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## **"I'LL PERCEIVE IT WHEN I SEE IT" – ENTREPRENEURS' PERCEPTION OF FINANCIAL RISK**

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### **Abstract**

Research Gap: Risk taking is at the very nature of entrepreneurship. But whether entrepreneurs are greater risk takers compared to non-entrepreneurs is another matter altogether. In this paper, we address the following research question: are entrepreneurs different from non-entrepreneurs in their perception of risky financial investments? This question is important as there is a need to further investigate where differences in risk taking between entrepreneurs and non-entrepreneurs' originate at the cognitive level of analysis, in particular by looking at individuals' perception of risk. In recent times, the link between cognition and action has attracted the attention of cognitive researchers and several contributions in entrepreneurship have been made by pursuing this research direction. Cognitive scholars' work has been useful to understand some key differences between entrepreneurs and non-entrepreneurs in the way they think about opportunities and how they evaluate them. Furthermore, individuals' perception of risky opportunities has been identified as a mechanism influencing entrepreneurial decisions, including self-selection. However, extant research testing differences between entrepreneurs and non-entrepreneurs' risk perception and risk taking is still inconclusive. State of the art: Two methodological issues, namely data source - experiment or questionnaire based - and sample selection - using two comparable groups - have both greatly influenced the available empirical evidence on entrepreneurial risk taking. On the one hand, some authors did not find significant differences between entrepreneurs and non-entrepreneurs in their propensity to choose risky opportunities (Miner & Raju, 2004 for a review), including financial and new venture investments. On the other hand, some authors did find differences between the two groups by looking at some mechanisms behind entrepreneurial risk taking, such as feeling of control and desire for venture growth. This paper follows this stream of research by studying two specific cognitive mechanisms behind financial risk taking: the perception of financial risk and the focus of attention. More specifically, our research aims at contributing to our understanding of the differences between entrepreneurs and non-entrepreneurs by providing a more direct link between financial risk perception and behavior on task. Methods & Theoretical Arguments: We hypothesize on the existence of differences between entrepreneurs and non-entrepreneurs in both financial risk perception and focus of attention when choosing between investment opportunities. We test our hypotheses by addressing a number of methodological challenges. Firstly, empirical research on entrepreneurial behavior has to control for the endogenous cognitive mechanisms behind choice behavior. For this reason, we have designed, collected and used data from a quasi-laboratory experiment

comparing choices between entrepreneurship and non-entrepreneurship students. We took this decision as data from laboratory experiments are especially suited to identify the casual link between cognition and behavior in a controlled environment. Secondly, the relationship between cognitive mechanisms and risk taking is not direct. In particular, it is well established that cognitive biases guides risk taking through the mediating effect of individuals' subjective perception of risk. Therefore, it is necessary to directly measure risk perception when assessing differences between entrepreneurs and non-entrepreneurs in their risk taking. We address this issue by expanding the methodological design by Sarasvathy Et Al (1998) - who hinted on differences in financial risk perception between entrepreneurs and non-entrepreneurs - by including a direct measure of financial risk perception. Thirdly, individuals' prior experience is found to be a powerful predictor of risk taking and substantial heterogeneity exists between entrepreneurs in their experience. In order to control for experience, we use a sample of seventy-three students that share a similar background in terms of experience and education, but differ in their entrepreneurial intentions. Finally, the perception of a "risky choice" is context dependent as risk can assume multiple meanings for individuals (e.g. financial risk, dread risk, health risk). In order to compare individuals in their perception and choices under risk, a precise definition of risk has to be used and individuals' perception of such risk has to be measured accordingly. In this paper, we focus on financial risk in its classical two different components - namely the variance in probabilities of obtaining a monetary outcome, and in size of the monetary outcomes. Results/Implications: Our results provide new insights of individual differences between entrepreneurs and non-entrepreneurs both in their perception of financial risk, and in their behavior on task. We find support for our hypotheses: entrepreneurs and non-entrepreneurs do differ in (1) their perception of financial risk as they (2) focus on different elements when choosing between investments. In particular, when comparing investments, entrepreneurs make choices by consistently looking at the size of possible monetary outcomes. On the contrary, non-entrepreneurs focus on probabilities attached to them. Furthermore, differences in focus across groups explain significant differences in individuals' perception of financial risk within groups. This more fine grained understanding of entrepreneurs' decisions under risk has important practical implications at both private (e.g. business angels' evaluation of entrepreneurs) and public (e.g. entrepreneurship education) levels of analysis

# **“I’LL PERCEIVE IT WHEN I SEE IT” – ENTREPRENEURS’ PERCEPTION OF FINANCIAL RISK**

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## **Abstract**

Are entrepreneurs different from non-entrepreneurs in their perception of risky financial investments? Using content analysis of verbal answers and behavioural data, we show that when faced with choices between risky investment prospects, entrepreneurs significantly differ from non-entrepreneurs in their perception of financial risk. In particular, when comparing investments, entrepreneurs make choices by consistently focusing at the size of possible monetary outcomes. On the contrary, non-entrepreneurs focus on probabilities attached to them. We further show that entrepreneurs who focus on the size of possible outcomes exhibit a significantly higher perception of risk as compared to entrepreneurs that focus on probabilities. Our findings provide new insights of differences within and across groups of entrepreneurs and non-entrepreneurs by showing a direct link between individuals’ risk perception and behaviour on task.

## **1. Introduction**

Risk taking is at the very nature of entrepreneurship. But whether entrepreneurs perceive risk differently compared to non-entrepreneurs is another matter altogether. In this paper, we address the following research question: are entrepreneurs different from non-entrepreneurs in their perception of financial risk? This question is important as there is a need to further investigate where differences in risk taking between entrepreneurs and non-entrepreneurs’ originate at the cognitive level of analysis, in particular by looking at individuals’ perception of risk (Mitchell Et Al 2007; Gregoire Et Al, 2011).

