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Heuristics, Biases, and the Behavior of Entrepreneurs

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Consider the following decision problem: As the president of an airline company, you have invested \$10 million of the company's money into a research project. The purpose was to build a plane that would not be detected by conventional radar, in other words, a radar-blank plane. When 90 percent of the project is completed, another firm begins marketing a plane that cannot be detected by radar and is much faster and far more economical than the plane your company is building. The question is, should you invest the last 10 percent of the research funds in finishing your radar-blank plane, yes or no?

Alternatively, consider a second situation: As the president of an airline company, you have received a suggestion from one of your employees. The suggestion is to use the last \$1 million of your research funds to develop a plane that would not be detected by conventional radar. However, another firm has just begun marketing a plane that cannot be detected by radar and is much faster and far more economical than the plane your company could build. Should you invest the \$1 million to build the radar-blank plane proposed by your employee anyway, yes or no?

Of course, both situations are identical in that they require you to decide whether to invest \$1 million into an apparently hopeless project. The difference between the two situations is only in that the first case involved a prior investment of \$9 million, whereas the second does not. The prospects of investing the last million, however, are equally unattractive in both situations. These questions are taken from an experiment by Arkes and Blumer.¹ In the first situation involving sunk costs, 85 percent of the subjects involved in the experiment said they would invest the \$1 million. In the second situation, only 16 percent said they would invest in the project. Only the framing of the situation was different in both cases; nevertheless, the framing influenced the perception of how attractive

the respondents considered the two alternatives. This, in turn, influenced their decision. The majority of the respondents in the first situation fell prey to a bias, specifically the *sunk-cost effect* or *escalation of commitment* that led them to invest in a forlorn project.

The point of this admittedly artificial example is simple: Individuals' decisions are often distorted by different kinds of heuristics and biases.² In this chapter, we argue that heuristics and biases are also relevant for entrepreneurial decisions. Entrepreneurs may use simplifying heuristics and can be subject to a variety of biases that can influence their behavior. This can lead to suboptimal outcomes, either for the individual or for society at large. Some types of biases appear to be typical for entrepreneurial behavior. This is because the exploitation of business opportunities requires the entrepreneur to make decisions in complex situations without complete knowledge of all relevant facts and likelihoods. By the time all necessary information for a sound decision is available, the opportunity might already be gone. Decision-simplifying heuristics can be particularly valuable in such situations, even though they might lead to systematic errors. Baron includes this behavior under the "specific cognitive style" of entrepreneurs.³ Most heuristics and biases, however, are relevant to all individuals in certain kinds of situations.

Our chapter is organized as follows. The second section describes how heuristics and biases can influence decision making in general and why they are particularly relevant for entrepreneurial behavior. The third section describes how heuristics and biases can influence the specific decision to start a new business. The fourth section discusses a variety of perceptual biases and heuristics that have been identified and their implications for the decision to start new businesses. This section also points to existing empirical evidence on the relevance of these biases for entrepreneurial behavior in general. The final section concludes with some ideas for future research that we believe to be exciting and worth exploring.

HEURISTICS AND BIASES IN ENTREPRENEURIAL DECISION MAKING

In their early seminal work, Tversky and Kahneman demonstrated that decision makers may strongly deviate from rationality because of the use of a number of *heuristics*, that is, rules of thumb, instead of formal techniques.⁴ They detected systematic deviations of most decision makers which they called *biases*, and initiated a large research stream on the topic. The reason for the use of heuristics by individuals and their susceptibility to biases is straightforward: Individuals are *boundedly rational* in the sense of being intentionally rational but having only limited capacity to be so.⁵

Heuristics can be described informally as tools and shortcuts that the human brain uses to quickly identify and interpret patterns in its environment in order to guide courses of action. It is important to describe how heuristics can influence

decisions and to disentangle them from individual preferences, thus, we start outlining briefly the basic components of all decisions. Any decision process can be decomposed into four successive steps: (1) The perception of information from the environment, (2) the processing of the perceived information, (3) the (intuitive) optimization process which identifies the best alternative, and finally (4) the decision, which manifests itself in the selection of the best alternative through a specific course of action.

In order to select the best alternative, the individual needs four types of information:⁶

1. What are the alternative courses of action?
2. What are the events that could follow from these actions?
3. What is the likelihood of each event?
4. What is the value of each event to me?

The decision process is moderated by two different factors: (1) The preferences of each individual and the heuristics an individual uses may lead to biases; and (2) individual preferences have an impact on how a person evaluates the attractiveness of an alternative. Abstracting from asymmetrical information, individual preferences are the economic explanation of behavioral differences between individuals in a given situation. Heuristics, instead, influence the perception and processing of information and the (intuitive) optimization process used by individuals in selecting the preferred course of action.⁷ Thus, behavior reflects more than preferences, it may also exhibit biases due to the use of heuristics. Heuristics and biases are one possible explanation for differences in behavior across individuals identified by psychologists.⁸ We argue that both preferences and heuristics are moderators of the decision process and can both lead to differences in the actions taken by individuals in identical environments and decision situations.

