

Foundations and Trends[®] in Entrepreneurship

**Experiments on Entrepreneurial Decision
Making: A Different Lens Through Which to
Look at Entrepreneurship**

By Christian Schade and Katrin Burmeister-Lamp

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Christian Schade¹ and Katrin Burmeister-Lamp²

¹ *Humboldt-Universität zu Berlin, Germany, cds@wiwi.hu-berlin.de*

² *Humboldt-Universität zu Berlin, Germany,
katrin.burmeister-lamp@wiwi.hu-berlin.de*

Abstract

In this paper, we propose that researchers might analyze key questions in entrepreneurship as problems of decision making. We believe that this allows for new insights. Experiments are especially suited to empirically test hypotheses derived within such a framework. In this paper, we thus introduce the decision-making perspective as well as general characteristics of the experimental method. We also discuss existing experimental studies in entrepreneurship with respect to the use of a decision-making perspective and specifics of their experimental designs. Finally, we present “research cases” that demonstrate the shift in perspective that occurs when common questions in entrepreneurship are analyzed through the lens of decision making. We conclude that entrepreneurial decision making (EDM) bears the potential of a scientific paradigm. This paper is intended to stimulate theory development to establish such a paradigm and (experimental) research within the perspective of EDM.

1

Introduction

A number of authors in entrepreneurship have used the term entrepreneurial decision making (EDM) to label their contributions (e.g., Busenitz and Barney (1997), Lévesque and MacCrimmon (1997), Forlani and Mullins (2000), Simon and Houghton (2002), Mullins and Forlani (2005), Lévesque and Schade (2005), Gustafsson (2006)). By the use of this term, each author may have had something slightly different in mind, but the general idea always traces back to decision theory: sometimes of the kind more rooted in economics and sometimes of the kind more rooted in psychology. Despite subtle differences, the joint perspective of economic and psychological approaches is to look at individuals' choices among alternatives as the object of investigation (Schade and Koellinger, 2007). For a psychologist a decision is a rich phenomenon involving all kinds of cognitive, emotional, motivational, judgmental, perceptual, personal, and environmental factors (Kunreuther and Krantz, 2007).¹ For a mainstream economist, factors

¹Common distinctions are made between normative decision theory and descriptive decision theory (the latter having much in common with cognitive psychology) as well as normative and descriptive game theory (the latter having much in common with social psychology). Whereas the two normative theories try to answer the question how one should behave

such as emotions and perceptions are typically not dealt with in detail (or not at all).

Investigating entrepreneurial decision making might imply having a specific perspective on entrepreneurship. It implies the analysis of key questions in entrepreneurship research as decision making of entrepreneurs and of other individuals in entrepreneurial contexts. This is different from general research on decision making because it looks at specific individuals in a specific context. Entrepreneurs have been demonstrated already to decide differently than others (see, Busenitz and Barney (1997) and Burmeister and Schade (2007)), and there are contexts specific to entrepreneurship. This makes it necessary to study entrepreneurship as a separate management discipline. According to Baron (1998), the behavior of entrepreneurs differs from that of other individuals because entrepreneurs either self-select into this career path or are shaped by the specifics of the environment: uncertainty, high-stakes decisions, short windows of opportunity, etc.

Why is the investigation of decision making a specific “lens”? With the word lens we refer to the fact that every individual and specifically every researcher has an idiosyncratic way of looking at the same research object. The idiosyncratic perspective is formed by the researcher’s original training, knowledge, and his or her openness for different perspectives. Let us demonstrate the effect of applying the EDM lens by looking at “classic” questions in entrepreneurship. We use those questions that were covered in the first issue of the *Journal of Business Venturing* in 1985 (see also Alvarez (2007)) because they are still reflective of a vast majority of research endeavors in entrepreneurship. The first question, “who is the entrepreneur?” has been analyzed earlier in the so-called trait approach and has also been dealt with in cognitive psychology.

What is the specific EDM take on this question? An example is the study of Burmeister and Schade (2007). In this research, entrepreneurs, bankers, and students are confronted with exactly the same decision situations. However, entrepreneurs appear to exhibit a so-called status

(if he or she intends to be rational — how difficult a convincing definition of rationality might be!), the descriptive parts deal with the question how people actually behave.

quo bias to a lesser extent in their decisions than bankers. Therefore, the authors can safely conjecture that entrepreneurs make decisions differently than other individuals. Unlike psychological questionnaires on individual characteristics that have been used in the trait approach,² these differences are established somewhat closer to the actual “playing ground,” than everyday decisions that individuals make.

The second question, “how do entrepreneurs raise capital?” can be dealt with as a decision process too; however, not only the entrepreneurs but also the venture capitalists (VCs), bankers, etc. are relevant decision makers, here. In contrast to the first question, a decision-making perspective has been adopted earlier for this question, e.g., in conjoint experiments.

With the third question, “how do entrepreneurs manage rapid growth?” literature mostly adopted a fairly aggregated (i.e., organization level) perspective, whereas a decision-making perspective would imply analyzing these problems more directly, e.g., by having entrepreneurs making decisions on growth related investments, organizational changes, etc.

“What impact do networks have on entrepreneurial phenomena?” is the fourth question. Here a sociological perspective is adopted in most of the literature. Namely, the structure of networks between organizations is the level of analysis. A decision-making perspective would focus on the decision of an entrepreneur whether or not to contact a specific person and whether to maintain this relationship or simply on how much to invest into networking rather than problem-solving activities.

The fifth question is “what role does corporate entrepreneurship have?” Different methods are employed that are more or less focused on individuals or higher units of aggregation. Sometimes, the focus is on decisions of individuals or groups, and sometimes on companies or products. While the view on aggregated units is not consistent with an EDM perspective, the view on the decision making of individuals or groups is.

²The trait approach refers to an extensive body of literature that tried to identify a specific entrepreneurial personality in the 70s and 80s of the last century (see, e.g., Brockhaus (1982)).

Summing up, EDM is a perspective bearing the potential of being applied to many research questions in entrepreneurship. Apparently, this perspective has specific requirements regarding the information needed to analyze a research question and it might lead to a shift in focus. For example, a network analysis from the perspective of EDM would partially shift the focus away from the resulting social network structure and draw attention to the determinants of the entrepreneur's decision, whom and how to contact in order to establish a business relationship. The information needed is much more detailed than the information required to understand the structure of the network. The researcher would have to know the information the entrepreneur possesses about the potential partners, her goals and restrictions, and her long-term strategy. In many cases, additional information on her risk propensity, professional background, and social skills would be helpful. Since such detailed information requires controlling, measuring, or manipulating a variety of factors with each individual, experiments are often a method of choice.

This paper tries to make the point that EDM opens an important perspective on entrepreneurship that contributes to our knowledge and is complementary to other perspectives. It might have the potential to become a research paradigm. When the researcher decides to adopt this perspective, it is important to understand which of the different kinds of experiments is appropriate in each situation.

The experiments we are going to propose are often different from those currently used to analyze entrepreneurial cognition or heuristics and biases. An example is a quasi-experiment analyzing whether entrepreneurs are more overconfident than managers, e.g., Busenitz and Barney (1997) propose a test of overconfidence where, instead of making decisions, individuals are asked general knowledge questions. Busenitz and Barney (1997) also conduct a test of the representativeness bias in the same publication — a decision experiment of the type we are going to propose. Here, subjects are given scenarios representing various types of what the authors call real-to-life strategic decisions.

This paper continues with a characterization of the decision-making perspective: it defines the structure of a decision-making process and analyzes an example. We then suggest a classification of experiments,

explain different experimental designs, describe quality criteria of experiments and address the differences between economic and psychological experiments. The subsequent section discusses existing experimental work on entrepreneurial decision making. In the next section, we develop three “scientific cases” where we start with existing theory, we then delineate the decision-making take on the respective problems, and finally we develop experimental designs to analyze the resulting questions. The final section addresses the question whether EDM might have the potential for becoming a research paradigm and how applying this perspective might contribute to the development of knowledge in entrepreneurship.

2

Characterizing the EDM Lens: Theoretical Definition and Example

Any decision process consists of 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.

According to Connolly et al. (2000, p. 4) an individual needs four types of information for selecting the best alternative:

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?

Two different factors moderate the decision process: (1) Individual preferences have an impact on how a person evaluates the attractiveness of an alternative and (2) the heuristics an individual uses may lead to biases. Specifically, from an economic perspective and under the assumption that information is not asymmetrically distributed, only the individual preferences lead to behavioral differences

between individuals in a situation. From a psychological perspective, the perception and processing of information as much as the (intuitive) optimization process (Lévesque and Schade, 2005) used by individuals influence the selection of a preferred course of action.

To illustrate the use of experiments for the investigation of an entrepreneurship phenomenon within a decision-making framework, we use the following example: Several econometric studies show that entrepreneurs on average tend to work longer hours for lower average wages than employees (Parker et al., 2005; Carrington et al., 1996; Hamilton, 2000). Without the decision-making perspective, i.e., without considering the individual decision-making process, these studies could only consider macroeconomic variables such as tax policy or insurance systems for entrepreneurs that might influence entrepreneurs' labor supply. Adopting the individual decision-making perspective, i.e., the methodological individualism from microeconomics or a psychological perspective, allows for many additional explanations of the results in econometric studies. For example, Parker et al. (2005) interpret the significant effect of entrepreneurs' income variability on labor supply as self-insurance. Specifically, they find that if entrepreneurs respond to greater income variability by working harder to make their income larger, they end up working longer hours than employees do. However, such individual-based interpretations of econometric studies remain speculative due to two main reasons. First, the causal relationship between variables cannot be clearly identified in econometric studies. Second, omitted unobserved variables that moderate the relation between two variables may lead to alternative explanations. An alternative explanation of the results in Parker et al. (2005) might be that management qualities differ between individuals. Someone who has difficulties in managing her daily business has to work longer for completing the same task and besides external factors this lack of efficiency may lead to income variability.

Using an experiment for the research question why entrepreneurs work longer average hours than others would circumvent the above mentioned problems. Experiments do not *ex post* apply the decision-making perspective to some econometric results but already before the data are collected, i.e., when the research hypotheses

are stated. Through direct or indirect control, an experimenter can then establish causality and additionally exclude alternative interpretations by measuring potentially important variables such as risk propensity.

