.000$	3 (6.7)	3 (6.7)	0.313	
Parent entrepreneur	5 (11.1)	7 (15.6)		
No parent entrepreneur	13 (28.9)	(20 (44.4)	0.019	
University degree	3 (6.7)	1 (2.2)		
No University degree	15 (33.3)	26 (57.8)	2.588	
Part-time employed	11 (24.4)	23 (51.1)		
Not part-time employed	7 (15.6)	4 (8.9)	3.389	*
Established firm	3 (6.7)	1 (2.2)		
Not established firm	15 (33.3)	26 (57.8)	2.241	
Establish firm within 3 years	12 (26.7)	4 (8.9)		
Not establish firm within 3 years	6 (13.3)	23 (51.1)	12.672	***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, percentages of table total in parentheses

Table 2: Considering 10 Real Monetary Games (in Six Pairs) Between Certainty (Option A) and Risk or Uncertainty (Option B). 1Dkr = $0.16, Expected Gain = $2.2 of Decision

		Option A		Option B		Feedback Prior Gain
Pair 1	Decision 1	100%	14 DKr	50% 50%	4 DKr 24 DKr	No
	Decision 2	100%	14 DKr	Unknown chance of getting Unknown chance of getting	4 DKr 24 DKr	No
Pair 2	Decision 3	100%	14 DKr	50% 50%	0 DKr 28 DKr	No
	Decision 4	100%	14 DKr	Unknown chance of getting Unknown chance of getting	0 DKr 28 DKr	No
Pair 3	Decision 5	100%	14 DKr	50% 50%	8 DKr 20 DKr	Yes
	Decision 6	100%	14 DKr	Unknown chance of getting Unknown chance of getting	8 DKr 20 DKr	Yes
Pair 4	Decision 7	100%	14 DKr	50% 50%	4 DKr 24 DKr	Yes
	Decision 8	100%	14 DKr	Unknown chance of getting Unknown chance of getting	4 DKr 24 DKr	Yes
Pair 5	Decision 9	100%	14 DKr	50% 50%	0 DKr 28 DKr	Yes
	Decision 10	100%	14 DKr	Unknown chance of getting Unknown chance of getting	0 DKr 28 DKr	Yes

Table 3: Descriptive Statistics on Key Variables (N = 225)

	With entrepreneurial intentions	Without entrepreneurial intentions	Total	χ^2	Significance
Choose Uncertainty (Option B)	24 (10.7)	35 (15.6)	59 (26.3)		
Choose Certainty (Option A)	66 (29.3)	100 (44.4)	166 (73.7)	0.0153	
Prior gain greater than expected	60 (26.6)	69 (30.6)	129 (57.4)		
Prior gain not greater than expected	30 (13.4)	66 (29.4)	96 (42.6)	5.3416	**
Total	90 (40.0)	135 (60.0)	225 (100.0)		