In recent times, the link between cognition and action has attracted the attention of cognitive researchers and several contributions in entrepreneurship have been made by pursuing this research direction. Cognitive scholars' work has been useful to understand some key differences between entrepreneurs and non-entrepreneurs in the way they think about opportunities (Sarasvathy, 2001; Baron & Ensley, 2006) and how they evaluate them (Wood & Williams, 2013; Wood Et Al, 2014). Furthermore, individuals' perception of risky opportunities has been identified as a mechanism influencing entrepreneurial decisions, including self-selection (Shane & Venkataraman, 2000; Shane Et Al, 2003). However, extant research testing differences between entrepreneurs and non-entrepreneurs' risk perception and risk taking is still inconclusive (Ireland & Webb, 2007).

Two methodological issues, namely data source – experiment or questionnaire based – and sample selection – using two comparable groups – have both greatly influenced the available empirical evidence on entrepreneurial risk taking (Stewart & Roth, 2004). On the one hand, some authors did not find significant differences between entrepreneurs and non-entrepreneurs in their propensity to choose risky opportunities, including financial and new venture investments (Brockhaus, 1980; Miner & Raju, 2004; Koudstaal Et Al, 2015). On the other hand, some authors did find preliminary evidence on differences between the two groups by looking at some mechanisms behind entrepreneurial risk taking, such as feeling of control and desire for venture growth (Sarasvathy Et Al, 1998; Stewart & Roth, 2001). This paper follows this stream of research by studying two specific cognitive mechanisms behind financial risk taking: the perception of financial risk and the focus of attention. More specifically, we aim at contributing to our understanding of individual differences between entrepreneurs and non-entrepreneurs by directly measuring both the reasons behind choices (here defined as “focus of attention”) and the subjective risk perceived in a risky investment (here defined as “financial risk perception”).

Advancing our understanding on how entrepreneurs and non-entrepreneurs' differ in their risk taking at the cognitive level requires dealing with multiple challenges. Firstly, empirical research on entrepreneurial behavior has to control for the endogenous cognitive mechanisms behind choice behavior. For example, it remains unclear whether cognitive differences between entrepreneurs and non-entrepreneurs originate from idiosyncratic factors that anticipate entrepreneurs' efforts and actions (among others, the perception of risk), or from the very experience of entrepreneurship by these individuals (Gregoire Et Al, 2011). For this reason, we use data from a quasi-laboratory experiment as these data are better suited to identify the casual link between cognition and behavior in a controlled environment. Secondly, the relationship between cognitive mechanisms and risk taking is not direct. For example, several papers have shown that risk perception, defined as the subjective assessment of risk in a given opportunity, acts as a mediator between cognitive heuristics and behavior under risk (Simon Et Al, 2000; Keh Et Al, 2002). In other words, heuristics guides risk taking by affecting individuals' subjective perception of risk. Therefore, it is necessary to use a more direct, context specific measurement of risk perception when assessing differences between entrepreneurs and non-entrepreneurs in their risk taking. We address this issue by expanding the methodological design by Sarasvathy Et Al (1998) including a direct measure of financial risk perception. Thirdly, individuals' prior experience is found to be a powerful predictor of risk taking and substantial heterogeneity exists between entrepreneurs in their experience (Podoyntsyna Et Al, 2012). In order to control for experience, we use a sample of students that share a similar background in terms of experience and education, but differ in their entrepreneurial intentions. Fourthly, the perception of a "risky choice" is context dependent (Slovic, 1987) as risk can assume multiple meanings for individuals (e.g. financial risk, dread risk, health risk). In order to compare individuals in their perception and choices under risk, a precise definition of risk has to be used and individuals' perception of such risk has to be measured

accordingly. In this paper, we focus on financial risk in its classical two different components – namely the variance in probabilities of obtaining a monetary outcome, and in size of the monetary outcomes. Finally, we aim at addressing the limitations of comparing groups of individuals in their risk taking underlined by March & Shapira (1987) by presenting simplified investment opportunities (instead of gambles) and manipulating only one critical performance target (probabilities or outcomes) at a time.

Our results provide new insights of differences within and across groups of entrepreneurs and non-entrepreneurs both in their perception of financial risk and focus of attention. We find that when faced with risky investment prospects, entrepreneurs differ from non-entrepreneurs in their focus of attention. In particular, when choosing between investments entrepreneurs make choices by consistently focusing at the size of possible monetary outcomes. On the contrary, non-entrepreneurs focus on probabilities attached to them. Such differences in focus of attention are consistent among manipulations of both size of probabilities and outcomes. Further, we find that individuals that focus on the size of possible outcomes show a significantly higher perception of risk as compared to individuals that focus on probabilities. However, such differences in risk perception are found only within the group of entrepreneurs.

Our contribution is two-fold. On the one hand, we aim at contributing to entrepreneurship research by advancing our understanding of entrepreneurs' behaviour under risk. We do this by showing that entrepreneurs and non-entrepreneurs differ in their focus of attention when making choices. This finding has implications for private investors as individuals' expectations on the size of possible new ventures' returns influence both self-selection into entrepreneurship (Forlani & Mullins, 2000) and likelihood to get funded. On the other hand, we show that unlike non-entrepreneurs, entrepreneurs' perception of financial risk is tightly linked with their focus on the size of possible outcomes. This finding provides a further step ahead in our

understanding of entrepreneurs' risk perception and its direct, contextual importance when making decisions under risk.