In general, a major difficulty often encountered by decision makers is that likelihoods and outcomes are not easy to assess. This is particularly relevant for entrepreneurial decisions since potential entrepreneurs are often subject to Knightian uncertainty or to ambiguity, that is, to situations in which outcomes and their likelihoods are often unknown.^{9, 10} In such situations, instead of making a decision based on known outcomes and probabilities, the potential entrepreneur has to form a belief and a personal judgment about the expected outcomes and their probabilities. Such beliefs are often expressed in statements like "I think that . . .," "Chances are . . .," "It is unlikely that . . ." and so forth.

To illustrate the difficulties involved in making judgments under uncertainty, consider the following example: What is safer for a child in the United States? To play at a friend's house where parents keep a gun? Or to play at a friend's house where parents do not have a gun but a beautiful swimming pool in the garden? Intuitively, most of us would agree that the child is much safer at the house with the swimming pool. Yet, the data tell a different story: In any given year, one child

drowns for every 11,000 residential pools in the United States. But only one child is killed by a gun for every 1 million-plus guns. Hence, the likelihood of death by drowning (1 in 11,000) is significantly higher than that of death by gun (1 in 1 million-plus). Indeed, they are not even close, with the child being 100 times more likely to die in the swimming pool than from gunplay.¹¹

It also appears that people are sometimes bad at assessing risks. Human judgment in uncertain situations has been shown to make use of a variety of heuristics and to be prone to biases that can influence decision processes in a systematic way.¹²⁻¹⁴ Often, these heuristics are quite useful, but sometimes they can lead to systematic errors.¹⁵⁻²⁰ The evidence suggests that people are better at assessing risks they are used to, but perform badly when assessing risks associated with small probabilities since such events occur rarely.²¹

Because of the uncertainty that typically surrounds entrepreneurial activity, and because of the idiosyncrasies characterizing many entrepreneurial decisions, it can be expected that probability judgments are especially difficult. Furthermore, it can be expected that heuristics and biases contribute significantly to explain many entrepreneurial decisions, such as the choice of business activities that an entrepreneur engages in, the choice of business location, and the selection of staff and business partners. The use of simplifying heuristics and biases may lead to suboptimal outcomes, such as excess entry into markets and low average survival chances for young businesses.²² On the other side, it can also be argued that the use of such simplifying heuristics and biases is particularly appropriate or even necessary for entrepreneurial decisions.²³⁻²⁵ Some entrepreneurship scholars propose a compromise between these two positions and advocate the appropriateness of certain heuristics in some situations, but the inappropriateness of the same heuristics in other situations.²⁶

Studying heuristics and biases may help us to better understand entrepreneurial behavior, for example, why some people in some situations decide to become entrepreneurs while others do not. It may be important for policymakers who are interested in fostering entrepreneurial activity and for entrepreneurs by helping them to improve their decision making. Also, understanding the role heuristics and biases play in entrepreneurial behavior may be of interest to entrepreneurship teachers who want to prepare their students to become successful entrepreneurs. Finally, understanding the role of heuristics and biases in entrepreneurial behavior might help researchers to explain recurrent anomalies noted about entrepreneurship. For example, it is known that many new businesses fail shortly after inception, and business venturing has been shown to be—on average—an inferior decision both in terms of returns to money invested and career choice.²⁷⁻³⁰ Yet, despite these depressing prospects, individuals continue to start businesses. A better understanding of the individual decision to start a business and the potential impact of heuristics and biases on this decision could be the key to solving these puzzles.

In the following sections, we focus on the influence of heuristics and biases on the decision to start a new business because this is arguably the most fundamental

decision characterizing entrepreneurial behavior. The success probabilities are unknown, resources are typically limited, experience may be scarce, and there is no safety net. While still uncertain, later decisions are typically based upon more experience, information, and resources.

HEURISTICS AND BIASES IN THE DECISION TO FOUND A NEW BUSINESS

The entrepreneurship literature often differentiates between the exploration and the exploitation of business opportunities.^{31, 32} According to Sarasvathy, decision theoretic frameworks normally used to explain that the exploration process suffers from some severe limitations.³³ In most decision theoretic approaches, decision alternatives are just assumed to exist, that is, they are exogenously given. Hence, it is not surprising that most of the literature in descriptive decision theory that underlies the heuristics and biases paradigm does not concern itself with situations where the objects to judge or the alternatives to decide upon are not given. Since this chapter builds upon this decision theoretic framework, we will also not deal with exploration and opportunity recognition processes.³⁴ Instead, we assume that at least one business opportunity and at least one other decision alternative are given.