** p < 0.10, ** p < 0.05, *** p < 0.01, percentages of table total in parentheses*

Table 4: Descriptive Statistics and Pearson's Correlation Coefficients

		Mean	S.D.	Min	Max	[1]	[2]	[3]	[4]	[5]	[6]
[1]	Entrepreneurial Intention	0.40	0.49	0	1						
[2]	Prior gain (monetary)	0.13	0.34	0	1	0.1712					
[3]	Prior gain (presence)	0.66	0.47	0	1	-0.0000	-0.7055				
[4]	Degree of Risk (pair)	1.2	0.75	0	2	0.0000	0.2551	-0.3273			
[5]	Extraversion	0.06	0.92	-3.07	1.46	0.1333	0.0074	0.0000	-0.0000		
[6]	Openness	0.08	0.88	-2.14	2.52	0.1556	0.0137	0.0000	0.0000	-0.0049	
[7]	Neuroticism	-0.03	0.87	-1.90	1.86	-0.1205	-0.0320	0.0000	-0.0000	-0.0754	-0.0334
[8]	Conscientiousness	0.06	0.91	-2.87	1.60	0.3524	0.0032	-0.0000	-0.0000	0.0806	-0.0236
[9]	Agreebleness	0	0.93	-1.98	1.80	0.2007	0.0602	-0.0000	0.0000	0.0291	-0.0315
[10]	Overconfidence	101.25	21.72	67	148	-0.1368	-0.0043	0.0000	-0.0000	0.1037	0.0816
[11]	Pathological Aggregate	1.52	0.56	1	3.20	-0.0715	-0.0208	0.0000	-0.0000	0.0007	-0.2302
[12]	Age	21.51	0.78	20	23	-0.0700	-0.0299	0.0000	-0.0000	-0.0170	0.1560
[13]	Female	0.22	0.42	0	1	-0.0000	0.0038	0.0000	0.0000	0.2078	0.2075
[14]	International	0.07	0.25	0	1	0.1455	-0.0081	0.0000	0.0000	0.0674	0.0236
[15]	Parent Entrepreneur	0.27	0.44	0	1	0.0205	-0.0121	-0.0000	0.0000	0.0499	-0.0411
[16]	Part time employed	0.76	0.42	0	1	-0.2744	-0.0258	0.0000	-0.0000	0.1221	-0.0462
[17]	Income above 50.000	0.87	0.34	0	1	-0.0801	-0.0200	0.0000	0.0000	-0.0015	-0.1855

		[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
[8]	Conscientiousness	0.0072									
[9]	Agreebleness	0.0568	0.0206								
[10]	Overconfidence	-0.0169	0.0682	0.0570							
[11]	Pathological Aggregate	-0.2210	-0.1521	0.1014	0.2690						
[12]	Age	-0.1316	-0.0403	-0.1299	-0.0314	-0.0140					
[13]	Female	0.2817	0.0120	-0.1989	-0.0294	-0.3749	0.1968				
[14]	International	0.1133	0.2159	0.2743	0.0354	-0.1172	0.0417	0.1917			
[15]	Parent Entrepreneur	0.0916	0.0189	0.0680	-0.0303	-0.0641	-0.1361	-0.0314	-0.0895		
[16]	Part time employed	-0.0551	-0.1901	-0.2687	0.1940	0.1219	-0.0601	0.0314	-0.2217	-0.0798	
[17]	Income above 50.000	-0.0600	-0.0025	-0.1411	0.0856	0.2237	0.0254	-0.2524	-0.4020	0.1080	0.2863

Note: Correlation coefficients above 0.065 are significant at a 5% level

Table 5: Explaining Subjects' Choices Under Uncertainty After Risk, Logit Regressions

	Standard Logit Models				RE Logit
	Baseline Model	Explanatory Model	Interaction Model	Full Model	
Explanatory Variables					
Entrepreneurial intention	0.310	-0.035	-0.815*	-0.454	-0.454
	[0.436]	[0.304]	[0.471]	[0.592]	[0.664]
Risk Prior		0.537**	-0.162	-0.276	-0.0305
		[0.305]	[0.432]	[0.522]	[0.576]
Entrepreneurial intention x Risk Prior			1.675**	1.645**	1.703**
			[0.234]	[0.791]	[0.884]
Control Variables					
Prior Gain (Monetary)	-0.105			-0.447	-0.614
	[0.398]			[0.794]	[0.891]
Prior Gain (Presence)	0.933**			-0.453	-0.568
	[0.464]			[0.424]	[0.459]
Degree of Risk (pair)	0.321			0.400*	0.470*
	[0.220]			[0.238]	[0.262]
Extraversion	-0.086			-0.0371	-0.0201
	[0.221]			[0.229]	[0.270]
Openness	0.414**			0.378**	0.445*
	[0.190]			[0.190]	[0.262]
Neuroticism	-0.134			-0.0901	-0.0816
	[0.158]			[0.160]	[0.278]
Conscentiousness	-0.673***			-0.576***	-0.645**
	[0.192]			[0.189]	[0.264]
Agreebleness	0.195			0.185	0.192
	[0.190]			[0.187]	[0.239]
Overconfidence	0.018			0.0186	0.0199
	[0.023]			[0.0247]	[0.0269]
Pathological Aggregate	-0.893*			-0.873*	-0.939
	[0.463]			[0.467]	[0.574]
Age	0.243			0.193	0.240
	[0.270]			[0.283]	[0.367]
Female	-0.812			-0.825	-0.967
	[0.622]			[0.649]	[0.880]
International	2.245**			1.867**	2.126*
	[0.928]			[0.867]	-1204
Parent Entrepreneur	0.236			0.178	0.112
	[0.383]			[0.380]	[0.537]
Part time employed	0.445			0.472	0.556
	[0.514]			[0.504]	[0.665]
Income above 50.000	0.507			0.427	0.471
	[0.689]			[0.713]	[0.833]
Constant	-8.081	-1.231***	-1.000	-6.374	-7.630
	[5.851]	[0.751]	[0.234]	[6.319]	[8.009]
Number of observations	225	225	225	225	225
Log Likelihood	-115.9824	-127.9790	-124.7084	-109.5551	-108.3070
χ^2	34.91***	3.13	8.91**	37.95***	22.89
LR test (RE vs. Logistic regression)					2.50*