The remainder of this paper is organized as follows: Section 2 briefly reviews the relevant literature and forwards our arguments on risk perception. This section specifically seeks to articulate the reasoning justifying testing the two effects – namely risk perception and focus of attention - and how they differ among entrepreneurs vis-à-vis comparable others. Section 3 describes data, sample construction, the details of the experiment and the method for testing the proposed arguments. Section 4 presents the results. Section 5 concludes and discusses the implications of our findings.

## **2. Theory**

### **2.1. Entrepreneurial cognition**

Entrepreneurial cognition theory (ECT) has been under a recent attention and development due to the high importance (compared for example to the “individual traits” approach) of understanding how do entrepreneurs think. ECT focuses on cognitive mechanisms influencing individuals' behavior in many different contexts, including business opportunities recognition (Mitchell Et Al, 2002; Mitchell Et Al, 2007) and assessment (Forlani & Mullins, 2000). Entrepreneurial cognitions are defined as the “knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth” (Mitchell Et Al, 2002). In these respects, research in entrepreneurial cognition has primarily focused on understanding how entrepreneurs use simplifying mental models to piece together previously unconnected information. These mental models help entrepreneurs to identify and invent new products or services, and to assemble the necessary resources to start and grow businesses (Mitchell Et Al, 2002; Mitchell Et Al 2007).

Research analyzing the effects of cognitive mechanisms behind risk taking has been particularly fruitful. In particular, entrepreneurs' risk taking was found to be influenced by decision heuristics (Busenitz & Barney, 1997), cognitive biases (e.g. overconfidence, Camerer & Lovallo, 1999, Simon Et Al 2000), and over optimism both in opportunity evaluation (Kahneman & Lovallo, 1993; Palich & Bagby, 1995) and likelihood of success (Cooper Et Al, 1988). Cognitive biases and heuristics are a fundamental element behind risk taking. Busenitz & Barney (1997) argue that without the use of biases and heuristics, many entrepreneurial decisions would never be made. Using biases and heuristics helps entrepreneurs to take timely decisions and to deal with multiple problems connected with successfully starting a new business.

The relationship between cognitive biases and risk taking is not direct. Extant research has shown that risk perception acts as a mediator between cognitive heuristics and behavior under risk (Simon Et Al, 2000; Keh Et Al, 2002). In other words, heuristics guides risk taking by affecting individuals' subjective perception of risk. Despite the importance of risk perception in risk taking, relatively little is known about how the perception of risk is different between groups of individuals and, in particular, between entrepreneurs and non-entrepreneurs.

## **2.2. Entrepreneurs' financial risk perception**

Risk perception is defined as the subjective assessment of risk in a given opportunity (Weber Et Al, 2002). In entrepreneurship, risk perception assumes an important role as individuals' evaluation of opportunities is a driver of both behavior under risk and self-selection in entrepreneurship (Sitkin & Pablo, 1992; Weber & Milliman, 1997; Mitchell Et Al, 2007). Financial risk is one of the types of risk that are relevant for entrepreneurs in their evaluation of investments (Sarasvathy Et Al, 1998).

Several studies point to the existence of nuanced differences between entrepreneurs and non-entrepreneurs in their perception of risk. Brockhaus (1980) provided a point of departure for entrepreneurship research on financial risk taking, as the author found no difference in absolute risk propensity<sup>1</sup> between entrepreneurs and non-entrepreneurs. Sitkin and Pablo (1992) have been among the first to consider risk perception as a determinant of risk behavior, despite arguing for a prominent role of risk propensity in individuals' decisions under risk. More recently, Weber Et Al (2002) argued for a central role of risk perception in behavior by presenting a more fine-grained, multi-items scale to measure risk perception. According to the authors, the motives behind risk perception, including the feeling of control, can help us understand how people think about opportunities.

Whilst entrepreneurs are still widely considered to be risk takers, their business related behavior may be the result of entrepreneurs' unique perceptions stemming from systematic differences in cognitive processes, not from a desire to pursue ventures because they are risky per se. Therefore, following hypotheses one to four of Palich & Bagby (1995), we argue that there are no differences in the size of risk perceived by entrepreneurs versus non-entrepreneurs. Instead, we argue that individuals' focus of attention is significantly different between the two groups, and that such differences in focus of attention drive entrepreneurs' perception of risk.

### **2.3. Focus over outcomes vs probabilities**

The feeling (or illusion) of control influences individuals' behavior under risk by focusing their attention on opportunities that are perceived more manageable or controllable (Sitkin & Pablo, 1992; Weber Et Al, 2002). This influence is widely recognized both in the fields of cognitive psychology (Kahneman & Tversky, 1982; Loewenstein Et Al, 2001; Lerner & Keltner,

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<sup>1</sup> Risk propensity is defined as the relatively stable individual risk preferences (Andersen Et Al, 2008). On the contrary, risk perception is defined as the circumstantial subjective individual assessment of risk.

2001) and entrepreneurship (McGrath & McMillan, 1992; Baron, 1998). Particularly in entrepreneurship, the feeling of control has been positively associated with both opportunity evaluation and decision to start a new venture through a mediating effect of risk perception (Simon Et Al, 2000; Keh Et Al, 2002). But how exactly the feeling of control affects entrepreneurs risk perception is still an open question.