What is the advantage of adding a decision-making perspective? Does it help us to understand phenomena in entrepreneurship better? The major advantage of applying the EDM perspective to understanding, e.g., the time allocation of entrepreneurs, appears to be the closeness to actual entrepreneurial behavior potentially leading to higher external validity — contrary to the fact that laboratory research is often considered artificial (Campbell and Stanley, 1963; Schade, 2005).

Second, important antecedents of decisions on time allocation can only be understood via experimental manipulation. This point is illustrated in the example above where we speculate about alternative explanations for the high labor supply of entrepreneurs.

Finally, in entrepreneurship the behavior of the *individual* is often the main focus. For example, questions such as why some individuals found a venture and others do not or why entrepreneurs recognize opportunities that others do not illustrate the main avenues in entrepreneurship research. Shaver and Scott (1991) pointed out that despite the failure of entrepreneurial trait research it was still the individual who created a new venture. This statement was meant to imply that although the psychological trait approach did not deliver coherent results on the entrepreneurial personality, the individual as the creator of the new firm might still be worth being investigated.

We would like to suggest that economic decisions of entrepreneurs are often the appropriate level of analysis since decision making is at the core of entrepreneurial activities. Hence, we expect that experimental studies comparing economic decisions of entrepreneurs with those of other individuals will lead to more consistent patterns of behavioral differences between entrepreneurs and others than applying a trait approach.

We acknowledge, however, that often it is inevitable to look at entrepreneurship phenomena on a meso or macro level. Either there is a lack of individual-level data, or it is impossible to get such data (Schade, 2005), or there are effects that might be called “system dynamics” that

actually require macro analysis; what happens on a macro level cannot easily be understood by aggregating individual-level data. An example would be the analysis of regional development that cannot be inferred from individual decisions because of, e.g., network externalities (e.g., Bass (1969) and Minniti (2005)).

3

Experiments as a Research Method

So far we explained two general advantages of the use of experiments for our purposes: (1) in an experiment, the EDM approach to concentrate on the individual is translated into an appropriate research design that also focuses on the individual; (2) experiments are a superior solution to the internal validity problem of empirical research (the influence of third variables is controlled and causal relationships can be established). Besides these two advantages, experiments are especially suited to investigate entrepreneurial decision making also due to an additional reason. In entrepreneurship many objects and relationships to be researched are dynamic or are embedded in a *dynamic* environment. These dynamics potentially threaten the reliability of ostensibly identified relationships in field studies. Only with experimental control, the factors of interest may be discriminated from “noise” of other rapidly changing factors (for a detailed reasoning see Schade (2005, p. 409)).

The first economic experiments were thought experiments in which the author constructed a hypothetical problem and suggested a solution (e.g., Allais (1953) and Bernoulli (1954)). The reader could agree or disagree on the proposed solution. No results of other individuals were reported and also no incentives were available (Sorensen, 1992).

Since thought experiments were not appropriate to test more complex real-life phenomena, researchers further developed the experimental methodology (Pogrebna, 2007).¹

Those who explicitly attempt to classify experiments will notice that there are many possibilities and no classification so far leads to sharply bounded categories (see, e.g., Kagel and Roth (1995, p. 22)). For experiments in entrepreneurship research such a classification was not yet attempted. We would like to introduce such a classification. Harrison and List (2004) define six dimensions to describe *field* experiments (see also Pogrebna (2007)): nature of the subject pool, nature of the information that the subjects bring to the task, nature of the commodity, nature of the task or trading rules applied, nature of the stakes, and nature of the environment that the subjects operate in. However, since we do not restrict our analysis to field experiments, we propose the modified classification in Table 3.1. Note that the transitions between the categories are sometimes blurred.

With natural experiments in the field, the manipulation oftentimes results from an event occurring outside the experimenter's control such as testing a new learning program only in a subset of schools (the other schools becoming the control group). However, the selection of a subgroup of schools analyzed in the study may have been the result of an experimenter's decision, too. Hence, what discriminates a natural experiment from laboratory experiments is not necessarily the degree of control but rather the artificiality of the testing environment in the latter. According to Harrison and List (2004, p. 1014), in natural experiments "... the environment is one where the subjects naturally undertake these tasks and where the subjects do not know that they are in an experiment." Prominent examples for natural experiments are studies on risk taking behavior in game shows (e.g., Blavatsky and Pogrebna (2008)) and the attempts to manipulate naturally occurring betting markets (Camerer, 1998).

Opposite to natural experiments, economic experiments in the laboratory allow the experimenter to manipulate different treatments

¹There are important examples for thought experiments in philosophy, and thought experiments might sometimes help understanding basic premises of behavioral theories. As an empirical tool, however, their use is somewhat limited because of a lack of reliability, objectivity, as well as internal and external validity.

Table 3.1 Classification of experiments suitable for research on entrepreneurial decision making.

	Economic experiments		Hypothetical experiments				
	Natural experiments in the field	Between-subject design	Within-subject design	Between-subject design	Within-subject design	Conjoint experiments	Quasi-experiments
Predominant subject pool	Nonstudents	Students, nonstudents in a mobile lab	Students, nonstudents	Students and nonstudents			
Environment	Natural	Artificial but context can be manipulated					
Stakes	High	Usually low but high stake decision can be implemented via <i>ex post</i> random draw Bolle (1990)	High	None (if there are monetary incentives, they are not coupled to performance)	Depending on economic versus hypothetical setup		
Incentives for participation	High	High	None or flat payment for participation				
Manipulation	Difficult	Conditio sine qua non					

explicitly. However, due to this manipulation the artificiality of the context increases compared to natural experiments. In entrepreneurship research, most laboratory experiments test (behavioral) game theoretic predictions such as overconfident behavior with market entry (e.g., Camerer and Lovo (1999)).² Hybrid forms of experiments are those conducted in a mobile laboratory (see Harrison et al. (2002 and 2007) and Burks et al. (2007)). These author teams install a laboratory in the natural context of a nonstudents subject pool such as a trade fair and at the same time present controlled artificial treatments to the subjects. Stakes are usually low unless subjects playing for real are determined randomly *ex post* (a technique introduced by Bolle (1990) and applied by Schade et al. (2002); more details are provided in subsection 4.4).

Hypothetical experiments do not include any performance-dependent payments but only a flat participation fee that is not related to an individual's decision behavior, or nothing is paid at all. Since subjects are mostly not required to come to the laboratory but the experiments are carried out in the form of questionnaires, hypothetical experiments of this type are often used to investigate entrepreneurs' or managers' behavior; the latter having high opportunity costs so that traveling to the lab may just be too "expensive." We subdivide hypothetical experiments with respect to the experimental design: between-subject, within-subject, and conjoint experiments — the first two are also relevant with economic experiments. We also include quasi-experimental studies which compare different natural groups of subjects confronted with the same conditions (i.e., no experimental manipulation but rather a selection of individuals). Quasi-experimental studies are also relevant with economic experiments.

Before we describe the experimental studies in entrepreneurship, we further introduce the experimental method and its characteristics. Section 4 is mainly based on the seminal publications of Campbell and Stanley (1963) as well as Friedman and Sunder (1994). Whereas the former authors adopt the general perspective of experiments in social sciences, Friedman and Sunder (1994) concentrate on economic experiments.

²We consider the paper by Camerer and Lovo a contribution (also) to entrepreneurship although the authors or some readers may not agree.

4

Experiments

4.1 Experimental Designs

Depending on the research question, researchers are usually interested in the effects of a few variables only: the focus variables. However, when measuring the effect of *focus* variables, researchers should keep track of several other variables of little or no direct interest, the *nuisance* variables, because they may affect the results. Which variables are focus variables and which are nuisance variables depends on the research question. With the help of different experimental designs, researchers can disentangle the effects of variables, i.e., they can avoid confounding the effects of two or more variables (Friedman and Sunder (1994, p. 21)). For example, Burmeister and Schade (2007) focus on the status quo manipulation in their study but also measure variables such as gender and years of professional experience. Typically, the effect of focus variables is theoretically developed in a paper whereas nuisance variables are measured because prior research or the researcher's intuition gives some hints for possible effects.

Friedman and Sunder (1994) differentiate between direct experimental control via constants and *treatments* and indirect control via *randomization*. Controlling a variable directly in an experiment implies

that either the variable is kept constant at some convenient level or two or more different levels of a variable are chosen that the researcher expects to influence the dependent variables. For example, if it is supposed that outcome variability influences the entrepreneur's choices as in Forlani and Mullins (2000), an experiment can test the effect of different values of this variable (e.g., high vs low outcome variability). The variables that are controlled at two or more levels are called treatment variables.

If it is difficult or even impossible to control certain variables, researchers often apply indirect control. For example, a subject's fatigue or boredom is often not adequately measurable. According to Friedman and Sunder (1994), such uncontrolled nuisances might cause inferential errors if they are confounded with the focus variables. Staying with the study by Forlani and Mullins (2000), a third unobserved variable such as having experienced a negative profit in the past might moderate the relationship between outcome variability and the entrepreneur's choices. Randomization is a remedy because it provides indirect control of uncontrolled or even unobservable influences by ensuring their independence of treatment variables. A successful randomization should ensure that the fraction of entrepreneurs with negative profit experiences is about the same in both groups. The basic idea is to assign chosen levels of the treatment variables in a random order. For example, when subjects arrive, a researcher should not assign all the early birds to one treatment and the late arrivals to the other treatment (Friedman and Sunder, 1994). If the assignment is randomized, researchers can be confident that, e.g., the entrepreneur's choices result from differences between the treatments and not from unobserved third variables.

Campbell and Stanley (1963, p. 6) expressed the core idea of experiments in the following way: "Basic to scientific evidence is the process of comparison, of recording differences, or of contrast. Any appearance of absolute knowledge, or intrinsic knowledge about singular isolated objects, is found to be illusory upon analysis. For such a comparison to be useful, both sides of the comparison should be made with similar care and precision." Investigating the success of a government program to foster entrepreneurship requires the comparison with a control group that is not treated by the program. Omitting such a comparison group

does not allow for reliable results. How these comparisons are supposed to be made is a matter depending on the situation. Textbooks such as Campbell and Stanley (1963) as well as Levine and Parkinson (1994) describe the advantages and disadvantages of different experimental designs for different situations extensively. Experimental designs that vary levels of the focus variable across subjects are typically called between-subjects designs and those that use several different levels for each subject are called within-subjects designs (Friedman and Sunder, 1994, p. 25).