Research on heuristics and biases has provided us with a general understanding of how individuals deviate from rationality in different decision situations. With a few exceptions that we will discuss in the context of specific examples, there is not much empirical research on the use of heuristics by entrepreneurs and the impact of biases on entrepreneurial decisions. Specifically, not much work exists on the relevance of these aspects for the decision of prospective entrepreneurs, although their possible relevance has been suggested in theoretical articles.^{35, 36}

From the perspective of economics and operations research, the decision whether to start a business may be seen as an optimization decision involving complex trade-offs.³⁷ To simplify, the decision maker is assumed to consider the opportunity costs of being an entrepreneur—typically determined by a job in a dependent position—as well as potential outcomes of different entrepreneurial opportunities and their probabilities of occurrence.³⁸ The decision to become an entrepreneur requires individuals to decide whether they actually want to exploit a business opportunity themselves by starting a business or if other courses of action are more desirable. Let us consider a simple example to illustrate the elements of this decision process and the role of perceptions.

Marie works for an advertising agency and writes promotional texts. She earns fairly good money and she is popular among her clients. She also thinks she could do a better job than her boss in running the company and has always dreamed about being independent. Thus, she considers starting her own advertising agency and believes she has fairly good chances to take some of her clients along. There is, however, the risk she will fail.

Her possible actions are to remain employed or to start her own company. Staying with her current job yields a safe income. Starting her own company bears the risk of failure. Marie knows from casual observation that those start-ups in the advertising business that manage to survive for at least three years usually continue to exist or provide their owners with a nice sum of money when the business is sold. She estimates that her own company would have an 80 percent chance of surviving for three years. Marie considers successfully running her own business to be the most desirable scenario with a utility value of 1. A start-up failure would be her least desirable scenario with a utility value of 0. Staying with her current job is not as attractive as being successful with her own venture, but clearly more attractive than failing, thus she attaches to this outcome a utility value of, say, 0.7. Given their probability of occurrence, remaining with her current job yields for Marie an expected utility of $1 \times 0.7 = 0.7$, whereas starting her own advertising agency yields $(0.8 \times 1) + (0.2 \times 0) = 0.8$. Because the expected utility of starting her own business is higher (0.8) than remaining with her job (0.7), Marie decides to dare her own venture.

Obviously, Marie's decision is highly sensitive to her personal preferences (the subjective utility values that she has assigned to each outcome) as well as to her perceptions of the outcomes and the associated probabilities. Her colleague Rachel had the same idea but was more skeptical about her business prospects: She estimated that her venture would only have a 50 percent chance of survival and was quite surprised when she heard about Marie's decision to start her own business. Although Rachel also shared Marie's preferences, she was less optimistic that running her own venture would yield a considerably higher income compared to her wage job. As a consequence, she evaluated the utility of staying in her current job at 0.85 compared to 1.0 for starting her own business. Evaluating her options, she decided to stay with her wage job (expected utility of 0.85 compared to 0.5 for her own venture).

This example illustrates the typical difficulties in business venturing decisions. Both the outcomes of the alternative actions and the probabilities of each outcome are not precisely known *ex ante*. The evaluation of expected outcomes and probabilities requires judgments based on individual perceptions: What information does the potential entrepreneur receive and how does she interpret them? Even when the individual has well-defined preferences and no doubts about the relevant time horizon, misperceptions of chances or outcomes can still yield suboptimal decisions.

POTENTIAL EFFECTS OF WELL-KNOWN HEURISTICS AND BIASES

We now discuss the effects on decision making of a number of well-known heuristics that are relevant for entrepreneurial decisions and point to some related empirical evidence. The heuristics and corresponding biases are taken from

behavioral decision theory and are grouped according to their common features. We present three distinct groups: reference-dependent behaviors, biases in probability perceptions, and biases in self-perceptions. Under reference-dependent behavior we include all situations in which behavior is influenced by a specific predetermined anchor, or reference point, that influences subsequent behavior. A rational decision maker should not react to these kinds of past experiences, or at least not very strongly. Under biases in probability perceptions, we include heuristics used to judge the probability of potential events that typically lead to deviations from an objective processing of information about probabilities. Finally, under biases in self-perceptions, we include biases indicating the tendency of individuals to judge their own behavior and abilities more favorably than they objectively should.

Reference-Dependent Behaviors

The most striking fact about human decision making is that all comparisons are made relative to some anchor, reference point, or aspiration level. Unlike standard or subjective expected utility theory, which assumes that individuals look at their final state of wealth, reference-dependent behaviors imply comparing potential outcomes of a decision with what you have or what you want to have or what you regard as a typical outcome. Hence, behavior becomes dependent on experiences, on expectations, and so on, in nonrational ways. Since these behaviors are relevant for individuals in general, we expect them to be also relevant for entrepreneurs and will discuss reasons why some of these behaviors may be stronger and others weaker when entrepreneurial behavior is concerned.

