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***Cognitive biases in economic decisions – three essays on the impact
of debiasing***

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“Human life occurs only once, and the reason we cannot determine which of our decisions are good and which are bad is that in a given situation we can make only one decision, we are not granted a second, third, or fourth life in which to compare various decisions.”

Milan Kundera

“You can think of an organization as a factory for producing decisions. The organization might produce other things, but it produces decisions at all levels. Thinking about decisions as a product is a useful way to think about it, because it immediately raises the issue of quality control. As an organization, whenever you have a product you take measures to ensure that your product meets certain standards. That raises the question what we know and what we can do to improve the quality control of decisions.”

Daniel Kahneman

Table of contents

Acknowledgments.....	II
Abstract.....	V
Kurzfassung (German abstract)	VII
I. Introduction.....	1
1 Motivation and research questions.....	1
2 Research methods and data sources.....	7
3 Structure of this dissertation, key findings and contributions.....	9
II. Essays	15
II.1 Essay 1: Biases and debiasing in entrepreneurial financing decisions:	
An experimental study on gender stereotypes.....	15
II.2 Essay 2: Concerns about the age quake:	
How to mitigate age stereotypes in personnel evaluation.....	16
II.3 Essay 3: Debiasing the disposition effect:	
An experimental investigation of investor behavior	17
III. Conclusion	18
1 Summary of results	18
2 Directions for further research	20
3 Implications.....	22
4 References	24

Abstract

This thesis investigates whether human decision-making under risk and uncertainty can be enhanced by means of debiasing. Based on theories from psychology, management, and behavioral finance, the results of multiple empirical studies indicate that debiasing interventions systematically substantiate and rationalize human decision-making in both the corporate and business area as well as the domain of private investment decision-making.

First, drawing on gender stereotype theory, an empirical experiment demonstrates that credit approval decisions on the financing of new ventures by banks depend on the constellation of the banking professional's gender, the entrepreneur's gender, and the influence of combined (direct and indirect) debiasing: While male banking professionals are not influenced in their judgments by the interaction between the entrepreneur's gender and debiasing, female banking professionals significantly disadvantage female entrepreneurs under the influence of debiasing. Without the influence of debiasing, in contrast, no significant differences in lending behavior are identifiable. The effectiveness of combined debiasing in this decision-making area thus depends on the specific gender constellation of entrepreneur and banking professional.

Second, also building on gender – and additionally – age stereotype theory, two experimental studies in the corporate context of personnel decision-making show that older candidates are discriminated against in both performance appraisal and hiring decisions. Moreover, they provide empirical evidence that the direct debiasing strategy of informative warnings against age discrimination offsets this unfair and yet irrational treatment towards both older male and female candidates. Indirect debiasing (i.e., holding decision-makers accountable for decision outcomes), on the other hand, does not reduce age-based

discrimination for female candidates (whereas male candidates also benefit from this debiasing intervention).

Third, analyzing private investment decisions in the domain of financial decision-making, the empirical results of an online experiment demonstrate that a combined, direct debiasing strategy is best suited to diminish the disposition effect. Moreover, the results of a separate testing of the two different direct debiasing strategies (rational and emotional warnings) also lead to a positive result, i.e., a reduction of the detrimental impact of the disposition effect on private investment decision-making.

Based on these empirical results, this thesis derives implications for both theory and practice and delineates directions for further research on the advancement of decision making under risk and uncertainty.

Kurzfassung (German abstract)

Die vorliegende Dissertation untersucht, in wie weit Entscheidungen unter Risiko und Unsicherheit durch Debiasing Maßnahmen optimiert werden können. Basierend auf Theorien aus der Psychologie-, Management- und Behavioral-Finance-Forschung, zeigen die Ergebnisse mehrerer empirischer Studien, dass Debiasing Maßnahmen sowohl im Unternehmenskontext, als auch im Bereich privater Investitionen zu objektiveren und rationaleren Entscheidungen führen können.

Auf der Grundlage der Theorie zu Geschlechterstereotypen zeigt die erste empirische Studie der vorliegenden Dissertation, dass die Entscheidung über die Vergabe von Gründungskrediten an junge Unternehmer von der spezifischen Geschlechterkonstellation von Banker/in, Gründer/in und kombiniertem Debiasing abhängt: Während Banker unabhängig vom Geschlecht des Gründers und der Debiasing-Intervention Kredite vergeben, benachteiligen Bankerinnen Gründerinnen unter dem Einfluss der Debiasing-Intervention. Ohne Debiasing zeigen sich dagegen keine signifikanten Unterschiede im Kreditvergabeverhalten. Dieses Ergebnis zeigt, dass die Effektivität von Debiasing – zumindest in diesem speziellen Bereich – von der spezifischen Geschlechterkonstellation von Banker/in und Gründer/in abhängt.