4.2 Quality Criteria

The quality of an empirical study may be examined with three criteria: internal validity, external validity, and reliability.¹ The most important quality criterion is internal validity: “Internal validity is the basic minimum without which any experiment [or other empirical study] is uninterpretable: Did in fact the experimental treatments make a difference in this specific instance?” (Campbell and Stanley, 1963, p. 5). The second quality criterion, external validity, is defined as follows: “External validity asks the question of generalizability: To what populations, settings, treatment variables, and measurement variables can this effect be generalized?” (Campbell and Stanley, 1963, p. 5). Reliability is the third important quality criterion for empirical research. It is considered a major criterion for research in psychology and economics (Krahn et al., 1997); hence it should be important for entrepreneurship research as well. It addresses the degree of accuracy or error-freeness of a measurement (for a definition see Green and Tull (1988, pp. 253–256); see also Nunnally and Bernstein (1994)). Reliability is often measured via the ratio of true variance of the variable over total variance of the measure.

Often, validity criteria are perceived as being in conflict. The typical chain of arguments looks like this: A highly controlled environment, i.e., the laboratory, facilitates high reliability and high internal validity;

¹ Objectivity is another quality criterion that is related to replicability of a study. We are not dealing with the objectivity problem in this paper because dealing with this criterion goes far beyond our introductory thoughts on experiments.

however, it often reduces external validity. Hence, controlled laboratory experiments often score on the first two by sacrificing the third. However, this “rule” may not always hold in entrepreneurship research. In situations characterized by high dynamics, questionnaires, field experiments, and other activities outside a controlled environment may lead to mere snapshots of reality. In such situations, a controlled laboratory experiment may also lead to higher external validity (for a detailed reasoning see Schade (2005)).

4.3 Experimental Subjects

Researchers who have to make a decision about the subject pool might consider the following dimensions: students vs nonstudents, novices vs experts in the domain of the experimental task, graduates vs undergraduates, volunteers vs draftees, acquaintances vs strangers, and males or/and females (Friedman and Sunder, 1994). Although the choice of the population for an experiment has to be determined for each research question separately, in this section we would like to reproduce some of the controversial discussions on students and professionals as experimental subjects.

In the early management literature, the argument prevails that students are a narrow and special segment of the general population and thus undermine the external validity of experiments (e.g., Cunningham et al. (1974) and Enis et al. (1972)). Fleming (1969) and Alpert (1967) also cast doubt upon the validity of using students as subjects in business decision research.

On the other hand, the literature on experimental economics suggests the following reasons for the use of students in experiments: (a) researchers have a ready access to the subject pool, (b) it is convenient to recruit students on university campuses where most of the research is carried out, (c) students have low opportunity cost, (d) students have a relatively steep learning curve, and (e) they have a lower tendency to confound external information with the experimental task (Friedman and Sunder, 1994, p. 39).

Those researchers that criticize the use of students in experiments should know that the use of business professionals may solve some

problems but create others (Friedman and Sunder, 1994, p. 40). For example Burns (1985) reports on an experiment with professional wool buyers and students that should test a progressive auction type. The author reports that the wool buyers in this experiment reacted not to the opportunities and incentives present in the experimental market but to those present in other situations with which they were familiar. In order to measure reactions to experimental conditions, it is unproductive to choose subjects whose prior experience is contrary to the current design requirements, for they will have difficulty in adjusting to a new frame of reference and will consequently have a suboptimal behavior (Burns, 1985, p. 152). Abbink and Rockenback (2006) refer to the observation that professionals transfer routines of every day work situations to the lab situation as the “curse of knowledge.”

To resume the controversial opinions, we believe that it is essential for a researcher to carefully analyze the appropriateness of different subject pools for his research. In case entrepreneurs or managers with their experience and personal characteristics are the main focus of the research question, they should be chosen as subject pools. On the other hand, students are the better subjects when, e.g., the efficiency of different market mechanisms should be investigated and confounding effects with external information are expected.

However, we feel that the parallel use of students and entrepreneurs may often provide a more complete picture. In this regard, new methods or technologies such as mobile labs, web-based experiments, and experiments in virtual worlds may facilitate to reach professionals and to investigate their behavior under controlled conditions. Using mobile computers allows participation in entrepreneurs’ fairs or meetings, instead of hoping that entrepreneurs come to the laboratory or living with the limitations of experiments on the Internet or questionnaires sent by email or regular mail. Using mobile labs, researchers can produce the controlled environment of experiments whilst overcoming the problem of getting practitioners into the lab. Even though this methodology is only in its infancy, Elston et al. (2005, 2006) measured the risk attitudes of entrepreneurs in an incentive-compatible manner and investigated a market entry decision of entrepreneurs by using a mobile lab at an entrepreneurship fair.

Gatewood et al. (2002) conducted a web-based experiment and discussed the advantages and disadvantages compared to traditional laboratory experiments. With web-based studies the time frame to conduct an experiment is not limited and no particular time and place of participation has to be announced to potential subjects. (An exception would be a simultaneous game where every subject has to participate at the same time because the interaction between different subjects is of main interest.) However, potential advantages of web-based studies may easily turn into disadvantages. Gatewood et al. (2002) report on high variance of page hits and viewing times, suggesting the possibility of measurement problems. Whereas very long viewing times might be interpreted either as subjects carefully considering their decision but also as subjects parallelly engaging in some additional activities, short viewing times may indicate that some of the subjects just clicked through the task.

4.4 Actual vs Hypothetical Decisions

Experiments have a long tradition in psychology especially when individuals, instead of organizations, are the object of interest. However, there are some major differences between experiments in psychology and experiments in economics. The major difference is that the experimental economics paradigm requires monetary incentives coupled to an individual's performance (she may get, e.g., €3 for a poor decision, but €20 for an excellent decision in an economic experiment). Another difference is that in economic experiments, there is no cheating on the side of the experimenter. This implies that economic experiments are more costly and less flexible. Possible payment levels and potential subjects are restricted since you can ask people to *imagine* winning €1,000,000 but not actually pay them such a large amount of money. Only students' behavior may be influenced by performance dependent payments given the average *level* of payments an experimenter can afford. However, Bolle (1990) suggests how experimenters can afford to implement high stakes decisions without overrunning their experimental budget. Schade et al. (2002) applied this technique and investigated the willingness-to-pay for an insurance policy protecting a painting or a sculpture. It was

announced that only one painting and one sculpture would be originals, each worth 2,000 DM; if they were forgeries, they would have a value of zero. All participants knew that two persons in the experiment would have the original art objects and that these individuals would be determined by a random draw. Thus individual decisions involving large stakes were made as if the art objects were real without stressing the experimenter's budget too much.

However, when the level of payments is satisfactory and their variation sufficient, the major advantages of such performance based payments are the incentives to actually concentrate on the experimental stimuli (and react to them) and hence the measurement accuracy. Economic experiments are therefore called incentive compatible (see, e.g., Smith (1994), Friedman and Sunder (1994), Camerer (1995), Kagel and Roth (1995)).

The theoretical basis of incentive compatible economic experimentation is the Induced Value Theory of Vernon L. Smith (1976), one of the two 2002 Nobel laureates in economics (the other being Daniel Kahneman), where *monotonicity* (more is better than less), *saliency* (impact of the quality of an individual's decision on expected payoffs from the experiment, and the respondents' awareness of this relationship), and *dominance* (nothing is more important for the respondent's utility than the experimental payoffs) are required of economic experiments. An example for the violation of monotonicity is that a respondent prefers a sure transfer of € 12 to a sure transfer of € 20. An example for the violation of saliency is that a better decision in an experiment does not lead to a higher expected payoff or that the relationship is not clear from the experimental instructions (e.g., both good and bad decisions seem to lead to a payoff of € 12). From our perspective, the dominance criterion is the most questionable criterion. Dominance is violated when individuals chose the alternative they would "like" more or chose an alternative that is displayed in their preferred color on the computer screen in the laboratory (e.g., the one with the "red button") instead of reacting to the monetary incentives. The strict compliance of the dominance criterion would negate any framing effects and thus an important stream of literature (e.g., Tversky and Kahnemann (1981)). Moreover, the neglect of naturally framed decision scenarios would

lead to a higher artificiality of lab experiments. We propose that the dominance axiom should be purposely violated or tested like for example in Weber and Zuchel (2005) who test the effects of prior outcomes on risk attitude in a portfolio decision and in a (neutrally framed) two-stage betting game.

If the above requirements are met, according to Nobel laureate Vernon Smith's parallelism concept, results will carry over to the world outside the laboratory. Propositions about the behavior of individuals and the performance of institutions, which have been tested in laboratory microeconomies, apply also to nonlaboratory microeconomies where similar *ceteris paribus* conditions hold (Smith, 1982, p. 936). It is the burden of the researcher to state what is different about the outside world and might change results observed in the laboratory (Friedman and Sunder, 1994, p. 16). Since we suggested violating the dominance axiom, one might be skeptical that our results will still hold in the world outside the laboratory. However, we expect them to even be more predictive, as long as the framings used in the experiment match with the situation outside the laboratory that is supposed to be predicted.

5

Experimental Studies on Entrepreneurial Decision Making

In Table 5.1, we distinguish decision experiments from nondecision experiments and only the design of the decision studies will be described in greater detail. From our perspective, this distinction is important and useful. All studies that investigate individual decision-making behavior are consistent with our EDM perspective including the step that would directly precede such a decision — the comparison of the attractiveness of economic alternatives. Although experiments that analyze knowledge, (distortions of) perceptions and beliefs, as well as general evaluations might be perceived as potentially leading to decisions as well, they are somewhat farther away from them. Up to now, experiments on knowledge, perception, etc. are far more frequent than decision experiments. Table 5.1 reports on such studies. Some of the decision experiments are reported two or three times in this table because they belong to several categories, i.e., they are quasi-experimental and contain between and/or within-subjects manipulations.

5.1 Quasi-experimental Papers

The studies containing quasi-experimental elements illustrate the importance of comparing different groups of individuals in

Table 5.1 Experimental studies in entrepreneurship: discriminating between studies within and outside the EDM perspective.