Escalation of Commitment

In the example opening the chapter, individuals had a tendency to invest the last million into the development of a radar-blank plane when \$9 million were already sunk, but they did not invest \$1 million without this history. In both cases, the success prospects were equally poor. This type of bias is called escalation of commitment and is not limited to strategic decisions with large monetary consequences but may as well apply to intimate personal relationships.^{39, 40}

How could this phenomenon be explained? The theory of cognitive dissonance suggests that individuals try to avoid situations where they have to deal with conflicting thoughts or emotions.⁴¹ Clearly, a revision of a previous decision leads to a cognitive conflict about which between the old and the new decision is right. According to Bem, individuals have a strong urge to perceive themselves as good decision makers.⁴² According to Baron, Staw and Ross, and Bobocel and Meyer, several factors such as feelings of responsibility for the initial decision, concerns about the loss of face, and the urge to justify one's initial choice to oneself may play a role in the genesis of this effect.⁴³⁻⁴⁵

Baron discusses a possible reason why entrepreneurs may be more prone to this behavior than others.⁴⁶ For example, after an individual has detected an opportunity and become a nascent entrepreneur, he or she may feel more and more committed to continuing in the business where more time and money have already been invested, even though the objective prospects may have turned out less favorable than expected. Hence, individuals tending to an escalation of commitment would be more prone to start businesses once they have detected an opportunity. These individuals will also exhibit a tendency not to quit their business, even if after some time they are only burning money.⁴⁷ A different explanation for this phenomenon is that individuals perceive the incurred losses as pulling them more and more below their aspiration level and hope that a final breakthrough investment will bring them back to the subjective break-even point. Even a small probability of success will be sufficient to make such additional investments subjectively attractive. This line of thought is related to what will be discussed in more detail under "Aspiration Levels and Reference Dependence."

Anchoring and Adjustment

Another heuristic frequently used by people in producing estimates is to start from some initial value and to adjust that value to yield a final answer. Thus, the term *anchoring* describes a phenomenon in which different starting points typically lead to different estimates for an identical problem, and in which these estimates are biased toward the initial value.⁴⁸ The initial value might be somehow suggested or it might be the result of some reasonable partial calculation or thought. Whatever the origin of the starting value, adjustments are typically insufficient.⁴⁹ This phenomenon may have significant implications for business venturing decisions.^{50, 51} A potential entrepreneur, for example, might try to estimate the potential profit of her new business by considering business reports in the media. She might know that the profit is likely to be biased upward because the media reports predominantly about successful enterprises. Yet, even if she knows this and adjusts her estimate, the anchoring and adjustment heuristic implies that in such situation she will be prone to make an insufficiently large adjustment, thereby overestimating her potential profit.

Although the processing of probabilities will be dealt with in a subsequent section, anchoring and adjustment is also relevant for probability estimation. A consequence is that people often overestimate conjunctive probabilities and underestimate disjunctive probabilities.^{52, 53} Conjunctive probabilities are relevant, for example, when the successful completion of a project requires each of a series of events to occur. Disjunctive probabilities are relevant, instead, when a particular event can occur if any one of a series of instances occurs. According to statistical theory, the overall probability of a conjunctive event is lower than the probability of each elementary event if the elementary events are independent. Vice versa, the overall probability of a disjunctive event is higher than the probability of each elementary event. The anchoring and adjustment heuristic

implies that people do not actually compute the correct probabilities but that they take the probabilities of the elementary events as starting points, and insufficiently adjust these probabilities up or down for disjunctive or conjunctive events, respectively. This has implications for the risk assessment of new ventures: The successful launch of a new business is clearly a conjunctive event. It requires the successful completion of each of a number of events, like finding a competent management team, acquiring necessary resources, finding a good location, hiring qualified staff, producing a product, and finding customers who are willing to pay a certain price for the product. Even if each of these events is very likely, the conjunctive probability can be quite low. As Tversky and Kahneman note, the general tendency to overestimate the probability of such conjunctive events leads to unwarranted optimism.⁵⁴

To the best of our knowledge, the only empirical study on this heuristic in the context of entrepreneurship is Lévesque and Schade's who show, in an experiment with students, that anchoring and adjustment are the major heuristics driving the time allocation decisions between developing a new business and holding a wage job.⁵⁵

Aspiration Levels and Reference Dependence

This is the most general phenomenon in the group of reference-dependent behaviors. Indeed, some of the above-mentioned behaviors can be traced back to aspiration levels and reference dependence. No one, including entrepreneurs, seems to be able to escape the strong behavioral tendencies to behave in this biased way: Individuals typically evaluate the attractiveness of an outcome not in terms of total wealth, but in terms of gains and losses compared to an aspiration level or a neutral state, such as the maintenance of the status quo. This neutral state or aspiration level is called reference point. According to prospect theory, decision makers transform the possible outcomes of a risky decision or prospect into subjective values.⁵⁶ A central feature of prospect theory is that people evaluate one and the same prospect as more or less desirable depending on their reference point, which determines whether outcomes are perceived as relative gains or a losses. People are usually risk averse with respect to gains (e.g., they would prefer a sure win of \$800 over an 85 percent chance to win \$1000, although the expected value of the risky outcome is higher) and risk seeking with respect to losses (they would prefer a chance of 85 percent to lose \$1000 and a 15 percent chance to lose nothing over a sure loss of \$800, although the expected value of the risky outcome is lower). Thus, according to prospect theory, how attractive someone perceives a risky alternative critically depends on what the point of reference is and whether the person believes to be in a win or loss situation.