Prior literature hints on the existence of differences between entrepreneurs and non-entrepreneurs in their feelings of control. In their seminal paper on the topic, March & Shapira (1987) examined the relationship between risk preferences and the focus of attention for non-entrepreneurs. In doing so, the authors argue that managers focus their attention on key performance targets (e.g. size of a possible loss) and tend to avoid investments where risk cannot be reduced or managed. Sarasvathy Et Al (1998) tests these arguments empirically by comparing entrepreneurs and bankers' feelings of control. The authors find that while entrepreneurs tend to accept risk as given and focus on controlling outcomes, bankers tend to choose risky investments where they feel control over reducing the probabilities of negative outcomes. These different feelings of control are argued to have an effect on entrepreneurs' financial risk perception. Yet, no empirical test of such effect is given in their paper. From the empirical evidence available, it seems clear that entrepreneurs are not necessarily greater risk-takers compared to non-entrepreneurs. However, entrepreneurs might significantly differ from non-entrepreneurs in their feelings of control behind their opportunity evaluation and decision making. In their experimental study Forlani & Mullins (2000) argue that, despite entrepreneurs are found to be avoiding high level of variability in outcomes, they are found to be willing to accept high levels of risk in the pursuit of a greater outcome. The concept of effectuation by Sarasvathy (2001) helps to understand why entrepreneurs are different in their feelings and management of control over risky investments. Effectuation assumes that the future is unpredictable but that entrepreneurs can control a value-creating part of it

through the use of a given set of means available to them. In this sense, entrepreneurs can utilize the means at their disposal to influence their future without the need to neither predict it nor consider the expected chance probabilities.

For all these reasons above mentioned, we expect entrepreneurs to perceive financial risk differently than non-entrepreneurs due to their different focus on control. In particular, when comparing risky investments we argue that entrepreneurs choose financial investments by mainly considering the size of possible outcomes. On the contrary, non-entrepreneurs choose financial investments by mainly considering the probabilities of obtaining possible outcomes.

#### **2.4. Focus of attention and risk perception**

Individuals' focus of attention impacts on several dimensions including risk perception. Part of our intended contributions is to test a more direct link between risk perception and risk taking. As we have already argued for a different focus between the two groups when taking risky decisions, we aim here at testing differences within the groups of entrepreneurs and non-entrepreneurs in individuals' risk perception.

Shane Et Al (2003) criticize extant research in its tendency to study the wrong motives behind risk taking. The authors argue that some motives are more relevant to entrepreneurial activity than others and that risk perception is one of them. However, a precise definition and operationalization of risk perception has to be used to rule out alternative explanations. With particular reference to risk perception, they question whether entrepreneurs cannot perceive the riskiness of their own actions, or that what is risky to one person is not risky to another. In this respect, consider the possibility of observing no difference in risk perception alone between the two groups. We argue that when individuals face two alternative risky investments, they significantly differ in their financial risk perception when focusing either on the outcomes or on probabilities

attached to the investments. Prior research guides us to argue that entrepreneurs who focus on outcomes would have a greater perception of risk as compared to entrepreneurs who focus on probabilities (Stewart & Roth, 2001, 2004). In particular, we follow the logic of conjecture two in the directions of future research section of Saras Sarasvathy's 2001 paper: in financial decisions, in contrast to traditional decision makers effectuators are less likely to use long-term planning and more likely to be focused on the short term. Entrepreneurs would not give up the opportunity of a possible higher (but riskier) gain as in the short run their feeling of control towards outcomes is strong. Keh Et Al (2002) found that entrepreneurs that perceive more risk will be less likely to judge positively an opportunity. However, the authors neither directly test the choice behavior between two possible alternatives, nor make a comparison between entrepreneurs and non-entrepreneurs. More recently, Koudstaal Et Al (2015) compared entrepreneurs with non-entrepreneurs in their behavior under risk. They found that entrepreneurs are unique in their lower degree of loss aversion and more likely to choose a risky investment when there is the possibility of a loss. Hence, the presence of a loss as a possible outcome would not impact the group of entrepreneurs in their choices but might impact their perception of risk. We follow this line of thought and argue that within the group of entrepreneurs, those who focus on outcomes will perceive significantly higher risk than those who focus on probabilities.

### **3. Data & Method**

In this paper, we aim at exploring when and how entrepreneurs and non-entrepreneurs differ in their perception of financial risk. For this purpose, we use data coming from a laboratory computer-based experiment we designed and conducted in Fall 2014. A total of seventy-three students in business economics at Copenhagen Business School participated in the experiment. Individuals were divided in two groups – entrepreneurial-oriented individuals and non-

entrepreneurial oriented individuals – according to three criteria: firstly, their two study concentrations (entrepreneurship program versus normal business program), secondly, their intentions to start a firm in the next three years, and thirdly their current interests in starting a firm (active role as a founder in a student incubator). Both groups are representative of the populations of students in their respective programs, and presents nuanced differences but in their entrepreneurial orientation.

During the experiments individuals were faced with three choices between two hypothetical investment opportunities. The design of these opportunities is an adaptation of Sarasvathy Et Al (1998) experimental task. Compared to Sarasvathy Et Al (1998), we added a direct measure of risk perception and modified the investments' monetary outcomes in order to have two opportunities with the same expected value. Information on investment opportunities included a probability distribution of possible Net Present Values (NPV) and the size of possible NPVs.