	Quasi-experiments	Within-subjects experiments	Between-subjects experiments
Decision experiments (including judgment of economic alternatives)	<ul style="list-style-type: none"> • Palich and Bagby (1995). • Busenitz and Barney's (1997) study on the representativeness bias. • Bouckaert and Dhaene (2004): strategic. • Burmeister and Schade (2007). 	<ul style="list-style-type: none"> • Forlani and Mullins (2000). • Mullins and Forlani (2005). • Lévesque and Schade (2005). • Burmeister and Schade (2007). <p><i>Conjoint experiments:</i></p> <ul style="list-style-type: none"> • Riquelme and Rickards (1992). • Muzyka et al. (1996). • Franke et al. (2006). • Moore and Cain (2007): strategic DM. 	<ul style="list-style-type: none"> • Krueger and Dickson (1993). • Camerer and Lovallo (1999): strategic. • Gatewood et al. (2002): judgment. • Mullins and Forlani (2005). • Lévesque and Schade (2005). • Elston et al. (2006): strategic. • Burmeister and Schade (2007).
Nondecision experiments but rather experiments on the measurement of knowledge, (distortions of) perceptions and beliefs, general evaluations, etc.			
		<ul style="list-style-type: none"> • Begley and Boyd (1987). • Cooper et al. (1988). • Kaish and Gilad (1991). • Busenitz and Barney's (1997) study on overconfidence. • Baron (1999). • Mitchell et al. (2000). • Amit et al. (2000). • Baron et al. (2001). • Mitchell et al. (2002). • Peterman and Kennedy (2003). • Baron and Markman (2003). • Forbes (2005). • Maurer and Schade (2006). • Baron and Ensley (2006). • Baron et al. (2006). • Souitaris et al. (2007). • Brundin et al. (2008). • Fiet and Patel (2008). 	

entrepreneurship research. This research is in line with Shane and Venkataraman's (2000, p. 218) major research questions in entrepreneurship: "why, when, and how some people and not others discover and exploit (...) opportunities."

A considerable amount of entrepreneurship literature deals with the comparison of entrepreneurs and nonentrepreneurs, mostly managers. By contrasting both groups' responses to the same stimuli, researchers try to better understand entrepreneurs and to move toward a theory of entrepreneurship. Papers on entrepreneurial cognition (Mitchell et al., 2007; Busenitz and Lau, 1996) are a representative segment in entrepreneurship that is built upon qualitative and quasi-experimental methods. However, these studies do not apply a decision-making perspective but analyze processes that are more distant from economic decisions.¹ In the following, we present some examples for experiments that apply the decision-making perspective in the field of entrepreneurship.

Busenitz and Barney (1997) investigate how entrepreneurs and managers differ in their tendency to be overconfident and fall prey to the representativeness bias. We classify this study as a quasi-experiment since it compares the behavior of two natural groups and does not use any experimental manipulation. This study offers a nice example for both a decision-making and a nondecision-making experiment. Whereas their test of the representativeness bias involves decisions in two different scenarios (purchase of a major piece of equipment and an automation update decision), they test overconfidence with different knowledge questions (e.g., Which cause of death is more frequent in the US? (A) cancer of all types (B) heart disease) that we do not

¹In the following, some examples for (quasi-)experimental studies in entrepreneurship that do not adopt a decision making perspective are described: Forbes (2005) determined variables that influence overconfidence of entrepreneurs and managers. Baron (1999) compared the tendency for counterfactual thinking between three natural groups — entrepreneurs, potential entrepreneurs, and nonentrepreneurs. Baron and Ensley (2006) contrast novice and experienced entrepreneurs with regard to their opportunity detection abilities. Kaish and Gilad (1991) compare characteristics of company founders and executives of a large company. Baron and Markman (2003) investigate social competence of entrepreneurs in two different industries. Begley and Boyd (1987) also compare founders and nonfounders with respect to psychological characteristics, financial performance, individual, and firm characteristics.

consider economic decisions or evaluations directly preceding them. The authors find that entrepreneurs are more overconfident and fall prey to the representativeness bias more often than managers.

Palich and Bagby (1995) compare how entrepreneurs and nonentrepreneurs perceive strengths and weaknesses of business opportunities. Although the subjects in this study do not directly make a decision but rather evaluate strengths and weaknesses of a business opportunity, we incorporate it in our framework because evaluations of the reported kind would directly precede a decision on these opportunities.

The study of Bouckaert and Dhaene (2004) investigated Belgian and Turkish businessmen playing an inter-ethnic trust game. This game was not played in the laboratory but it was conducted almost simultaneously in the entrepreneurs' shops or homes. In the first stage of a trust game, player 1 decides how to split a given amount of money between himself and player 2. The amount that is transferred to player 2 is then tripled by the experimenter. In the second stage, player 2 decides how to divide the amount received between himself and player 1. The amount of money that is transferred is often interpreted as an indicator of trust. This experiment is incentive-compatible since the entrepreneurs' decisions and the decisions of their counterpart fully determine the payoffs. Interestingly, the amount transferred in the second stage was larger than the amount of the first stage irrespective of ethnic type. This study is a good example of how experiments may be conducted in the field without losing control.

5.2 Experimental Papers with a Within-Group Manipulation

A within-subject design was used by Forlani and Mullins (2000) to investigate the role of entrepreneurs' risk perception and risk propensity in the venture founding process. Instead of comparing different groups of individuals or relying on a between-group manipulation based on randomization, these authors presented a set of four different stimuli to the subjects. Specifically, entrepreneurs evaluated four hypothetical ventures that differed on the two dimensions outcome variability and potential loss. Forlani and Mullins (2000) found that risk propensity and the evaluation of the perceived risk for each venture

significantly influences entrepreneurs' choices. An argument against a within-subject-design would be that subjects have difficulties distinguishing between their decisions in different scenarios or that the decisions are not independent. Specifically, the high income variability of the first venture description emphasizes variability. Hence, individuals may weigh this attribute more when they evaluate the second venture than if this decision were not preceded by a high-variability venture. It is well-known from behavioral decision theory that prior experiences or more general framing effects influence the decision making of individuals (e.g., Tversky and Kahnemann (1986)). A possible solution that mitigates this problem is to vary the sequencing of different scenario descriptions. Since Forlani and Mullins (2000) rotated the venture descriptions and did not report on any significant differences in the choice behavior, we can abstain from possible order effects in this study.

5.2.1 Conjoint Experiments as a Subgroup of Within-Subjects-Design Experiments

Conjoint experiments are an established research method for the analysis of multi-attribute decision making. The method has its roots in cognitive psychology and marketing and is mostly used to understand the importance of attributes with new products (Green and Srinivasan, 1978). Introducing conjoint analysis to entrepreneurship, Riquelme and Rickards (1992, p. 508) state that the method “has potential for use in almost any scientific field where measuring people’s perceptions or judgments is important.” According to their preferences, respondents in an experiment have to rank a set of different products that are described or illustrated on multiple dimensions (full-profile ranking). In entrepreneurship research these profiles are often different venture descriptions that are ranked by VCs according to their investment preference (e.g., Riquelme and Rickards (1992), Franke et al. (2006), Shepherd (1999), Zacharakis and Meyer (2000)). Shepherd and Zacharakis (1999) consider conjoint analysis as a real-time method that eliminates many biases resulting from *post-hoc* methodologies such as recall difficulties and *post-hoc* rationalization. In order to get a better

understanding of the research questions that are investigated with this method, we provide some example studies.

In their pilot study, Riquelme and Rickards (1992) investigated how VCs select start-ups for financing. They found that there are two stages of evaluation. In the first stage, VCs focus on a small subset of criteria (here: entrepreneur's experience and the existence of a prototype) in a noncompensatory way. Applying noncompensatory decision rules means that an unacceptable value on an attribute dimension cannot be compensated by a high value on another dimension. Thus, venture descriptions that lack a prototype and entrepreneur's experience are immediately eliminated from the process of further evaluation. In a second stage, VCs only consider those ventures that reach the predefined value on the two dimensions: existence of a prototype and entrepreneur's experience. In this second phase, the evaluation is based on compensatory decision rules, i.e., a low but acceptable value on one dimension can be offset by a high value on another. Riquelme and Rickards (1992) identified expected product gross margin and the existence of a patent as the most important criteria in this phase. We think that this paper has opened conjoint analysis the door to entrepreneurship research. The authors stimulated various further studies on decision criteria of VCs. Despite its merits, for critical purposes we have to mention that only six VCs participated in the study and evaluated 30 full profile business start-ups.

Franke et al. (2006) used this criticism as a starting point and increased the number of participants in order to investigate VCs' decision criteria. These authors use the heuristics-and-biases perspective as a theoretical background for their study and find that VCs favor teams that are similar to themselves in type of training and professional experience. Opposite to previous studies (with the exceptions of Shepherd et al. (2003), Zacharakis and Shepherd (2001)), Franke et al. (2006) do not assume that VCs objectively (or unbiased) assess new venture quality but also fall prey to cognitive biases like most individuals. Franke et al. (2006) used a conjoint data design in order to vary the characteristics experimentally. They collected 20 evaluations from 26 VC firms in three cities. Since the characteristics of the venture team were identified as predominant in the evaluation process

(Zopounidis, 1994), the authors only experimentally varied team characteristics and left prototype and patent existence, cost saving potential as well as potential customers unchanged across all venture profiles. This procedure is comprehensible in order to reduce the number of profiles. However, the systematic within-subject variation of team characteristics might have made these dimensions more salient compared to other nonteam related dimensions. Although we know that team characteristics are predominant in VCs decision-making processes, with this experimental design the predominance might have been even more pronounced or primed than we would expect with actual financing decisions. Considering only the contribution of team characteristics to the evaluation of new ventures might induce bias compared to the “true” underlying decision mechanism. However, the issue that frames, priming, and elicitation procedures influence decision behavior is known for a long time (Tversky et al. 1988 and 1990). We are not able to propose an easy solution to this issue but we think researchers that conduct empirical studies should at least be aware of this effect and probably discuss the robustness of their results in the light of these phenomena.

Opposite to the previous conjoint studies, Muzyka et al. (1996) investigated which *trade-offs* in investment criteria European VCs make and thus did not use venture descriptions with the full set of criteria. According to the authors, this multi-attribute procedure has advantages when the investigated attributes are not environmentally correlated. In a first step, Muzyka et al. (1996) identified 35 individual criteria from the literature and from interviews with VCs. For the analysis, these 35 criteria were grouped into five general categories. Similar to the other studies that investigate decision criteria of VCs, Muzyka et al. (1996) identified management team criteria as the most important ones. Product-market criteria appeared to be only moderately important. The fund and deal characteristics were ranked as least important.