Specifically, prospect theory implies that unemployed people should be more likely to attach higher subjective values to the possible gains from a new business and lower subjective values to possible losses compared to people who currently have a job. Hence, they should be expected to be more likely to start a business

but also more likely to fail (on average) than people who start a business from a neutral or gain position. Some empirical evidence supports this argument. Taylor and Ritsila and Tervo, for example, have shown that unemployment increases the chance that a person will make the transition to self-employment or to starting a business.^{57, 58} Also, Cooper et al. have shown that ventures founded by people who quit their previous jobs to pursue an entrepreneurial opportunity were more likely to survive three years than those who started businesses upon losing their jobs.⁵⁹ Finally, Reid and Smith have found that pull factors such as the detection of a business opportunity lead to a larger chance to survive than pull factors such as unemployment.⁶⁰ All these studies, however, do not allow differentiating between the explanation based on prospect theory and alternative explanation based on the fact that unemployed people face lower opportunity costs.

That reference dependence according to prospect theory is indeed an important phenomenon for entrepreneurial decisions can be more directly demonstrated via the risk-return paradox.⁶¹ Among others, Fiegenbaum and Thomas demonstrated the risk-return paradox in detail: Businesses with an above than average profitability exhibit a positive relationship between risk and return—which is consistent with risk-averse decision making.⁶² However, companies with a below-average performance exhibit a negative relationship between risk and return; a result that is consistent with risk seeking. These results have been found to hold in various countries such as the United States and Germany.⁶³ These results also hold in hypothetical questionnaires where, in a low performance situation, individuals opt for riskier investments.⁶⁴ Although the risk-return paradox has been demonstrated for all kinds of businesses, including large firms, its effect is of particular importance for entrepreneurs because start-ups typically operate below the entrepreneurs' aspiration levels. Entrepreneurs may start small and with negative returns, but most of them have higher goals. A potential implication is that entrepreneurs are risk taking in the beginning, but may become risk averse as they become successful.

The phenomenon is supported by some anecdotal evidence: Fred Smith, founder of FedEx Corp., facing a deep crisis of his company, went to the casino to gamble with a substantial part of the company's capital to save the enterprise (and won). Donald Trump, real estate tycoon, twice threatened by insolvency, got back to the top via some very risky real estate speculations. There is much reason to believe that such behavioral tendencies also occur among small-business owners and in business venturing decisions.

Reference dependence also works in the absence of risk. An entrepreneur may be satisfied if she reaches profitability in a given year, if the aspiration level was becoming profitable. However, if she compares her performance with that of a close friend who founded a business in the same year but has a much higher profitability, happiness may turn into unhappiness if the friend's performance becomes the aspiration level. This, in turn, may have severe consequences for the evaluation of future prospects.

Status Quo Bias

The status quo bias is defined as the tendency to select a previously chosen alternative disproportionately often.⁶⁵ Instead of an unbiased consideration of all available information in the decision-making process, most people have a tendency to rely on what they have chosen before, on what represents the actual state, or even what someone else has chosen for them and consequently is the status quo. Numerous empirical studies have demonstrated the relevance of the status quo bias for human decision making in various contexts.⁶⁶⁻⁷⁰ The status quo bias implies that people have a tendency to stick with the current state even if objectively better alternatives are available. Interestingly, this bias is contrary to what entrepreneurs are expected to do. For example, Schumpeter described entrepreneurs as revolutionary, unconventional individuals who break the routines.⁷¹ Thus, we would expect status quo bias to be of low or no importance for entrepreneurial behavior. Burmeister and Schade investigate in a quasi-experimental study whether entrepreneurs are actually less susceptible to the status quo bias compared to students and to bankers specialized in start-up financing.⁷² Their results suggest that bankers are more susceptible to a status quo bias than entrepreneurs. So in a way, entrepreneurs seem indeed to outperform other professionals when it comes to the status quo bias.

To summarize, this overview of the different facets of reference-dependent behaviors has described a variety of important behavioral phenomena and shown that, among them, some find entrepreneurial behavior to be more susceptible (such as in the escalation of commitment), while others (such as the status quo bias) find it to be less so. Clearly, most of these behaviors will need to be investigated more deeply in the context of entrepreneurial actions.

Biases in Probability Perception

In the category of biases in probability perceptions, we include heuristics used by individuals to judge the probability of potential events that typically lead to deviations from the objective processing of information about probabilities.