### **3.1. Sample**

To investigate our arguments, we identified a sample of individuals and asked them to participate in a lab experiment. Specifically we draw on students of general business economics enrolled in entrepreneurship and non-entrepreneurship focused programs at Copenhagen Business School. We chose to use students in order to minimize the impact of entrepreneurial experience in explaining differences between groups. By doing so, we at least partially circumvent differences in propensities attributable to variations in prior or current entrepreneurial encounters. All subjects were sampled in study lines that share many elements in common but provide two very distinct orientations: entrepreneurship or non-entrepreneurship focused. In particular, students in the entrepreneurship group either (1) applied and enrolled in an entrepreneurship focused undergraduate program or (2) applied and enrolled in the Copenhagen Business School's

entrepreneurship student incubator. To qualify for the entrepreneurship undergraduate program, students had to apply by handing in a motivation for why they in particular would like to study entrepreneurship. 49 students out of approximately 600 applied to enter into the program and all 49 students were accepted to enter into the program. To qualify for the entrepreneurship incubator, students had to apply by handing in an application with a detailed description of a business idea they wish to pursue. Students in the non-entrepreneurship group enrolled in a non-entrepreneurship focused study program. This high level of comparability allow us to rule out many alternative explanations which otherwise could be attributed to unobserved factors. Virtually all applications suggested the entrepreneurship students were motivated by the intention to establish a business of their own. We therefore consider subjects enrolled into either the entrepreneurship program or the incubator to be individuals with entrepreneurial intentions and hence define these as our population of entrepreneurs. Students not applying for the entrepreneurship program represent the pool of non-entrepreneurs since they actively choose not to specialize in entrepreneurship and instead continue in the general business economics studies. These two groups define the populations from which we draw the treated group (entrepreneurs) and control group (non-entrepreneurs).

We sent two separate mails to the two populations in order to secure subjects for experiments. The students were able to sign up for the experiment through a website designed to register the subjects and make some initial inquiries. 29 subjects signed up from the entrepreneurship population and 43 signed up from the control population providing a total of 72 individuals for the investigation. In order to make a meaningful comparison, we checked that both samples were representative of the respective populations in their general characteristics (age, gender). We found that the samples reflect roughly speaking the demographics of the populations.

Preliminary analysis of the sampled subjects revealed that 75.4 percent (22) of the entrepreneurship students intended to start a firm within the next three years while only 8.4 percent

(7) of the control sample had such intentions ( $\chi^2 = 25.561$ ;  $p < 0.000$ ). This provides some support for our sampling suggesting that the entrepreneurial intentions are greater among the entrepreneurship students than among the general business economics students. We further checked the match between entrepreneurial traits (Big Five Personality Traits, see Zhao & Seibert, 2006; John Et Al, 1991, John Et Al 2008) and group composition. Our results confirm the distinction between the two groups and their compositions<sup>2</sup>

The experiment is coupled with a questionnaire designed to capture the individual's demographics, psychological profile, cognitive biases and economics circumstances. These dimensions are utilized for the purpose of ensuring that the samples are comparable on dimensions which otherwise may cause spurious correlations and hence potential bias.

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Insert Table 1 about here  
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Table 1 contains some descriptive statistics of the two groups across categorical variables drawn from the questionnaire data. It also provides test statistics on differences. We find little difference in the two groups on these demographics. Non-entrepreneurship students seem to be more inclined to have a part-time job next to their studies compared to the entrepreneurship sample ( $\chi^2 = 8.815$ ;  $p < 0.000$ ). In addition, almost 3 out of 4 non-entrepreneurship students (versus 1 out of 2 entrepreneurship students) already possessed a bachelor degree at the time of experiment. We also tested for whether there is a difference in age using a t-test. The groups have approximately a difference of a year of difference, with entrepreneurship students having an average of approximately 24.0 years and non-entrepreneurship students an average of approximately 25 years.

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<sup>2</sup> The two groups significantly differ in their score of "openness to experience", one of the factors that are found to be correlated with self-selection into entrepreneurship (Zhao & Seibert, 2006). In particular, individuals in the entrepreneurship group score positively (mean = 0.2321) whereas the ones in the non-entrepreneurs score negatively (mean = -0.1565). The difference is statistically significant ( $t = -1.63$ ,  $p = 0.05$ )

The t statistics is insignificant at 0.7234. All in all, we believe these data points suggest the samples to be comparable while also providing some justification for considering them to be groups of entrepreneurs and non-entrepreneurs respectively.

### **3.2. The Experimental Task**

A quasi-experimental design was employed to compare entrepreneurs and non-entrepreneurs' choices after manipulating the size and probabilities associated with the outcomes of risky investments. In particular, we adopted Sarasvathy Et Al (1998) experimental task: each individual was confronted with three unique choices between two risky investments. The full experimental task is presented in Table 2.

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Insert Table 2 about here  
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For each decision, subjects are asked them to imagine that they were about to undertake a new investment. They were presented with the two new potential investment descriptions, and were told that both investment prospects were fully comparable but in two key aspects: namely the size of predicted outcomes (NPVs) and probabilities. The investments were presented one at a time and no information was given on the number of decisions to be made during the experiment. For every decision, investments' descriptions were repeated along. Subjects were asked precise questions for measuring the two key variables of interests – namely focus of attention and risk perception.

The three pairs of investments have equal expected values. However, Option B is exogenously manipulated during the experiment to present a higher risk compared to Option A. To maintain the same expected value, Option B always presents a higher variability of possible

investments' outcomes, with possibility of a loss in Decision 3. Outcomes and probabilities in Option B are manipulated one at a time. In particular, two exogenous manipulations of financial risk are introduced: a more centered probability distribution of possible outcomes in Decision 2, and a higher variance of the size of possible outcomes in Decision 1 and 3.

Firstly, subjects were asked to choose between two alternative investments (Option A or Option B). Secondly, they were asked to explain the reasons behind their decision. Verbal answers were limited to 180 characters and were codified following Sarasvathy Et Al (1998). Focus of attention, codified as either focus on outcomes or probabilities, recorded the reasons why subject decide to choose an investment over another. Lastly, subjects were asked to indicate how risky they perceived their choice compared to the alternative. Risk perception was measured on a 1-5 likert scale.

The experiment design allows us to test differences within and across the two groups: on the one hand, we test the link between risk perception and the reasons driving choices of individuals within each group; on the other hand, we test for differences across the two groups in the focus of attention when choosing between investments. In order to test such differences, we use two chi-squared tests.