5.3 Experimental Papers with a Between-Group Manipulation

Although we analyze the study of Burmeister and Schade (2007) in the between-subject-design section, it also has quasi-experimental

and within-subject-design characteristics. The between-subject design results from the classic measure of the status quo bias. The effect that people overproportionately often decide for the status quo option is measured between groups. Each individual was either assigned to a treatment group in which one option from the choice set is emphasized as the status quo or to the neutral nonmanipulated control group. With this design, we were able to measure the strength of the status quo bias for each group of individuals (entrepreneurs, students, and bankers). This comparison between natural groups is the quasi-experimental part of the study. Furthermore, in order to test the status quo bias in different situational contexts, each subject made six choices in both consumer and business contexts. Manipulating different contexts (e.g., buying a digital camera or renting new office space) within-subjects is a common procedure.

Building on their study from 2000, Mullins and Forlani (2005) used a 2×2 between-subjects experiment to investigate the influence of sources of funding for the venture and suitability of the entrepreneur's skills on the decision for a new venture. The use of a between-subject design by the same author team for a similar question emphasizes the differences between both types of manipulation. Whereas we assume in a within-subject manipulation the spillover effects of prior scenario descriptions on the subsequent scenarios to be quite low, a between-subject design signals that such spillover effects may bias decision behavior to a larger extent. Thus according to Mullins and Forlani (2005), variability of outcome and size of a potential loss may lead to no or a negligible spillover effect and are therefore manipulated within-subjects. On the other hand, source of funding and personal experience are varied between-groups since their variation in sequential descriptions is expected to impact subsequent decision-making behavior.

The internet-based study of Gatewood et al. (2002) investigates how the type of feedback (positive or negative) impacts on expectations regarding a future business start-up. The authors used undergraduate business students for their investigation. First, students completed an Entrepreneurial Attitude Questionnaire, a 35-item instrument to measure beliefs about one's entrepreneurial attitudes and values (Shaver et al., 1996). Afterwards, the subjects randomly received a positive or

negative feedback about their potential as an entrepreneur regardless of actual ability. Of course, subjects believed that this feedback was based on the first survey instrument. Gatewood et al. (2002) provided 48 different feedback possibilities in total in order to avoid that students get the same feedback when they were sitting next to each other by chance in a laboratory. Afterwards, students read a business case and were instructed to answer five questions about the future potential of the new venture. In the third and last part of the questionnaire, the authors measured subjects' expectations for starting a business in general. Subjects were informed that three winners of a monetary prize would be chosen based on their performance answering the case questions. This is an interesting form of compensation since it sets incentives for a diligent completion of the questionnaire without directly relating each decision to monetary consequences. It turned out that neither effort nor the quality of the answers to the case study questions is significantly influenced by the kind of feedback. However, individuals receiving positive feedback about their entrepreneurial abilities had higher entrepreneurial expectations than individuals receiving negative feedback. Gatewood et al. (2002) consciously chose student subjects since with entrepreneurs their prior real success may influence their expectations. Thus, the authors directly avoided the problems that Burns (1985) reported on using professionals.

Lévesque and Schade (2005) rely on business and economics students for testing benchmark predictions from an economic model that the authors complement with predictions based on behavioral decision theory. In their paper, the authors first investigate how individuals distribute their time between leisure and working activities and second how individuals divide their working time between their newly formed venture and a wage job. The experiment contains four factors that are manipulated either within or between subjects. Specifically, Lévesque and Schade (2005) vary work tolerance between groups (8 hours vs 12 hours). Moreover, each subject had to decide on the number of hours to be allocated to a new venture for multiple situations (within-subject factors): low versus high venture leverage, increasing versus decreasing rate of return from time allocated to the venture, and low versus high wages. The use of an experiment is the only appropriate research

method since the model's conditions are predetermined and too complex to test in reality. Of course, testing the theoretical predictions with a subject pool of actual entrepreneurs and using incentive-compatible mechanisms are further advancements that are worth doing in order to investigate the question of time allocation. Lévesque and Schade (2005) find that subjects do not rationally optimize but rather use the anchoring-and-adjustment heuristic and tend to avoid extreme values when determining the number of working hours they assign to the newly formed venture. Moreover, subjects' risk attitude influenced decisions and new ventures were perceived too risky relative to wage jobs.

Krueger and Dickson (1993) examined the effect of self-efficacy on perceptions of opportunity and threat. Instead of measuring self-efficacy, the authors manipulated this attribute in their student sample. The experimental design looks as follows: subjects reported basic measures of their perceptions of self-efficacy and received two separate decision tasks (a choice dilemma and a gamble) that they had to evaluate with respect to opportunities and threats. The experimenter then appeared to evaluate these "results" while subjects completed some filler questions. In a 2×2 design, subjects were then randomly assigned to receive either positive or negative feedback on the "quality" of their decision making in the two tasks. Within each task, the authors varied decision context (business vs personal) and domains (loss vs gain). The study's results suggest that perceptions of opportunity and threat appear to derive significantly from personal perceptions of self-efficacy and from differences in decision context or domain.

5.4 Economic Experiments on Strategic Decisions

This section analyzes economic experiments. Since there is no single published study implementing outcome-dependent payoffs in non-strategic decisions within the domain of entrepreneurship,² we will only report on strategic experiments. Such experiments that satisfy the tenets of Induced Value Theory (Smith, 1976) are still rare

²There is one hitherto unpublished experiment by Schade and Lévesque that has been described in Schade (2005).

in entrepreneurship research. Since our definition of entrepreneurial decision making not only comprises decision making by entrepreneurs, VCs, or corporate managers but also decision making by students in entrepreneurial situations, we also review studies such as the one by Camerer and Lovo (1999). We think that the following studies have great potential to stimulate research in entrepreneurship. They implement incentive-compatible mechanisms and link them to entrepreneurial tasks, therefore avoiding disadvantages resulting from hypothetical decision making. As already mentioned, the studies focus on situations where the outcome of a decision does not only depend on subjects' own behavior and the state of nature (decision theory) but additionally on others' behavior.

Camerer and Lovo (1999) explore whether optimistic biases influence entry behavior into competitive markets. They relate overconfident behavior and business failure that is often observed with new ventures. With the help of an experimental design the authors are able to measure personal overconfidence and economic market entry behavior simultaneously. Although the participants in Camerer and Lovo's experiments are undergraduate students and MBAs, the specific nature of the experimental task, market entry decisions, qualifies it as research in terms of the EDM perspective. Their market entry game is based on experiments by Kahnemann (1988). In a nutshell, N players simultaneously choose to enter a market or not. Communication between players is not allowed. The individual payoffs depend on whether the market capacity c is fully exhausted (payoffs are zero), undershot (payoffs are positive), or exceeded (payoffs are negative). For Kahnemann (1988), it "looked like magic" that the number of entrants lies typically in the range $[c - 2, c + 2]$.

Camerer and Lovo (1999) extended the original experiment in four ways: (a) payoffs depend on subject's rank (relative to other entrants), (b) ranks depend on either a chance device, or on a subject's skill on trivial pursuit or sports related questions, (c) subjects in some experiments are told in advance that the experiment depends on skill (and hence, more skilled subjects presumably self-select into the experiment), and (d) subjects forecast the number of entrants in each period. Individuals' payoffs depending on skill are much more realistic than

situations where all entrants earn the same payoff as it was assumed in earlier market entry experiments. The recruiting method (standard or self-selection based on skill) was manipulated between-subjects. The two types of ranking mechanisms (depending on chance or on skill) were manipulated within-subjects. The sequence of both mechanisms was varied to control for order effects. Being informed about the size of the market (ranging between 2 and 8) and the ranking mechanism, subjects decided to enter the market or not in 24 rounds. One group comprised 12 to 16 individuals that simultaneously decided. Furthermore, participants forecasted the number of individuals that they expect to enter each round.

The only feedback that individuals received after each decision was the number of total entrants in that round. After all market entry decisions were made, subjects solved the quiz and their skill rank was determined and announced. The main result of the study is that excess entry into a market is much larger when individuals' payoff not only depends on market size and others' behavior but also on their own skill. Camerer and Lovallo (1999) call this phenomenon reference group neglect. Subjects apparently neglect the fact that they are competing with a reference group of subjects who all think they are skilled, too. This study clearly demonstrates how payoffs generally or specifically influence individual behavior. In general, payoffs depending on individual behavior are better than no payoffs or a fixed show-up fee that cannot be influenced by the participant. Specifically, this study shows that payoffs depending on own behavior and on own skills leads to different behavior than payoffs depending on own behavior and luck. When designing experiments it is very important that researchers consider the payoff mechanism carefully because it can induce different behaviors.

Moore and Cain (2007) based their research question on the paper of Camerer and Lovallo (1999) and used the same incentive-compatible mechanism in order to determine individual payout. However, they suggest that individuals perceive their own skills better than that of others only when the quiz or the task is easy. When the questions are more difficult to answer, Moore and Cain (2007) expect subjects to estimate their own skills lower than the skills of others leading to

under-entry into a market. In order to test their hypotheses, the authors included another within-subject treatment: difficulty of the quizzes. To rule out idiosyncratic effects of order, the authors systematically varied the sequence in which subjects encountered the three different ranking mechanisms (random, difficult, and simple). And they were able to confirm their hypotheses: in the average simple-rank round significantly more individuals entered the market than in the average difficult-rank round. Also, confidence regarding one's competitive performance depends on the type of competition. Specifically, easy tasks do not always elicit more overconfidence than chance tasks. In difficult-rank rounds, most individuals overestimate others' performance, which deters them from entering the market.

Since both studies (Camerer and Lovallo, 1999; Moore and Cain, 2007), investigated market entry behavior and overconfidence with students, we think it would be very interesting to replicate the studies with entrepreneurs and intrapreneurs. Investigating the market entry behavior of these groups of individuals would add another realistic component to the experimental setting. Of course, we know from Burns (1985) that there are difficulties when nonstudents face relatively clean experimental settings. However, we believe that the systematic variation of subject groups in experiments (from undergraduates to MBAs to entrepreneurs or VCs) very much contributes to our understanding of entrepreneurship.