Availability

One way to assess the downside risk of a new business is to imagine the various difficulties it could encounter. Similarly, the upside risk of a new business could be assessed by thinking about entrepreneurs who succeeded in their markets. This procedure is called an availability heuristic. In general, an availability heuristic implies that people assess the probability of an event by the ease with which instances or occurrences of that event can be brought to mind.⁷³ This simple rule allows people to make guesses about probabilities because instances of common events are usually recalled better than instances of less frequent events. However, the availability of cues can also lead to systematic biases

because things other than frequency and probability influence the ease with which instances or occurrences can be recalled.

A bias can result from the retrievability of instances. An event or a class of events that are easily retrieved from memory appear more frequently than a class of equal frequency whose instances are, however, less retrievable. For example, knowing someone who has gone bankrupt with her business makes business failure appear more likely. Also, witnessing the business failure of a close friend will have a stronger effect on subjective probability judgments regarding business venturing than just reading about a business failure in the newspaper. Furthermore, recent occurrences are more likely to be available than occurrences in the far past: Presently, witnessing a business failure or a successful start-up can temporarily influence the subjective probability of the risk associated with a business venture if the availability heuristic is applied. Thus, if people assess risks and outcomes based on the availability heuristic and if their judgment is influenced by the ease with which a class or an event can be recalled, random events in the individual's environment that are totally independent from the prospects of her own business idea influence her judgment.

Imaginability can also lead to biased estimates of risks and outcomes. For example, a potential entrepreneur who considers her business idea to be unique will probably not rely on the statistics of the past or the experiences of other entrepreneurs to assess her prospects. Kahneman and Lovallo called such a perspective the inside view.⁷⁴ To evaluate the prospects of a business idea, the potential entrepreneur typically constructs several scenarios and evaluates their likelihood by the ease with which they can be constructed. In fact, such multiscenario calculations are often part of business plans that are submitted to banks and venture capitalists to seek funding. However, the ease with which the scenarios can be constructed does not always reflect their actual likelihood of occurrence and this mode of evaluation is prone to biases.⁷⁵ Hence, the upside chances of a new business might be evaluated by how vividly the entrepreneur can portray favorable scenarios. If the potential entrepreneur can easily imagine such scenarios, she might overestimate the likelihood of success of her business idea. Conversely, the chances of success might be grossly underestimated if the decision maker is very imaginative in thinking about possible difficulties and constructing unfavorable scenarios.

Overall, the influence of the availability heuristic on business venturing decisions has been discussed by various authors.^{76, 77} We are not aware, however, of any empirical test demonstrating, yet, the relevance and the performance implications of this heuristic on entrepreneurial behavior.

Representativeness

Representativeness, also called the law of small numbers, is the willingness to generalize and draw strong conclusions from small samples that do not represent a population.⁷⁸ Thus, in trying to answer the question whether some object or

event A belongs to or originates from class B, the representativeness heuristic implies that people search for similarities between A and B. If A closely resembles B, it is believed that it belongs to or originates from B, regardless of prior probability distributions or sample size.⁷⁹ This heuristic can help in formulating judgments and can enable quick decisions in situations in which only very limited information exist or the search for further information would not significantly reduce uncertainty. Thus, the representativeness heuristic should encourage a person to exploit entrepreneurial opportunities because they often have only a limited window of opportunity and require quick action based on very limited information. In this sense, the belief in the law of small numbers may be beneficial to entrepreneurs.

Yet, it may also lead to biased judgments that result in poor decisions. For example, an entrepreneur may be unduly encouraged by limited feedback from two potential customers who state they would buy the new venture's proposed product or from articles in the press that report about successful new ventures.⁸⁰ Although generalizing from a small sample may in principle lead either to overly optimistic or pessimistic judgments, some scholars argue that individuals are more likely to utilize limited amounts of positive information which result in overly optimistic forecasts.^{81, 82} Consequently, people who rely on the representativeness heuristic tend to ignore base-rate probabilities and underestimate risks such as, for example, the high average rate of new business failures. Busenitz and Barney found evidence that entrepreneurs are more likely to follow the representativeness heuristic than managers.⁸³ In other words, they are more likely to use rules of thumb rather than accurate statistical analysis to guide their decisions. This may suggest that entrepreneurs and managers have different cognitive decision-making styles. Looking at students' responses to a survey based on a teaching case about entrepreneurial activity, Simon et al. found evidence that individuals who showed a strong tendency to generalize from small samples had lower perceptions of risk and a higher tendency to start new businesses.⁸⁴

To summarize, biases in probability perception are likely to influence entrepreneurial behaviour. The heuristics that typically lead to such biases often help an individual to make decisions in situations with limited information about actual probabilities and distributions. In this sense, they might be beneficial or even necessary for entrepreneurial behavior that often requires action despite prevailing uncertainties, but they may also lead to suboptimal decisions.