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Measures of Intra-class Associations in Random-effects Logit Regression

Measure	1st Percentile	25th Percentile	50th Percentile	75th Percentile	99th Percentile
Marginal Prob.	.02425	.126013	.210552	.355698	.783894
Joint Prob.	.001046	.02363	.060115	.153578	.63079
Odds ratio	1.85103	1.73944	1.69741	1.66229	1.69539
Pearson's r	.019365	.070378	.094954	.118059	.096222
Yule's Q	.298498	.269925	.258549	.248766	.257991

Table 7: Explaining Individuals' Choice Combinations Across Pairs, Results of Multinomial Logit Regressions

	Multinomial Logit Model (Dep. Var: Choice Pairs. Base Pair: Certainty, Certainty)					
	Pair 1 Certainty, Uncertainty		Pair 2 Risk, Certainty		Pair 3 Risk, Uncertainty	
	Explanatory Model	Full Model	Explanatory Model	Full Model	Explanatory Model	Full Model
Explanatory Variables						
Entrepreneurial intentions	-0.815	-0.689	0.128	0.269	0.989*	1.311**
	[0.579]	[0.751]	[0.490]	[0.557]	[0.543]	[0.636]
Control Variables						
Prior Gain (Monetary)		0.444		0.138		0.0171
		[0.298]		[0.279]		[0.371]
Prior Gain (Presence)		0.0635		0.977		2.184*
		[0.915]		[0.919]		[1.258]
Degree of Risk (pair)		0.433		-0.460*		-0.380
		[0.297]		[0.268]		[0.381]
Extraversion		-0.227		0.107		0.340
		[0.270]		[0.252]		[0.367]
Openness		0.578*		0.173		0.542**
		[0.309]		[0.271]		[0.226]
Neuroticism		-0.150		-0.520**		-0.630**
		[0.296]		[0.262]		[0.274]
Conscentiousness		-0.529**		-0.306		-0.979***
		[0.256]		[0.302]		[0.332]
Agreebleness		-0.126		0.537**		1.082***
		[0.294]		[0.276]		[0.304]
Overconfidence		0.00886		0.0675***		0.0714*
		[0.0346]		[0.0241]		[0.0440]
Pathological Aggregate		-0.542		-1.734***		-2.573**
		[0.581]		[0.612]		-1.178
Age		0.542		0.478		0.254
		[0.363]		[0.313]		[0.325]
Female		-0.622		-1.330		-2.649**
		[0.868]		[0.838]		-1.332
International		0.994		0.381		3.160***
		-1.641		-1.471		[0.834]
Parent Entrepreneur		1.017		0.756		0.311
		[0.656]		[0.512]		[0.455]
Part time employed		0.186		0.492		1.282**
		[0.684]		[0.737]		[0.637]
Income above 50.000		0.415		-0.747		-0.328
		[0.838]		[0.669]		[0.744]
Constant	-1.001***	-15.23**	-0.754***	-12.35*	-1.917***	-9.982
	[0.318]	[-7.621]	[0.286]	[-6.507]	[0.335]	[-7.160]
Number of observations	225	225	225	225	225	225
Loglikelihood	-270.233	-223.410	-270.233	-223.410	-270.233	-223.410
χ^2	7.046*	100.72***	7.046*	100.72***	7.046*	100.72***