Elston et al. (2006) already conducted a reduced version of Camerer and Lovallo's (1999) market entry experiment with actual entrepreneurs at two Small Business Innovation Research (SBIR) National Conferences. As Moore and Cain (2007), they varied the difficulty of the skill questions but in a different way: *difficult* questions were open-ended and *simple* questions were the same questions but in form of multiple-choice. Before answering these trivia questions, subjects decided whether to enter a market or not. Each subject was endowed initially with 10 USD for participating 15 minutes in this study. Opposite to Camerer and Lovallo (1999), Elston et al. (2006) used only a market capacity of one, leading to the fact that only one person earned a payoff according to his or her skills when nobody else entered the

market. The authors find that the entry behavior significantly differs *within* the group of entrepreneurs. Specifically, part-time entrepreneurs perceive themselves as being more skilled than others and believe only a small number of others to enter. However, counterintuitively they are very reluctant to entering the market. On the other hand, entry behavior does not differ between full-time entrepreneurs and employees. The level of difficulty of the trivia questions had no influence on individuals' behavior. Thus, the authors conclude that they cannot support other authors' hypothesis that entrepreneurs excessively over-enter due to overconfidence. However, not only the subject group (entrepreneurs vs students) differed between Elston et al.'s (2006) and other studies, but the number of decisions each individual made (1 vs 24) as much as the market capacity were lower (1 vs 2–8) than in Camerer and Lovo (1999).

A study by Boewe et al. (2009) offers some interesting preliminary findings on how strategic entrepreneurs are. For the example of an R&D investment decision with technological spillovers (i.e., where individuals are able to copy innovations from each other), they find that a group of IT entrepreneurs (labeled strategy practitioners) seems to be less strategic in their decision making than a group of business and economics students (labeled strategy theorists). Specifically, whereas students often make use of clues helping them to (dis-)coordinate their investments, a large fraction of entrepreneurs seems to be better characterized by an "inside view," i.e., they do not pay much attention to the situation of the others. Their decision to invest or not invest into R&D is made independently of other individuals.

5.5 Intermediate Summary

The knowledge generated in the above experimental studies on entrepreneurial decisions is substantial. The studies draw the picture of a boundedly rational, highly biased entrepreneur that engages in innovative activities, is willing to expect positive developments, tends to take more risk than other individuals, and is more open to change. We believe that applying the decision-making perspective and using experiments has added to our knowledge of "who the entrepreneur is."

What we know may still be a little but it makes curious for more. What we want to say with this is that, if the few existing studies applying the decision-making perspective and using experiments already add considerably to our understanding of entrepreneurs, than we should carry out more of them. The following section therefore outlines possibilities of applying the decision-making perspective to established questions in entrepreneurship.

6

“Scientific Cases”: How EDM Might Change the Way We Look at Things

In the following, we will demonstrate the strength of our approach by re-analyzing existing research questions or reinterpreting existing theory. This will be done through the lens of entrepreneurial decision making. Each of the three hypothetical “research cases” will end with some thoughts on how such problems could be analyzed experimentally.

6.1 Integrating Individual Decisions into the Dispersed Knowledge View of the Entrepreneurial Firm

Dew et al. (2004) suggest an entrepreneurial theory of the firm that is based on dispersed knowledge. Figure 6.1 depicts such a situation. Whereas the knowledge chunks *a*, *b*, and *c* are idiosyncratic for individual 1 (no other individual has the same knowledge), *e*, *f*, *g*, and *h*, are idiosyncratic for individual 2, and *j* as well as *k* for individual 3; however, *d* is shared by individuals 1 and 2 and *i* is shared by individuals 2 and 3.

According to Dew et al. (2004), three phenomena arise from the fact that the knowledge of different individuals often shows only

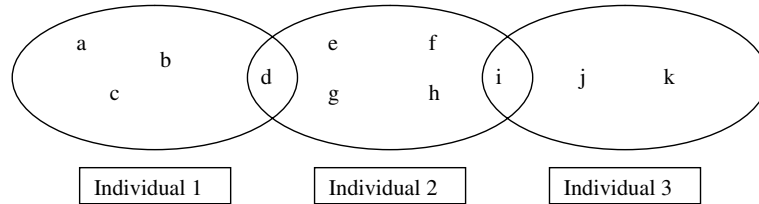


Fig. 6.1 A graphical representation of the phenomenon of dispersed knowledge (characters represent knowledge chunks); own representation.

limited overlap. First, this situation leads to genuine uncertainty that necessitates the firm as a contractual formation. Second, the dispersion of knowledge and the genuine uncertainty contribute to heterogeneous expectations that are the prerequisite for some individuals to exploit the potential of the firm. Finally, dispersion of knowledge, genuine uncertainty and heterogeneous expectations induce the nexus of the enterprising individual and the opportunity to discover, create, and exploit new markets. The three components explain why new firms are created.

Although this theory is extremely valuable, direct empirical tests are still lacking. From our perspective, an empirical test becomes possible when the perspective is shifted toward individual decision making. Assume that all the knowledge chunks in Figure 6.1 would be necessary to be able to predict the success of some new business perfectly, but that some of the chunks would be more important than others. Let us further assume that limited communication between individuals 1, 2, and 3 would be possible. Such a situation could be implemented in the experimental laboratory. Provide three individuals with information of the structure provided in Figure 6.1, give them the respective investment opportunity with real monetary payoffs, and give them the possibility to communicate one round where each information chunk can be sold between individuals. The outcome of such a process could be taken to approximate a real market situation with dispersed knowledge. Theory tests could be carried out by manipulating the degree of information exchange, the degree of knowledge dispersion, etc.

6.2 Entrepreneurial Cognition Research: Back to the Thinking-Doing Link by Refocusing on Decision Making?

Research under the umbrella of entrepreneurial cognition increased during the last years and Mitchell et al. (2007) provide a vivid description of the development in the field. In their paper, Mitchell et al. (2002, p. 97) define “entrepreneurial cognition as the knowledge structures that people use to make assessments, judgments or decisions involving opportunity evaluation and venture creation and growth.” This definition seems to equally weigh decision making, assessments, and judgments. However, this perspective has changed during the last couple of years toward the central research question “How do entrepreneurs think?” — thus away from entrepreneurial decision making (Mitchell et al., 2007).

This new emphasis eclipsed the impact of entrepreneurial thinking about actions. This is mirrored in the contributions to entrepreneurial cognition that could be categorized as (1) the use of heuristic-based logics, (2) perceptual processes, (3) the entrepreneurial expertise approach based on information processing, and (4) the effectuation approach. Here, the investigated cognitive processes are rarely related to entrepreneurial decision making. However, we think that a reanimation of the “thinking–doing” link (Mitchell et al., 2007) would help integrating research on entrepreneurial cognition into the management literature and deriving practical implications for entrepreneurs. Moreover, this link allows a direct confrontation of predictions from cognitive psychology and microeconomics for specific decision situations.

Mitchell et al. (2007) already acknowledge upcoming changes to entrepreneurial cognition research: besides emotions and affect, they refer to an emphasis on entrepreneurial action as an important avenue for their research. The theoretical paper by McMullen and Shepherd (2006) also puts forward the simultaneous consideration of motives, means, and opportunities as prerequisites of entrepreneurial action.

An important question in entrepreneurial cognition is how entrepreneurs deal with information. The typical entrepreneurship take on this is to compare the information *processing* of novice and expert

entrepreneurs via verbal protocols (Sarasvathy et al., 1998; Gustafsson, 2006). This stream of research leads to valuable insights and may not easily be transferred into a decision-making approach. However, the EDM take on this is to look at the decision to invest resources to *acquire* information. This is a quite different perspective and opens the floor for new and different kinds of insights. For example, in an unpublished study by Schade and Lévesque described in Schade (2005), students in a laboratory decide on when to enter a market with risky outcomes. This experiment manipulates the way information on potential R & D financing is presented, leading to different evaluations of the entry opportunity at different points in time. Individuals are paid based on their performance, and the latter depends on random variables and the time of entry. The authors find that a higher objective quantity and quality of information does not necessarily improve the decision.

6.3 Time Allocation of Entrepreneurs

In this subsection, we want to explore further our earlier example (see Section 2). We already demonstrated that asking the question of how entrepreneurs allocate their time into different activities is *per se* a decision-making problem. Several hypotheses on why entrepreneurs work on average longer working hours than employees could be tested in an experiment. Among them, Parker et al.'s (2005) interpretation that entrepreneurs' high income variability leads to the higher labor supply could directly be evaluated. Such an experiment might be designed in the following way: individuals receive an initial endowment and complete certain tasks over several rounds. In each round, the monetary income depends on how well the task is accomplished and on a random variable. The size of the random component and thus the variation of each round's income — independent of the problem solving abilities and success — can be manipulated between groups (one group gets a larger random component than the other). In order to transfer important aspects of an entrepreneur's actual working situation into the lab, the deterministic part of the income would have to increase with the effort (working time) devoted to the task. The individuals in the lab thus need to decide how much time and effort they invest

into completing the task. Under the assumption that individuals are randomly assigned to groups and that individual abilities to complete the task are also equally distributed between groups, we can test how different income variances impact on the time and effort an individual devotes to a task.

7

EDM: Potentially a New Paradigm for Entrepreneurship Research?

We tried to broaden the perspective on how to look at research questions in entrepreneurship using the EDM lens. We introduced experiments as a research method that is especially suited to investigate individual entrepreneurial decisions. We also suggested a classification of experimental studies that have been conducted in the entrepreneurship research so far. For a more detailed discussion of these studies, we focused on those experiments that aim at examining individuals' decision-making behavior — including studies on evaluations of economic alternatives (the step directly before the decision).

Within the group of such decision experiments, a considerable fraction applies conjoint analysis and investigates VCs' funding decisions with hypothetical firms, teams, and individuals. Experimental studies that directly analyze individual decision making and employ a within- or between-subjects design often investigate the use of heuristics in nonstrategic situations. Strategic experiments that are based on, e.g., (behavioral) game theory are not yet very widespread in entrepreneurship research. When they are carried out, however, they employ real incentives. A reason for this is the fact that these studies are carried

out by experimental economists — who are used to employing real incentives — rather than entrepreneurship researchers “by origin.”

In our opinion, incentive compatible experiments analyzing hypotheses from either behavioral game or decision theory are a promising avenue for future research in entrepreneurship. We strongly believe that many decision problems that entrepreneurs face may be modeled with game or decision theoretic approaches and that the field of entrepreneurship may benefit from those insights.