Biases in Self-Perception

In the context of behavioral decision theory, the third and last group of heuristics and corresponding biases is biases in self-perception. In this category, we include biases indicating the tendency of individuals to judge their own behavior and abilities more favorably than they objectively should.

Self-Serving Bias

Individuals differ in the way they make attributions, that is, they exhibit different tendencies when identifying whether the causes of positive or negative events are external (outside world) or internal (within the individual).⁸⁵ Watkins et al., for example, have shown that depressive individuals have a tendency to attribute success to the outside and failures to internal causes, whereas individuals falling prey to a self-serving bias attribute positive developments to internal causes and negative developments to external causes (bad luck, etc.).⁸⁶ As an example, think of a student attributing all successful exams to his own superior skills and preparation, and all failed exams to professors having had a bad day when inventing the (clearly unfair) exam. According to Baron, entrepreneurs may be more prone to self-serving biases than other people.⁸⁷

Indeed, a self-serving bias may facilitate the decision to start a new business. Specifically, the bias may have a twofold impact. (1) If failures in former occupations have mostly been attributed to external causes, trying it on your own may be a logical consequence. (2) If successes have been mostly attributed to oneself, chances of surviving as an entrepreneur will be judged to be higher than they objectively are. Along similar lines, Baron suggests that the self-serving bias might be one driver of entrepreneurial overconfidence.⁸⁸

Illusion of Control

The illusion of control is another bias that influences individuals' perceptions of risks and outcomes.⁸⁹ It occurs when individuals erroneously believe they are in control of a situation when, objectively, they are not. This has important implications because usually there is a causal link between skill or effort and performance, whereas success in luck or chance activities is apparently unrelated to skill and effort. The seminal study by Langer showed that people often do not distinguish these two concepts correctly.⁹⁰ For example, people in Langer's experiment demanded a significantly higher price to sell a lottery ticket they had selected themselves than a control group who did not have a chance to self-select their ticket. Obviously, whether a lottery ticket wins or not entirely depends on chance. Yet, people in the experiment demanded a premium for self-selected lottery tickets, erroneously believing the value (the winning chances) of this ticket to be higher.

A consequence of the illusion of control is that individuals believe that they can influence largely uncontrollable events, which makes them more optimistic about the expected outcome and more confident in their ability to correctly predict that outcome. Duhaime and Schwenk have interpreted the illusion of control as a reaction of individuals to alleviate discomfort with uncertainty.⁹¹ Managers with an illusion of control may generate overly optimistic performance estimates and are more likely to engage in risky decisions.⁹²⁻⁹⁵ This, in turn, may ultimately influence the performance of their business.

There is also some evidence that an illusion of control is positively related to an individuals' propensity to start a business: Boyd and Vozikis found that individuals' beliefs in their ability to control outcomes affect their intentions to start businesses.⁹⁶ Also, Simon et al. found evidence that an illusion of control negatively affects perceived risk and positively affects the chance of starting a business.⁹⁷

Overconfidence

There are different ways to perceive yourself or the outside world too optimistically. Perceiving a risky environment far too optimistically is typically referred to as overoptimism and may be due to already discussed concepts such as availability or illusion of control. Within this context, overconfidence is about self-perception although the term has been used in different ways. For example, the term has been used to describe an excessive belief in the precision of private judgments. Overconfidence has also been used to describe people's tendency to overestimate their own performance and, finally, to describe the so-called better-than-average effect, where respondents believe they perform better than the average individual.^{98, 99}

A number of studies have shown that most people are overconfident about their own relative abilities and unreasonably optimistic about their future.^{100, 101} It is also well known that the vast majority of people claim to be above average on almost any positive trait, although of course, only half can actually be above average.¹⁰² Thus, this concept is closely related to self-efficacy, that is, the belief in one's own ability to perform a given task.¹⁰³ Overconfidence is greatest for difficult tasks, for forecasts with low predictability, and for undertakings lacking fast, clear feedback.¹⁰⁴⁻¹⁰⁷ Given the complexity of factors that influence the possible success or failure of a new business, the lack of fast and clear feedback, and the high uncertainty of the outcome, it is not surprising that potential entrepreneurs should tend to be overconfident. Perhaps overconfidence may also contribute to the high level of self-efficacy found among entrepreneurs.^{108, 109}

Overconfidence leads people to follow their own judgment instead of paying attention to the information or advice provided by others, to disregard discomfoting information, or to neglect the skills of competitors.¹¹⁰⁻¹¹² Thus, overconfidence encourages people to exploit opportunities and to enter markets. In fact, there is robust empirical evidence showing entrepreneurial decisions to be related to overconfidence. Cooper et al. report that one-third of the new business founders they surveyed were certain of their success and 81 percent believed their chances of success to be at least 70 percent.¹¹³ Respondents also estimated their chances of survival to be much higher than those of other comparable companies. Yet, at the time of Cooper et al.'s study, 66 percent of all newly founded businesses were failing. Along similar lines, Camerer and Lovallo conducted an incentive compatible market entry experiment and found that subjects overestimate their chances of success.¹¹⁴ More surprisingly, they also found

that overconfidence in success is even higher when subjects know that their success will depend on their skills. According to Mahajan, not even experience helps against overconfidence. In a study with marketing managers, those with the broadest job experience exhibited the largest degree of overconfidence.¹¹⁵ Aldrich found that entrepreneurs often overstate their own skills and abilities, and Bhide found evidence that entrepreneurs exploit opportunities despite a lack of competitive advantage.^{116, 117}