Ebenfalls basierend auf der Theorie zu Geschlechterstereotypen in Kombination mit der Theorie der Altersdiskriminierung zeigen zwei experimentelle Untersuchungen im Unternehmenskontext, dass ältere im Vergleich zu jüngeren Kandidaten und Kandidatinnen sowohl bei der Bewertung ihrer Leistungen, als auch bei Einstellungsentscheidungen signifikant benachteiligt werden. Durch den Einsatz direkten Debiasings in Form informativer Warnungen bezüglich Altersdiskriminierung kann diese unfaire und irrationale Behandlung

jedoch aufgehoben werden. Indirekte Debiasing-Interventionen, welche den Entscheider für seine Entscheidungsergebnisse verantwortlich zu machen versuchen, sind dagegen nicht geeignet, Altersdiskriminierung für beide Geschlechter zu vermindern; diese unterstützen lediglich männliche Kandidaten.

Eine dritte empirische Untersuchung fokussiert sich schließlich auf Entscheidungen im Bereich privater Investitionen. Die Resultate zeigen deutlich, dass direkte Debiasing-Interventionen geeignet sind, dem Auftreten des Disposition Effekts in privaten Investitionsentscheidungen entgegenzuwirken. Des Weiteren weisen die Ergebnisse darauf hin, dass sowohl direkte rationale, als auch direkte emotionale Debiasing-Interventionen das Auftreten des Disposition Effekts verhindern können.

Auf der Grundlage dieser empirischen Ergebnisse werden in der vorliegenden Dissertation Implikationen sowohl für die weitere theoretische Forschung, als auch für die Unternehmenspraxis abgeleitet. Zudem werden weitere Leitlinien für zukünftige Forschungsarbeiten im Kontext von Entscheidungen unter Risiko und Unsicherheit entwickelt und aufgezeigt.

I. Introduction

1 Motivation and research questions

“The economist may attempt to ignore psychology, but it is a sheer impossibility for him to ignore human nature, for his science is a science of human behavior. Any conception of human nature that he may adopt is a matter of psychology, and any conception of human behavior that he may adopt involves psychological assumptions, whether these be explicit or not. If the economist borrows his conception of man from the psychologist, his constructive work may have some chance of remaining purely economic in character. But if he does not he will not thereby avoid psychology. Rather he will force himself to make his own, and it will be bad psychology.” (Clark, 1918, p. 5).

Although Clark (1918) has already laid the theoretical grounds for the inclusion of the psychology of human behavior in economic research, traditional economic assumptions still deny the potential of irrational human behavior. However, over the last decades, the emerging field of “behavioral economics” (cf. Kahneman, 2003) has gained substantial momentum. Starting with March and Simon (1958), who implied that individual judgment is bounded in its rationality, Tversky and Kahneman (1974) set the next milestones in behavioral economics research: They resumed March and Simon’s (1958) research approach by examining specific systematic biases and their harmful influence on judgment and decision-making (cf. Bazerman, 2010). The increasing popularity of the field of behavioral economics has also been underlined by the awarding of the 2002 Nobel Prize to Daniel Kahneman for his seminal work in prospect theory (Kahneman & Tversky, 1979).

Nowadays, it is widely accepted that limitations in cognitive processing prevent human beings from making objectively rational or optimal decisions under conditions of risk and uncertainty (Gary, Dosi, & Lavallo, 2008; Hastie & Dawes, 2001). This shortage can be