We finally developed three “research cases”: The first one deals with the entrepreneurial theory of the firm. The second case deals with research on entrepreneurial cognition and outlines the changes that occur when (re-)applying the decision-making perspective and what kinds of experimental studies might be used to analyze the arising questions. Finally, the third case expands on the initial example of time allocation. We hope that our approach might convince researchers to apply the decision-making perspective to questions in entrepreneurship and to use experiments to investigate these issues.

Finally, it now seems natural to ask the question whether EDM could be established as a research *paradigm*. To answer this question, one should have a look at Kuhn’s (1996) original definition. According to Kuhn, a scientific paradigm has four elements. It includes (1) the subject that is to be observed and scrutinized, (2) the questions that are supposed to be asked and probed for answers in relation to this subject, (3) the structure of these questions, and (4) the interpretation of results from scientific investigations.

From our perspective, EDM has the potential to fulfill these four criteria, but a lot of theory development lies ahead. To show that undergoing this challenge is worthwhile, Kuhn’s criteria are briefly analyzed with respect to the potential of EDM as a paradigm. (1) EDM defines the *individual’s decisions*, i.e., the selection of and between economic alternatives, as the subject that is to be observed and scrutinized. (2) The questions supposed to be asked are on the effects of persons, situations, and information on those decisions. (3) The questions are formulated as *explanans–explanandum* statements (where the explanans corresponds to the “if” component and the explanandum corresponds to the “then” component), the latter being the decision to be predicted.

Formal models are often used to deduce these statements. (4) The results of the analysis within the EDM paradigm lead to better understanding and prediction of entrepreneurs' behavior and how it might differ from those of other individuals. It might also help to better understand the impact of environment, individuals' characteristics, policy measures, etc. on success.

Hence, we conclude that EDM might be able to evolve as a scientific paradigm that complements other ways in which questions in entrepreneurship are investigated and interpreted (see also Schade, 2009). Investigating entrepreneurship within the decision-making paradigm can contribute to our understanding of entrepreneurial phenomena. However, we admit that more theoretical groundwork is necessary to separate the specifics of this approach from other ways of looking at entrepreneurship. On a more practical level, we hope to have convinced the readers of this contribution that applying a decision-making framework, as much as experiments is especially suited for the investigation of key questions in entrepreneurship.

References

- Abbink, K. and B. Rockenback (2006), ‘Option pricing by students and professional traders: A behavioural investigation’. *Managerial and Decision Economics* **27**, 497–510.
- Allais, M. (1953), ‘Le comportement de l’homme rationnel devant le risqué: Critique des postulats et axiomes de l’école americaine’. *Econometrica* **21**, 503–546.
- Alpert, B. (1967), ‘Non-businessmen as surrogates for businessmen in behavioral experiments’. *The Journal of Business* **40**(2), 203–207.
- Alvarez, S. (2007), ‘Entrepreneurial rents and the theory of the firm’. *Journal of Business Venturing* **22**(6), 427–442.
- Amit, R., K. MacGrimmon, C. Zietsma, and J. Oesch (2000), ‘Does money matter? Wealth attainment as the motive for initiating growth-oriented technology ventures’. *Journal of Business Venturing* **16**(2), 119–143.
- Baron, R. A. (1998), ‘Cognitive mechanisms in entrepreneurship: Why and when entrepreneurs think differently than other people’. *Journal of Business Venturing* **13**, 275–294.
- Baron, R. A. (1999), ‘Counterfactual thinking and venture formation: The potential effects of thinking about “what might have been”’. *Journal of Business Venturing* **15**(1), 79–91.

- Baron, R. A. and M. D. Ensley (2006), 'Opportunity recognition as the detection of meaningful patterns: Evidence from comparisons of novice and experienced entrepreneurs'. *Management Science* **52**(9), 1331–1344.
- Baron, R. A. and G. D. Markman (2003), 'Beyond social capital: The role of entrepreneurs' social competence in their financial success'. *Journal of Business Venturing* **18**(1), 41–60.
- Baron, R. A., G. D. Markman, and M. Bollinger (2006), 'Exporting social psychology: Effects of attractiveness on perceptions of entrepreneurs, their ideas for new products, and their financial success'. *Journal of Applied Psychology* **36**, 467–492.
- Baron, R. A., G. D. Markman, and A. Hirska (2001), 'Perceptions of women and men as entrepreneurs: Evidence for differential effects of attributional augmenting'. *Journal of Applied Psychology* **86**(5), 923–929.
- Bass, F. M. (1969), 'A new product growth model for consumer durables'. *Management Science* **15**(5), 215–227.
- Begley, T. M. and D. P. Boyd (1987), 'A comparison of entrepreneurs and managers of small business firms'. *Journal of Management* **13**(1), 99–108.
- Bernoulli, D. (1954), 'Exposition of a new theory on the measurement of risk'. *Econometrica* **2**(1), 23–36.
- Blavatsky, P. and G. Pogrebna (2008), 'Risk aversion when gains are likely and unlikely: Evidence from a natural experiment with large stakes'. *Theory and Decision* **64**(2-3), 395–420.
- Boewe, S., C. Schade, D. Krantz, and A. Kostanovskaya (2009), 'How strategic are entrepreneurs? Experimental findings for the example of R&D investments with spillovers'. Mimeo.
- Bolle, F. (1990). 'High reward experiments without high expenditure for the experimenter?' *Journal of Economic Psychology* **11**, 157–167.
- Bouckaert, J. and G. Dhaene (2004), 'Inter-ethnic trust and reciprocity: Results of an experiment with small businessmen'. *European Journal of Political Economy* **20**(4), 869–886.
- Brockhaus, R. H. (1982), 'The psychology of entrepreneur'. In: C. A. Kent, D. L. Sexton, and K. H. Vesper (eds.): *Encyclopedia of Entrepreneurship*. Englewood Cliffs, NJ: Prentice Hall, pp. 39–71.

- Brundin, E., H. Patzelt, and D. Shepherd (2008), 'Managers' emotional displays and employees' willingness to act entrepreneurially'. *Journal of Business Venturing* **23**(2), 221–243.
- Burks, S., J. Carpenter, L. Goette, K. Monaco, A. Rustichini, and K. Porter (2007), 'Using behavioral economic field experiments at a large motor carrier: The context and design of the truckers and turnover project'. NBER Working Paper, accessed at <http://www.nber.org/papers/w12976>.
- Burmeister, K. and C. Schade (2007), 'Are entrepreneurs' decisions more biased? An experimental investigation of the susceptibility to status quo bias'. *Journal of Business Venturing* **22**, 340–362.
- Burns, P. (1985), 'Experience and decision making: A comparison of students and businessman in a simulated progressive auction'. In: L. V. Smith (ed.): *Research in Experimental Economics*. Greenwich, Conn.: JAI Press, pp. 139–157.
- Busenitz, L. W. and J. B. Barney (1997), 'Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making'. *Journal of Business Venturing* **12**(1), 9–30.
- Busenitz, L. W. and C.-M. Lau (1996), 'A cross-cultural cognitive model of new venture creation'. *Entrepreneurship, Theory and Practice* **20**(4), 25–39.
- Camerer, C. F. (1995), 'Individual decision making'. In: J. H. Kagel and A. E. Roth (eds.): *The Handbook of Experimental Economics*. Princeton, NJ: Princeton University Press, pp. 587–703.
- Camerer, C. F. (1998), 'Can asset markets be manipulated? A field experiment with racetrack betting'. *Journal of Political Economy* **106**(3), 457–482.
- Camerer, C. F. and D. Lovo (1999), 'Overconfidence and excess entry: An experimental approach'. *American Economic Review* **89**(1), 306–318.
- Campbell, D. T. and J. C. Stanley (1963), *Experimental and quasi-experimental designs for research*. Boston: Houghton Mifflin Company.
- Carrington, W. J., K. McCue, and B. Pierce (1996), 'The role of employer/employee interactions in labor market cycles: Evidence

- from the self-employed'. *Journal of Labor Economics* **14**(4), 571–601.
- Connolly, T., R. A. Hal, and K. R. Hammond (2000), *Judgment and Decision Making — An Interdisciplinary Reader*. Cambridge: Cambridge University Press, 2nd edition.
- Cooper, A., C. Woo, and W. Dunkelberg (1988), 'Entrepreneurs' perceived chance of success'. *Journal of Business Venturing* **3**(3), 97–108.
- Cunningham, W. H., T. Anderson, and J. H. Murphy (1974). 'Are students real people?' *Journal of Business* **47**, 399–409.
- Dew, N., S. R. Velamuri, and S. Venkataraman (2004), 'Dispersed knowledge and an entrepreneurial theory of the firm'. *Journal of Business Venturing* **19**(5), 659–679.
- Elston, J. A., G. W. Harrison, and E. E. Rutström (2005), 'Characterizing the entrepreneur using field experiments'. University of Central Florida working paper 05-30.
- Elston, J. A., G. W. Harrison, and E. E. Rutström (2006), 'Experimental economics, entrepreneurs and the entry decision'. University of Central Florida working paper 06-06.
- Enis, B. E., K. Cox, and J. Stafford (1972), 'Students as subjects in consumer behavior experiments'. *Journal of Marketing Research* **9**, 72–74.
- Fiet, J. O. and P. C. Patel (2008), 'Entrepreneurial discovery as constrained, systematic search'. *Small Business Economics* **30**(3), 215–229.
- Fleming, J. E. (1969), 'Managers as subjects in business decision research'. *The Academy of Management Journal* **12**(1), 59–66.
- Forbes, D. P. (2005), 'Are some entrepreneurs more overconfident than others?'. *Journal of Business Venturing* **20**(5), 623–640.
- Forlani, D. and J. W. Mullins (2000), 'Perceived risks and choices in entrepreneurs' new venture decisions'. *Journal of Business Venturing* **15**, 305–322.
- Franke, N., M. Gruber, D. Harhoff, and J. Henkel (2006), 'What you are, is what you like — similarity biases in the venture capitalists' evaluations of start-up teams'. *Journal of Business Venturing* **21**, 802–826.