It is important noticing, however, that despite evidence that entrepreneurial decisions are probably related to overconfidence and that many entrepreneurs seem to start their businesses with erroneously optimistic beliefs about their abilities, overconfidence may not be such a bad thing after all. There can be situations in which the benefits of being overconfident clearly outweigh the costs. For example, some people might start a business with the erroneous belief that they have the sufficient skills and experience for doing so. But just starting may help them to acquire the skills and the experience that they actually need.¹¹⁸ Also, there is some evidence that confidence is actually positively related to success. Kalleberg and Leight, for example, studied the survival of a sample of owner-managed small businesses in Indiana.¹¹⁹ They found that owner's confidence in their ability to run the business reduced the likelihood that the firms would go out of business over the observed period.

To summarize, biases in self-perception such as the self-serving bias, illusion of control, and overconfidence can all lead to overly optimistic judgments about business prospects and have been found to facilitate the decision to start a business. Thus, biases in self-perception may help to explain the high failure rates of young businesses and the comparably low average financial returns on entrepreneurial activity.

CONCLUSION AND FUTURE RESEARCH

Although the list of perceptual phenomena is not exhaustive, it suggests that the expected outcomes and probabilities of entrepreneurial decisions are likely to be affected by heuristics and biases. On the one hand, heuristics may help in managing the complex task of assessing uncertain future prospects and might even be necessary to act quickly in an uncertain environment without wasting time and resources. On the other hand, they might also lead to miscalibrated judgments and suboptimal entrepreneurial decisions. Previous research has indicated that entrepreneurs are more likely to fall prey to certain biases (e.g., overconfidence, representativeness) and less likely to fall prey to others (e.g., the status quo bias). Yet, there is still much need for further empirical studies on the relevance and types of how other heuristics and biases (e.g., anchoring and adjustment heuristic, availability, aspiration levels) apply specifically to entrepreneurs. For example, it would be interesting to test whether suboptimal reactions to recent events have a measurable influence on business start-up decisions.

Lacking appropriate data, experimental methods provide a useful approach to tackle these issues.

Closely related to the question whether perceptual biases influence start-up decisions, is the question whether these biases have any implications for the performance of newly founded businesses. Existing evidence on this topic is scanty. Which of these perceptual biases is potentially harmful to performance? An interesting approach to study the performance implications of perceptual biases could be a longitudinal survey of new business founders that would include psychometric items measuring individual perceptions, miscalibrations, and preferences.

Also, Koellinger and Minniti and Koellinger et al. have shown surprisingly large differences in how individuals perceive themselves and their environment across countries and social groups, leading to strong implications for start-up activity.¹²⁰⁻¹²² To what extent are these differences in individual perceptions influenced by culture, institutions, or public policy? How would changes in institutions and public policy, for example, influence entrepreneurial activity and the way people perceive their individual prospects?

Finally, as we also discussed, the very nature of entrepreneurial decisions makes them susceptible to some perceptual biases and likely to lead to overoptimistic judgments. For example, the conjunctive nature of a successful business launch (each of a series of events must occur for a successful launch) lead to overoptimistic judgments due to the anchoring and adjustment heuristic. The complexity and uncertainty surrounding business ventures and the lack of fast and clear feedback make it also highly probable that people will make overconfident judgments. On the other hand, without the presence of overoptimistic judgments, we would probably see fewer business start-ups, but higher average returns and success rates among those who become entrepreneurs.

Overall, it is far from clear whether overconfidence in individual behavior yields a positive or negative social return: It may be that unsuccessful businesses create negative externalities for society (e.g., if the costs of their failure have to be paid—at least in part—by others). But it may also be that even the overconfident and unsuccessful entrepreneurs generate positive returns to society by generating valuable information (knowing that something is a bad idea can be very valuable).

Our discussion has emphasized that people frequently rely on simple heuristics and are affected by biases when making decisions in complex and uncertain environments. This is particularly relevant for entrepreneurial behavior because taking advantage of business opportunities often requires quick decisions without complete knowledge of all facts and probabilities. The frequent use of heuristics and biases implies a deviation of the decision maker from fully rational predictions of behavior. Although this might lead to suboptimal outcomes in some situations, it might be beneficial or even necessary in other situations. We believe that a further investigation of these issues is a highly relevant and interesting field for future entrepreneurship research.

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