traced back to two main reasons: First, decision-makers are not able to identify all potential courses of action. Second, even for those alternative courses of action identified, decision-makers cannot access and process all the information required in order to assess anticipated consequences in an accurate way and in order to select amongst them (Cyert & March, 1963; Morecroft, 1985; Simon, 1976, 1979; Sterman, 1987). As a consequence, in uncertain situations, decision-makers consciously or unconsciously adopt simplifying mental strategies, also called “rules of thumb”, “routines” or “heuristics”, to cope with the complexities of a problem (Bazerman, 2010; Kahneman & Tversky, 1984; Nelson & Winter, 1982; Schwenk, 1986; Simon, 1982; Tversky & Kahneman, 1974). Although some of these heuristics might prove efficient and helpful for solving problems, they also usually come with systematic decision biases (Gigerenzer & Gaissmaier, 2011; Wright & Goodwin, 2002), i.e., with “systematic deviations from the standard assumptions of the rational paradigm in economics” (Carter, Kaufmann, & Michel, 2007, p. 634). Several researchers have emphasized that even strategic decisions are not immune from cognitive biases (Barnes, 1984; Bateman & Zeithaml, 1989; Billet & Qian, 2008; Schwenk, 1984). Over the last 40 years, researchers documented many different types of these judgment and decision-making errors (e.g., Bazerman, 2010; March & Shapira, 1987). Of these, Carter, Kaufmann and Michel (2007) provided the most comprehensive overview on prevailing decision biases by summarizing these different streams of psychological and business research and allocating them to nine different categories (availability cognition, base rate, commitment, confirmatory, control illusion, output evaluation, persistence, presentation, and reference point) encompassing, in sum, 76 different decision biases.

Given both the ubiquity and the potentially detrimental consequences of decision biases on decision-making and decision outcome quality, the call for strategies countering the

occurrence of biases has led to a wide stream of mostly theoretical literature on debiasing (e.g., Arkes, 1991; Babcock, Loewenstein, & Issacharoff, 1997; Fischhoff, 1982; Larrick, 2004; Kahn, Luce, & Nowlis, 2006; Keren, 1990; Milkman, Chugh, & Bazerman, 2009; Wilson, Centerbar, & Brekke, 2002). Debiasing is defined as “the approaches and sets of actions aimed at reducing the detrimental influence of decision biases and as such to enhance the rationality and effectiveness of decisions” (Kaufmann, Michel, & Carter, 2009, p. 86). The bottom line of the literature on debiasing is that individuals rarely unconsciously correct for biases in their decision-making (“implicit adjustment”, cf. Wilson et al., 2002, p. 188). In most cases, therefore, active measures to consciously debias flawed decision-making are required. Researchers have proposed several debiasing strategies to improve decision quality: Keren (1990) suggested a general debiasing framework comprising three stages: First, identification of the existence and nature of the potential bias; second, consideration of ways and techniques to lower the impact of the bias; and, third, the evaluation of the effectiveness of the selected debiasing technique. Fischhoff (1982) recommended four different levels of debiasing activities: Warnings, description of the problem, personalized feedback, and finally, extensive training of decision-makers. Arkes (1991), in contrast, discerns three broad categories of biases (strategy-based errors, association-based errors, and psychophysically based errors): For each of these categories he provides specific debiasing methods: Strategy-based errors should be countered through increasing the data basis, considering the merits of arguments, and increasing accountability by raising the stakes for decision-makers. The influence of association-based errors, in turn, should be lowered through instructions, cues, and confidence as a second-order judgment. Finally, psychophysically based errors ought to be reduced by adding gains and losses to judgment problems, changing the concatenation of related items, altering reference points, and reframing decision problems. Arkes (1991)

concludes that for any strategies to work, specific professional training would be required. Larrick (2004) then was first to provide a more general taxonomy of debiasing strategies and his proposal found wide acceptance in the literature. He suggested three generic types of debiasing strategies: Motivational, cognitive, and technological. Motivational strategies include the provision of incentives and the installation of accountability for decision outcomes, attempting to raise the effort a decision-maker sets into the completion of a decision-making task. Cognitive strategies, on the other hand, aim at changing the decision-maker's perception of a problem, encompassing strategies such as "consider the opposite", and training in rules and representations. Ultimately, technological debiasing strategies change the decision-making process by using organizational or technological means. This type of debiasing strategy encompasses group decision-making as a surrogate for individual decision-making, the use of linear models, multi-attribute utility analysis or decision analysis, and the use of IT-based decision-support systems.

In sum, previous literature on debiasing has already proposed, on theoretical grounds, a variety of different tools and strategies aiming at the amendment of decision-making by reducing the most common decision-making biases. However, so far, little emphasis has been set on studies that test these theoretical suggestions and approaches empirically. This gap constitutes a major oversight in the literature for the following reasons:

First, prior research has indeed demonstrated the existence of numerous decision biases. However, the urgent call for more and further empirical research on how to overcome them has remained unheard so far. As long as the impact of a specific debiasing strategy has not been tested empirically, it remains unclear whether the proposed strategy really shows the intended effect on decision outcomes.