Clustered standard errors (unique ID for individuals) in parentheses. *** p<0.01, ** p<0.05, * p<0.1

FIGURES

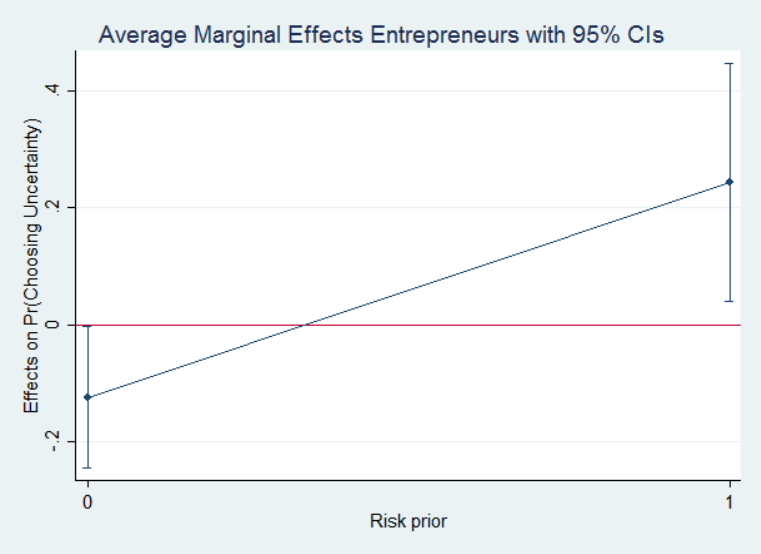

Figure 1: Contrasting the marginal effect of individuals with entrepreneurial intentions (entrepreneurs) against individuals without entrepreneurial intentions (non-entrepreneurs) with respect to uncertainty by prior risk choice.

Table A1

Results of Factor Analysis Generating Big-5 Personality Traits

Question	Extraversion	Openness	Neroticism	Conscien–tiousness	Agreeable–ness	As expected
I am someone who ...						
is talkative	0.7915					√
tends to find faults with others					0.4307	√
does a thorough job						
is depressed, blue	-0.5399					
is original, comes up with new ideas	0.4043	0.5208				√
is reserved	0.6932					√
is helpful and unselfish with others					0.5165	√
can be somewhat careless					0.4685	
is relaxed, handles stress well			0.7396			√
is curious about many different things		0.6015				√
is full of energy	0.6498					√
starts quarrels with others					0.4676	√
is a reliable worker						
can be tense			0.6384			√
is ingenious, a deep thinker		0.5641				√
generates a lot of enthusiasm	0.8022					√
has a forgiving nature				-0.5251	0.4328	√
tends to be disorganized				0.7063		√
worries a lot			0.7265			√
has an active imagination		0.4028				√
tends to be quiet	0.8135					√
is generally trusting						
tends to be lazy				0.5232		√
is emotionally stable, not easily upset			0.7654			√
is inventive		0.4512				√
has an assertive personality						
can be cold and aloof					0.5797	√
perseveres until the task is finished				0.6081		√
can be moody			0.5442			√
values artistic, aesthetic experiences		0.4505				√
is sometimes shy, inhibited	0.7268					√
is considerate and kind to almost everyone					0.5876	√
does things efficiently				0.6183		√
remains calm in tense situations			0.6463			√
prefers work that is routine		0.5409				√
is outgoing, sociable	0.7978					√
is sometimes rude to others					0.7959	√
makes plans and follows through with them				0.8054		√
gets nervous easily			0.4898			√
likes to reflect, play with ideas		0.6456				√
has few artistic interests						
likes to cooperate with others	0.4740					
is easily distracted						
is sophisticated in art, music, or literature		0.6223				√

Note: Factor loading above/below 0.4/-0.4 reported – 35 out of 44 load as expected