- Friedman, D. and S. Sunder (1994), *Experimental Methods: A Primer for Economists*. Cambridge: Cambridge University Press.
- Gatewood, E. J., K. G. Shaver, J. B. Powers, and W. B. Gartner (2002), 'Entrepreneurial expectancy, task effort, and performance'. *Entrepreneurship, Theory and Practice* **28**(2), 187–206.
- Green, P. and V. Srinivasan (1978), 'Conjoint analysis in consumer research: Issues and outlook'. *Journal of Consumer Research* **5**, 102–123.
- Green, P. E. and D. S. Tull (1988), *Research for Marketing Decisions*. Englewood Cliffs, NJ: Prentice Hall.
- Gustafsson, V. (2006), *Entrepreneurial Decision-making: Individuals, Tasks and Cognitions*. Cheltenham, UK: Edward Elgar.
- Hamilton, B. H. (2000), 'Does entrepreneurship pay? An empirical analysis of the returns to self-employment'. *Journal of Political Economy* **108**(3), 604–631.
- Harrison, G., M. Lau, and E. Rutström (2007), 'Estimating risk attitudes in Denmark: A field experiment'. *Scandinavian Journal of Economics* **109**(2), 341–368.
- Harrison, G., M. Lau, and M. B. Williams (2002), 'Estimating individual discount rates in Denmark: A field experiment'. *American Economic Review* **92**(5), 1606–1617.
- Harrison, G. W. and J. A. List (2004), 'Field experiments'. *Journal of Economic Literature* **42**(4), 1009–1055.
- Kagel, J. H. and A. Roth (1995), *The Handbook of Experimental Economics*. Princeton, NJ: Princeton University Press.
- Kahnemann, D. (1988), 'Experimental economics: A psychological perspective'. In: R. Tietz, W. Albers, and R. Selten (eds.): *Bounded Rational Behaviour in Experimental Games and Markets*. New York: Springer-Verlag.
- Kaish, S. and B. Gilad (1991), 'Characteristics of opportunities search of entrepreneurs versus executives: Sources, interests, general alertness'. *Journal of Business Venturing* **6**(1), 45–61.
- Krahen, J. P., C. Rieck, and E. Theissen (1997), 'Inferring risk attitudes from certainty equivalents: Some lessons from an experimental study'. *Journal of Economic Psychology* **18**(5), 469–486.

- Krueger, N. and P. Dickson (1993), 'Perceived self-efficacy and perception of opportunity and threat'. *Psychological Report* **72**, 1235–1240.
- Kuhn, T. S. (1996), *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press, 3rd edition.
- Kunreuther, H. and D. Krantz (2007), 'Goals and plans in decision making'. *Judgment and Decision Making* **2**(3), 137–168.
- Lévesque, M. and K. R. MacCrimmon (1997), 'On the interaction of time and money invested in new ventures'. *Entrepreneurship, Theory and Practice* **22**(2), 89–110.
- Lévesque, M. and C. Schade (2005), 'Intuitive optimizing: Experimental findings on time allocation decisions with newly formed ventures'. *Journal of Business Venturing* **20**(3), 313–342.
- Levine, G. and S. Parkinson (1994), *Experimental Methods in Psychology*. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Maurer, M. I. and C. Schade (2006), 'Strategiepraktiker versus Strategietheoretiker: Verhalten von Unternehmern im Vergleichsexperiment'. *ZfB Zeitschrift für Betriebswirtschaft* **4**, 69–91.
- McMullen, J. S. and D. A. Shepherd (2006), 'Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur'. *Academy of Management Review* **31**(1), 132–152.
- Minniti, M. (2005), 'Entrepreneurship and network externalities'. *Journal of Economic Behavior and Organization* **57**, 1–27.
- Mitchell, R. K., L. W. Busenitz, B. Bird, C. M. Gaglio, J. S. McMullen, E. Morse, and J. Smith (2007), 'The central question in entrepreneurial cognition research 2007'. *Entrepreneurship, Theory and Practice* **31**(1), 1–27.
- Mitchell, R. K., B. Smith, E. Morse, K. Seawright, and A. Peredo and B. McKenzie (2002), 'Are entrepreneurial cognitions universal? Assessing entrepreneurial cognitions across cultures'. *Entrepreneurship, Theory and Practice* **26**(4), 9–32.
- Mitchell, R. K., B. Smith, K. Seawright, and E. Morse (2000), 'Cross-cultural cognitions and the venture creation decision'. *The Academy of Management Journal* **43**(5), 974–993.
- Moore, D. A. and D. M. Cain (2007), 'Overconfidence and underconfidence: When and why people underestimate (and overestimate)

- the competition'. *Organizational Behavior and Human Decision Processes* **103**(2), 197–213.
- Mullins, J. W. and D. Forlani (2005), 'Missing the boat or sinking the boat: A study of new venture decision making'. *Journal of Business Venturing* **20**(1), 47–69.
- Muzyka, D., S. Birley, and B. Leleux (1996), 'Trade-offs in the investment decisions of European venture capitalists'. *Journal of Business Venturing* **11**(4), 273–287.
- Nunnally, J. C. and I. H. Bernstein (1994), *Psychometric Theory*. New York, NY: McGraw-Hill.
- Palich, L. and D. Bagby (1995), 'Using cognitive theory to explain entrepreneurial risk-taking: Challenging conventional wisdom'. *Journal of Business Venturing* **10**(6), 425–438.
- Parker, S. C., Y. Belghitar, and T. Barmby (2005), 'Wage uncertainty and the labour supply of self-employed workers'. *The Economic Journal* **115**(502), C190–C207.
- Peterman, N. E. and J. Kennedy (2003), 'Enterprise education: Influencing students' perceptions of entrepreneurship'. *Entrepreneurship, Theory and Practice* **28**(2), 129–144.
- Pogrebna, G. (2007), 'Natural experiments in television shows'. Doctoral dissertation, Leopold-Franzens-Universität Innsbruck, Austria.
- Riquelme, H. and T. Rickards (1992), 'Hybrid conjoint analysis: An estimation probe in new venture decisions'. *Journal of Business Venturing* **7**(6), 505–518.
- Sarasvathy, D. K., H. A. Simon, and L. Laver (1998), 'Perceiving and managing business risks: Differences between entrepreneurs and bankers'. *Journal of Economic Behavior and Organization* **33**, 207–225.
- Schade, C. (2005), 'Dynamics, experimental economics, and entrepreneurship'. *Journal of Technology Transfer* **30**(4), 409–431.
- Schade, C. (2009), 'Entrepreneurial decision making: A paradigm rather than a set of questions'. *Journal of Business Venturing*, forthcoming.
- Schade, C. and P. Koellinger (2007), 'Heuristics, biases, and the behavior of entrepreneurs'. In: M. Minniti et al. (eds.): *Entrepreneurship*:

- The Engin of Growth*. Westport, Connecticut, London, USA: Praeger, vol. 1, pp. 41–63.
- Schade, C., H. Kunreuther, and K. P. Kaas (2002), ‘Low-probability insurance decisions: The role of concern’. Discussion Paper Nr. 23, SFB 373, Humboldt-Universität zu Berlin/Wharton Risk Center Working Paper Nr. 02-10-HK, Wharton School, University of Pennsylvania, USA.
- Shane, S. and S. Venkataraman (2000), ‘The promise of entrepreneurship as a field of research’. *Academy of Management Review* **25**(1), 217–226.
- Shaver, K. G., W. B. Gartner, E. J. Gatewood, and L. H. Vos (1996), ‘Psychological factors in success at getting into business’. In: P. D. Reynolds, S. Birley, J. E. Butler, W. D. Bygrave, P. Davidson, W. B. Gartner, and P. P. McDougall (eds.): *In Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College, pp. 77–90.
- Shaver, K. G. and L. R. Scott (1991), ‘Person, process, choice: The psychology of new venture creation’. *Entrepreneurship, Theory and Practice* **16**(2), 23–45.
- Shepherd, D. A. (1999), ‘Venture capitalists’ assessment of new venture survival’. *Management Science* **45**, 621–632.
- Shepherd, D. A. and A. Zacharakis (1999), ‘Conjoint analysis: A new methodological approach for researching the decision policies of venture capitalists’. *Venture Capital* **1**(3), 197–217.
- Shepherd, D. A., A. Zacharakis, and R. A. Baron (2003), ‘VC’s decision processes: Evidence suggesting more experience may not always be better’. *Journal of Business Venturing* **18**(3), 381–401.
- Simon, M. and S. M. Houghton (2002), ‘The relationship among biases, misperceptions, and the introduction of pioneering products: Examining differences in venture decision contexts’. *Entrepreneurship, Theory and Practice* **27**(2), 105–124.
- Smith, V. L. (1976), ‘Experimental economics: Induced value theory’. *American Economic Review* **66**(2), 274–279.
- Smith, V. L. (1982), ‘Microeconomics systems as an experimental science’. *American Economic Review* **72**(5), 923–955.
- Smith, V. L. (1994), ‘Economics in the laboratory’. *The Journal of Economic Perspectives* **8**(1), 113–131.

- Sorensen, R. A. (1992), *Thought Experiments*. NY: Oxford University Press.
- Souitaris, V., S. Zerbinati, and A. Al-Laham (2007), 'Do entrepreneurship programs raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources'. *Journal of Business Venturing* **22**(4), 566–591.
- Tversky, A. and D. Kahnemann (1981), 'The framing of decisions and the psychology of Choice'. *Science, New Series* **211**(4481), 453–458.
- Tversky, A. and D. Kahnemann (1986), 'Rational choice and the framing of decisions'. *The Journal of Business* **59**(2), S251–S287.
- Tversky, A., S. Sattah, and P. Slovic (1988), 'Contingent weighting in judgment and choice'. *Psychological Review* **95**(3), 371–384.
- Tversky, A., P. Slovic, and D. Kahneman (1990), 'The causes of preference reversal'. *American Economic Review* **80**(1), 204–217.
- Weber, M. and H. Zuchel (2005), 'How do prior outcomes affect risk attitude? Comparing escalation of commitment and the house money effect'. *Decision Analysis* **2**, 30–43.
- Zacharakis, A. L. and G. D. Meyer (2000). 'The potential of actuarial decision models: Can they improve the venture capital investment decision?' *Journal of Business Venturing* **25**(4), 323–346.
- Zacharakis, A. L. and D. A. Shepherd (2001), 'The nature of information and overconfidence on venture capitalists' decision making'. *Journal of Business Venturing* **16**(4), 311–332.
- Zopounidis, C. (1994), 'Venture capital modeling: Evaluation criteria for the appraisal of investments'. *The Financier ACMT* **1**(1), 54–64.