Second, the few studies, testing debiasing strategies empirically, have only resulted in ambiguous results, especially with regard to the effectiveness of indirect debiasing strategies, such as accountability (e.g., Tetlock, 1983; Gordon, Rozelle, & Baxter, 1988): There is still a clear necessity for more and further empirical research in this area. As soon as more single empirical studies on one specific debiasing strategy exist, it will become clearer under which circumstances a strategy turns out to be effective.

Third, influencing factors on human decision-making under risk and uncertainty are still under-researched. Shedding more light on our still bounded understanding of how to best support decision-makers to overcome their biases and behave more rationally is therefore the overarching aim of this thesis. To this end, the present dissertation focuses on the following three main research questions that have not been addressed in the current literature so far:

- (1) How does combined debiasing (warning, information and justification for own decision-making) influence an establishing credit decision depending on the specific gender constellation of the entrepreneur and banking professional?
- (2) How do direct (informative warnings) and indirect (asking decision-makers for the specific reasons for their decision – justification) debiasing separately impact HR professionals' decisions respective performance evaluation of current employees and hiring of potential future employees?
- (3) Do different direct debiasing strategies (informative warnings, information on typical emotions in trading, combined rational and emotional information) manipulate investment decisions of private investors and thus reduce the detrimental impact of the disposition effect?

By addressing these research questions, the present thesis contributes to the current state of both psychological and management research as well as the literature on decision support and debiasing by empirically testing the impact of different debiasing strategies on decision outcomes in both corporate and financial domains.

2 Research methods and data sources

The empirical parts of this thesis are based on an experimental research approach, using primary data from different sample populations. The main advantages as well as disadvantages of this approach will be outlined in the following section:

The core benefit of an experimental research approach lies in rendering cause-effect-relationships observable. Systematic manipulations allow for drawing causal conclusions. By controlling for potential influencing factors the internal validity of an experimental research approach is maximized (cf. Cook & Campbell, 1979; Schade & Burmeister-Lamp, 2009). On the other hand, the generalizability of experimental findings to other contexts, different from the specific hypothetical situation presented in an experimental setup, is supposed to be lower in comparison to field studies. This drawback reflects the lower external validity of an experimental research approach (Grant & Wall, 2009). The experiments reported in this dissertation were all conducted by using manipulated scenarios by means of an (online) questionnaire. Experimental scenario studies are regularly used for analyzing hypothetical decisions by using vignettes. Vignettes are short stories about a hypothetical decision-making situation to which participants are asked to respond (cf. Finch, 1987). According to Baron (2007), hypothetical decisions, as they are made by participants of experiments, are expected to be “as useful as real ones for finding out how people think about certain types of problems.” Baron (2007, p. 40). This statement provides strong support for the application of vignettes in studies of debiasing as conducted in this dissertation. Besides, and even more important, it highlights the transferability of our research results to real decision-making situations.

In the following paragraphs the statistical analysis techniques are described, which were used to analyze the primary data in our experiments. First, in order to study the impact of

debiasing on the gender constellation of nascent entrepreneurs and banking professionals, a paper-based vignette study was conducted involving 168 banking professionals in Germany. The main hypotheses and research questions were tested applying binary logistic regression and analysis of covariance (ANCOVA). Using an experimental scenario setup for investigating this research question allows for inferring causal relationships between the independent variables gender of the entrepreneur, gender of the banking professional and debiasing and the dependent variables “credit approval” and “amount of credit granted”.

Second, the effect of direct and indirect debiasing on both age and gender stereotypes in performance appraisal and hiring decisions was examined by reverting to data of 176 (Study 1) and 348 (Study 2) HR professionals. Methodologically we stick to ANCOVA in order to analyze the data obtained. Again, an experimental, scenario-based research approach was chosen which allowed for inferring causality between the independent variables ratee age, ratee gender, and debiasing, and the dependent variable “performance evaluation” (Study 1) and between the independent variables candidate age, candidate gender, and debiasing, and the dependent variable “candidate evaluation” (Study 2).

Third, in order to investigate the disposition effect in private investment decisions, an online experiment was chosen which set our participants – 133 students with own investment experience, e.g., as members of university investment clubs – in a portfolio decision situation. The hypotheses were tested using t-tests and analysis of variance (ANOVA). In contrast to previous empirical studies suffering oftentimes from noise in real data, the experimental setup we chose provided us with the opportunity to observe investor behavior and investor decisions without any confounding influencing factors on respective investment decisions.