### **3.3. Main Variables**

#### **(Focus of Attention)**

The first variable of interest is individuals' focus of attention – namely whether the individual in each decision chooses by mainly focusing on the size of possible outcomes or on the probabilities attached to them. Descriptively, the riskier investment “Option B” is chosen 25 percent of the times both from the entrepreneurs, who chose it on average about 25,28 percent of the time (22 out of 87 decisions), and the control group, who chose it on average about 25,58 percent of the

time (33 out of 129 decisions). These differences were not statistically significant as shown in supplement 1.

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Insert Supplement 1 about here  
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To test whether entrepreneurs and non-entrepreneurs differ in their focus of attention, we rely on a dummy expressing whether the subject indicated as a main reason to choose the investment either the size of the possible outcomes or the probabilities attached to them. The codification of the variables “FocusOutcome” or “FocusProbabilities” followed the same logic as the variables “Contret” and “Contrisk” respectively presented in Sarasvathy Et Al (1998). As an example from our sample of verbal response, the variable “FocusOutcome” is codified as 1 for an explanation as the following: “I chose Option B as it presents higher potential gains as compared to option A”. The variable “FocusProbabilities” is codified as 1 for an explanation as the following: “20% of losing the investment is too much for me”.

Both variables was codified by three independent coders. The inter-coders reliability in our experiment was consistently higher than 90 percent throughout the decisions. The variables “FocusOutcome” or “FocusProbabilities” were considered mutually exclusive. In limited cases, coders did not recognize a main factor between the two and codified both as zeros. In Decision 1, both zeros represent around 8% of the cases (6 out of 73 individuals), while both in Decision 2 and Decision 3 only less than 3% (2 out of 73 individuals).

### **Financial Risk perception**

The second variable of interest is financial risk perception – namely the extent to which an individual perceives his/her investment decision to be risky compared to the alternative

investment. We operationalize risk perception as a dummy assuming value “High” or “Low” according to the score given in a 5-point Likert-scale (“Low” is assigned for values lower or equal than 1, and “high” for values greater than 1). We did not measure a multi-items individual index of risk perception in individuals as suggested by Keh Et Al (2002) or Weber Et Al (2002) for various reasons. Firstly, perception of risk has to have a precise definition as risk perception is context dependent as it is associated with the definitions of risk that are used by the experimenter. In this case, we restrict the definition of risk to a financial risk and measure the perception of risk only directly. Secondly, our objective is to test whether risk perception is different within groups as we argue that individuals focus their attention on different aspects when evaluating an investment. Our direct measure of risk perception is coupled with Sarasvathy Et Al (1998) framework by adapting a 5-point Likert-scale used by Forlani & Mullins (2000) and Simon Et Al (2000).

Descriptively, the risky investment “Option B” is consistently perceived as significantly more risky compared to “Option A” across decisions (Decision 1,  $\chi^2 = 36.9780$   $p < 0.000$ ; Decision 2,  $\chi^2 = 44.8000$   $p < 0.000$ ; Decision 3,  $\chi^2 = 38.3312$   $p < 0.000$ ). However, differences across groups in risk perception do not look as sharp at a first glance. Entrepreneurs perceived their choices to score “high” in risk 34,48 percent of the times (30 out of 87 decisions) while the control group perceived them to be risky about 31,78 percent (41 out of 129 decisions) of the time. Across decisions, these numbers did prove significantly different only in Decision 3 where entrepreneurs perceive significantly higher risk compared to the control group. Results have been obtained using a Chi-square test as shown in supplement 2.

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Insert Supplement 2 about here  
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#### 4. Results

In this paper we propose two main arguments. Firstly, following the reasoning of Sarasvathy Et Al (1998), we argue that entrepreneurs and non-entrepreneurs differ in the way they perceive financial risk. More specifically, individuals in these two groups focus on different elements of financial risk when choosing an investment opportunity, with entrepreneurs focusing on the size of possible outcomes and non-entrepreneurs focusing on probabilities attached to them. Secondly, we test whether such a difference in focus across groups affect individuals' risk perception. More specifically, we argue that within the group of entrepreneurs, individuals perceive greater risk as they focus on the size of a possible monetary outcome, whilst within the group of non-entrepreneurs, individuals perceive greater risk as they focus on the probability of a possible monetary outcome.

#### **4.1. Focus of attention and financial risk perception**

Our results fully confirm our first argument. Entrepreneurs do differ from non-entrepreneurs in the way they focus their attention when choosing between investments. In table 3 and table 4 we provide a test comparing the two groups of entrepreneurs and non-entrepreneurs in their focus on NPVs as opposed to Probabilities across decisions.

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Insert Table 3 and 4 about here  
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Entrepreneurs are found to be consistently focusing their attention on the size of possible outcomes (NPV) of investments. In both the first two decisions, almost 1 out of 2 entrepreneurs (versus 1 out of 4 non-entrepreneurs) in our sample justifies his/her investment choice by mentioning mainly the size of possible outcomes (difference 23%,  $\chi^2 = 3.9355$   $p < 0.05$ ). In

Decision 3, the difference between the two groups becomes even more significant (difference 32%,  $\chi^2 = 7.6472$ ,  $p < 0.005$ ).

On the contrary, non-entrepreneurs are found to be consistently focusing their attention on the probabilities attached to possible outcomes. In both the 2<sup>nd</sup> and 3<sup>rd</sup> decisions, almost 3 out of 4 non-entrepreneurs (versus almost 1 out of 2 entrepreneurs) in our sample justifies his/her investment choice by mentioning mainly the risk connected with the probability distribution of possible outcomes (difference 30%,  $\chi^2 = 6.4706$ ,  $p < 0.05$ ). In Decision 1, the difference between the two groups is slightly more nuanced but still consistent (difference 26%,  $\chi^2 = 4.7983$ ,  $p < 0.05$ ).