3 Structure of this dissertation, key findings and contributions

After the general introduction to the topic in Chapter I, the core of this dissertation consists of three distinct research papers on biases and debiasing in different economic decision-making situations (Chapter II). The overarching research question of this dissertation is whether (and if so, how) human decision-making can be improved by means of debiasing. Each of the three research papers represents a scholarly contribution by its own and addresses the overarching research question outlined above in one specific field of economic decision-making. In this dissertation, economic decisions are to be understood as strategic and far-reaching decisions in a specific area of either the corporate or business area (*Essay 1* and *Essay 2*) or the financial domain of investment decision-making (*Essay 3*). Given that all of the essays are self-contained academic contributions, each manuscript offers its own introduction, literature review, methodology, results, and discussion section.

Essay 1 addresses the occurrence of gender stereotypes in bank lending decisions to nascent entrepreneurs. Stereotypes (i.e., “societally shared beliefs about the characteristics [...] that are perceived to be true of social groups and their members” (Stangor, 1995, p. 628)), are thought to provide decision-makers with a short-cut for perceptual processing (Fiske & Neuberg, 1990) which, in turn, allow them to avoid the time-consuming and cognitively demanding task of rifling through loads of information. However, stereotypes usually impede decision-makers from using all of the information provided in a specific decision-making situation. The purpose of this paper thus is to analyze experimentally, within a group of 168 banking professionals, whether – under the influence of debiasing – a specific gender constellation of entrepreneur and banking professional is causative for the provisioning of establishing credits to nascent entrepreneurs. The experiment entails a controlled manipulation of the entrepreneur’s gender, while holding all other characteristics of

the entrepreneur (prior experience, education, business idea, CV) constant. A combined debiasing strategy consisting of (1) warnings and (2) information on typically prevailing gender stereotypes in lending decisions, in connection with a requirement for (3) justification of own decision-making, is tested for its impact on decision outcomes depending on the specific gender constellation of entrepreneur and banking professional. As a result, we find a significant three-way interaction, indicating that both credit approvals and the amount of credit granted to the entrepreneur depend on the constellation of the banking professional's gender and the entrepreneur's gender under the influence of debiasing: While male banking professionals were not influenced in their judgments by the interaction between the entrepreneur's gender and debiasing, female banking professionals significantly disadvantaged female entrepreneurs when debiasing was present. Without the influence of debiasing, in contrast, no significant differences in lending behavior were identifiable. Hence, this essay contributes both to the (women's) entrepreneurship literature by carving out contextual factors as a cause for the discrimination of women entrepreneurs in lending decisions, and, in addition to that, to the psychological and management literature on debiasing by establishing a closer link to the person of the rater and not only – as commonly applied – to the person being rated (ratee) as important factors in entrepreneurs' banking relationships. Besides, looking at the interaction effect generates substantial value for both research on gender discrimination and on biases and debiasing as we could figure out that the effectiveness of debiasing in this decision-making area depends on the specific gender constellation of entrepreneur and banking professional. Simple deductions on the impact of debiasing are therefore apparently not applicable. However, examining credit decisions provides only a limited view on the general subject of debiasing in the whole area of economic decision-making. While the first essay of this dissertation explores the effectiveness

of one (even though combined) debiasing strategy in credit approval decisions (given specific gender constellations of the entrepreneur and banking professional), it defines the agenda for further investigations of the mechanisms and the effectiveness of debiasing in other, different business and financial, contexts in future research.

Essay 2 builds on the findings and open ends for further research concerning the effectiveness of debiasing gathered in *Essay 1*: The different debiasing strategies (which were used only in combination in *Essay 1*) are tested in this paper against each other in two new business decision-making contexts – the performance appraisal and evaluation of a jobholder and the hiring decision towards a new potential employee. *Essay 2*, thus being composed of two independent experiments, explores which debiasing method turns out most appropriate and effective in mitigating age stereotypes in the above mentioned areas of HR management. In particular, Study 1 of *Essay 2* focuses on testing “direct debiasing” (cf. Kahn et al., 2006) in the form of an informative warning message regarding age-based discrimination before the evaluation of a subordinate. Study 2 then compares two different debiasing strategies, namely (1) accountability for own decisions as an “indirect debiasing” strategy (cf. Kahn et al., 2006) which does not require – or even is counterproductive to – consciousness of the decision-maker and (2) an informative warning message on age discrimination as a direct debiasing strategy (similar to the one tested in Study 1 of *Essay 2*) which provides explicit advice on how to cope with (and thus avoid) age stereotypes in personnel decision-making. Participants of the first experiment were 176 professionals who self-reported to already have been in charge of evaluating others. The second experiment was conducted with a different sample of 384 HR professionals, who were used to make professional decisions on hiring and placement as part of their day-to-day business. The main findings of this study are (1) that older target persons are discriminated against in both performance appraisal and hiring decisions and