#### **4.2. Focus of attention and financial risk perception**

Our results partially confirm our second argument. Only within the group of entrepreneurs, individuals' focus of attention affects individuals' financial risk perception in a significantly different way. In table 5 and table 6 we provide a test for dependence between focus of attention and financial risk perception within groups.

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Insert Table 5 and 6 about here  
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Within the group of entrepreneurs, individuals that focus their attention on the size of possible outcomes (NPV) are found to perceive more financial risks than individuals that focus on probabilities. This is statistically significant in both Decision 1 (difference 36%, Fisher Exact test,  $p < 0.05$ ) and Decision 3 (difference 41%, Fisher Exact test,  $p < 0.05$ ). In Decision 2, where no significant difference in risk perception is found (difference 17%, Fisher Exact test,  $p = 0.29$ ), individuals are presented with an exogenous manipulation of the probabilities of "Option B". As a consequence, we did not expect within groups differences in risk perception as a result of difference

in focus for Decision 2. Results for the group of non-entrepreneurs are non-significant at 5% level. Therefore, even if percentages show a consistent prevalence of individuals that perceive high risk when focusing on probabilities, we are cautious in the interpretation of such results.

## **5. Conclusions**

In this paper, we have addressed the following research question: are entrepreneurs different from non-entrepreneurs in their perception of financial risk? Following up on seminal studies identifying risk perception as a primary driver behind self-selection into entrepreneurship, this exploratory study on financial risk perception aimed at testing two specific working hypotheses in the form of arguments.

Firstly, we tested how focus of attention drives differences across entrepreneurs and non-entrepreneurs in choices under risk. When making decisions between investments, we argued that entrepreneurs are motivated by the size of possible investment outcomes whilst non-entrepreneurs focus on probabilities attached to investments. Literature already underlined how these different subjective values of incentives could drive decisions in opposite directions. Yet, no empirical test comparing two groups in a controlled environment is available. We worked in this direction to test the effect of entrepreneurs' motivations in decision making. In particular, entrepreneurs' focus on monetary incentives motivates them to pursue investments as they tend to accept risk as given and leverage on personal commitment to reach target objectives (Sarasvathy Et Al, 1998). On the contrary, the size of probabilities constrains non-entrepreneurs to use a more conservative view on investment opportunities.

Secondly we tested the link between risk perception and focus of attention within groups. As individuals focus on different elements when taking decisions, we argued that such differences would be reflected on a different individuals' perception of risk. In particular, we expected

entrepreneurs to perceive high risk when focusing on outcomes whilst non-entrepreneurs would perceive high risk when focusing on probabilities.

Our results confirmed both our arguments, giving us two new insights about entrepreneurs' behavior and cognition under risk. From a research perspective, results suggest a reason why entrepreneurs appear to be not greater risk takers as compared to non-entrepreneurs, namely their different focus of attention. Even though we are very cautious about generalization – as both groups perceive opportunities very consistently in terms of financial risk – our exploratory findings confirm extant research pointing at nuanced differences between entrepreneurs and non-entrepreneurs. From a private stakeholder's perspective, entrepreneurs are found to be non-blind risk takers, perceiving risk in a significantly different way as a function of their focus of attention. More research is needed in order to further understand how focus of attention and influence risk perception in the context of real business opportunities.

### **Limitations**

This paper presents several limitations as it is explorative in nature. We acknowledge first some limitations due to the nature of data and the external validity of results. Financial risk is only one aspect when evaluating opportunities. However, there are reasons to believe that using a precise definition of risk can still be possible. Financial risk is a quantifiable way of measuring risk. The idea that one number can be enough to describe a situation of risk is strongly connected with the idea that one number can indicate firms' success, namely profit (March & Shapira, 1987).

While cognition as a notion is obviously essential to explain risk perception, the idea that we might only study “mechanisms” is obviously a simplification. Little is yet known about the pathways of thought, the associations among discrete bits of long and short-term memories, retrieval processes, creativity, and “connecting the dots” (Mitchell Et Al, 2007, Baron, 2006).

Even when using lab experiment data, we acknowledge that we cannot tease out all motivational differences between individuals in their risk taking of real world investment opportunities. Motivational differences indeed also influence the entrepreneurial process. For example, such things as stable variation across people in their perceptions of risk and opportunity influence entrepreneurial decisions (Shane & Venkataraman, 2000). People vary in how they view the risk of expending resources before knowing the distribution of outcomes (Palich & Bagby, 1995). In this respect, it is beyond the scope of this paper to measure stable differences in risk perception using a wider definition of risk.

With respect to external validity and the sample used, we acknowledge the advantages and disadvantages of using entrepreneurial-oriented individuals. Using a sample of real, experienced entrepreneurs (vs students) would have required a careful management of the endogenous nature of choice in such individuals. Finally, as the probability of success at the entrepreneurial process is low, those people who are willing to proceed despite these odds might be more optimistic or higher in self-efficacy than people deterred by these odds. We consider the incorporation of this individual-level variation in motivation to be important to the entrepreneurial process. We hope future research will go beyond these limitations and advance even further our understanding of risk perception in entrepreneurship.

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## 6. Tables

**TABLE 1: Descriptive statistics and test of differences between entrepreneurs and Non-Entrepreneurs (N=73)**

	ENTREPRENEURS (N=29)	NON-ENTREPRENEURS (N=43)	$\chi^2$	SIGNIFICANCE
Risk Averse	13 (44.8)	20 (46.5)	0.0832	
Risk Neutral	7 (24.1)	11 (25.6)		
Risk Prone	9 (31.1)	12 (27.9)		
Male	22 (75.8)	32 (74.4)	0.0192	
Female	7 (24.2)	11 (25.6)		
Danish	23 (79.3)	41 (95.1)	4.8078	*
Foreign	6 (20.7)	2 (4.9)		
50000 DKK < income < 300000 DKK	23 (79.3)	40 (93.0)	2.9777	*
0 < income < 50000 DKK	6 (20.7)	3 (7.0)		
Parent Entrepreneur	7 (24.2)	10 (23.3)	0.0075	
No Parent Entrepreneur	22 (75.8)	33 (76.7)		
University Degree	15 (51.7)	32 (74.4)	3.9355	**
No University Degree	14 (48.3)	11 (25.6)		
Part time Employed	17 (58.6)	38 (88.4)	8.4997	***
No Part time Employed	12 (41.4)	5 (11.6)		
Entrepreneur in next 3 years	22 (75.9)	7 (8.4)	25.5610	***
No entrepreneur in next 3 years	7 (24.1)	36 (83.7)		

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, percentages of table total in parenthesis

	ENTREPRENEURS (N=29)	NON-ENTREPRENEURS (N=44)	T-test	SIGNIFICANCE
Overconfidence	70.37 (2.131)	72.06 (1.268)	0.4734	
Age	23.68 (0.726)	24.67 (0.938)	0.4478	

**TABLE 2: Choice tasks (Adapted from Sarasvathy Et Al, 1998). Three decisions between a less risky investment (Option A) and a riskier investment (Option B).**

	Option A		Option B	
	Probability (%)	NPV (\$)	Probability (%)	NPV (\$)
<b>Decision 1</b>	30	300000	30	0
	40	400000	40	400000
	30	300000	30	800000
<b>Decision 2</b>	30	300000	20	0
	40	400000	60	400000
	30	300000	20	800000
<b>Decision 3</b>	30	300000	20	-10000
	40	400000	60	400000
	30	300000	20	810000

Questions for every Decision:

- 1) Which project would you invest in? (Option A or Option B)
- 2) Why would you invest as such? (Verbal answer, limit of 180 characters)
- 3) How much risky, compared to the other investment, your choice is? (1-5 Likert Scale)

**TABLE 3: Shares of individuals that focus on NPVs as opposed to Probabilities across decisions (verbal response analysis)**

	<b>ENTREPRENEURS (N=29)</b>	<b>NON- ENTREPRENEURS (N=43)</b>	<b>Difference</b>	<b><math>\chi^2</math></b>	<b>SIGNIFICANCE</b>
Decision 1	48%	26%	23%	3.9355	**
Decision 2	48%	26%	23%	3.9355	**
Decision 3	55%	23%	32%	7.6472	***

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, percentage of group total

**TABLE 4: Shares of individuals that focus on Probabilities as opposed to NPVs across decisions (verbal response analysis)**

	<b>ENTREPRENEURS (N=29)</b>	<b>NON- ENTREPRENEURS (N=43)</b>	<b>Difference</b>	<b><math>\chi^2</math></b>	<b>SIGNIFICANCE</b>
Decision 1	41%	67%	26%	4.7983	**
Decision 2	45%	74%	30%	6.4706	**
Decision 3	45%	74%	30%	6.4706	**

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, percentage of group total

**TABLE 5: Differences within entrepreneurs in their “high” financial risk perception, across decisions**

	<b>ENTREPRENEURS (N=29)</b>		<b>Fisher Exact Test</b>	<b>SIGNIFICANCE</b>
	<b>Focus Outcomes</b>	<b>Focus on Probabilities</b>		
Decision 1	36%	0%	0.017	**
Decision 2	40%	57%	0.291	
Decision 3	56%	15%	0.029	**

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 percentage of group total

**TABLE 6: Differences within non-entrepreneurs in their “high” financial risk perception, across decisions**

	<b>NON ENTREPRENEURS (N=43)</b>		<b>Fisher Exact Test</b>	<b>SIGNIFICANCE</b>
	<b>Focus Outcomes</b>	<b>Focus on Probabilities</b>		
Decision 1	14%	34%	0.154	
Decision 2	36%	56%	0.216	
Decision 3	9%	19%	0.414	

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 percentage of group total

**Supplement 1: Differences in choices between entrepreneurs and non-entrepreneurs across decisions**

	<b>ENTREPRENEURS (N=29)</b>	<b>NON- ENTREPRENEURS (N=43)</b>	$\chi^2$	<b>SIGNIFICANCE</b>
Decision 1, Option A	26 (0.90)	34 (0.79)	1.3973	
Decision 1, Option B	3 (0.10)	9 (0.21)		
Decision 2, Option A	17 (0.59)	25 (0.58)	0.0016	
Decision 2, Option B	12 (0.41)	18 (0.42)		
Decision 3, Option A	22 (0.76)	37 (0.86)	1.2142	
Decision 3, Option B	7 (0.23)	6 (0.14)		

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, percentages of group total in parenthesis

**Supplement 2: Differences in “high” financial risk perception between entrepreneurs and non-entrepreneurs, across decisions**

	<b>ENTREPRENEURS (N=29)</b>	<b>NON- ENTREPRENEURS (N=43)</b>	$\chi^2$	<b>SIGNIFICANCE</b>
Decision 1	17,24%	27,91%	1.0923	
Decision 2	48,28%	51,16%	0.0577	
Decision 3	37,93%	16,28%	4.3304	**

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, percentage of group total