(2) that the direct debiasing strategy of informative warning offsets this unfair and irrational treatment towards the elderly. In addition to that, a significant two-way interaction effect between debiasing and applicant age can be observed in both experiments, indicating that direct debiasing significantly improves appraisal outcomes and hiring chances of older applicants, whereas indirect debiasing does not reduce – at least when taking both male and female candidates into consideration – age-based discrimination (male applicants also benefited from indirect debiasing). Thus, this paper is not limited to the examination of age-based discrimination in both performance appraisal and hiring decisions, but offers clear and unambiguous evidence on the effectiveness of different fundamental debiasing methods by splitting the combined debiasing strategy tested in *Essay 1* into two single debiasing strategies (direct and indirect debiasing). The essay results in the finding that direct debiasing (i.e., information on the bias combined with warnings not to fall prey to it) can be considered as an effective tool for mitigating age-based discrimination in performance appraisal and hiring decisions. Two primary contributions of this essay to the existing literature are to be highlighted: First, it is the only study to comprehensively explore debiasing interventions and potential countermeasures to age discrimination in performance appraisals and hiring decisions empirically. The results obtained might stimulate researchers and HR professionals to implement direct debiasing interventions in real hiring situations. Second, the study provides a valuable contribution to the psychological and management literature on debiasing, showing that in Study 2 of *Essay 2* (hiring decision) an indirect debiasing measure based on holding the respective decision-makers accountable has far less impact on decision quality than a direct debiasing measure which reminds the decision-makers of potential and prevailing biases in this specific decision-making situation. While *Essay 1* explores whether debiasing matters in combination with specific gender constellations of nascent entrepreneurs

and banking professionals in credit approval decisions, *Essay 2* highlights substantial differences between two debiasing strategies in an experimental appraisal and hiring situations (independent from specific gender constellations) and thus broadens the spectrum and transferability of our empirical findings.

Essay 3 finally examines debiasing in the context of individual private investors' investment decisions empirically. We thereby transfer our insights gained from the corporate contexts of *Essay 1* and *Essay 2* to the domain of financial decision-making. Based on the findings of *Essay 2* indicating that direct debiasing strategies are by far more effective than indirect debiasing strategies, *Essay 3* consequently expands the spectrum of direct debiasing strategies by analyzing and comparing the impact of three different direct debiasing strategies on the occurrence of the disposition effect, which is described as the tendency to sell winning investments too early and to hold on to losing investments for too long (Shefrin & Statman, 1985). The disposition effect has been shown to harmfully impact current and future wealth of all kinds of investors (e.g., Lee et al., 2008; Odean, 1998; Roger, 2009). These strategies are (1) informative warnings of the disposition effect, (2) information on involved emotions in financial decision-making, and (3) a combination of both aforementioned debiasing strategies. This study empirically investigates the impact and the effectiveness of these different types of debiasing strategies on the investment decision-making of 133 private investors in order to distill the best method to mitigate the disposition effect. The results show that the combined debiasing strategy is best suited to diminish the disposition effect. In addition to that, the results of a separate testing of these two debiasing strategies also leads to a positive result, i.e., a reduction of the detrimental impact of the disposition effect. The most important contributions of this study are as follows: First, the study establishes debiasing as a potential tool for the enhancement of investment decisions of private investors. All direct debiasing

methods tested in this experiment significantly reduced the disposition effect. Second, it provides first results on the effectiveness of direct debiasing strategies in financial decision-making, providing first hints on which methods to apply in this area of decision-making. Third, the paper also provides a comprehensive theoretical overview on the origins of the disposition effect, which is not only based on behavior predicted by prospect theory (cf. Kahneman & Tversky, 1979) but also in emotions (cf. Summers and Duxbury, 2012).

Following the three essays, a final conclusion (Chapter III) summarizes the results obtained, especially those providing valuable answers to the overarching research question, and discusses implications for both future research and practical application of the main findings.

II. Essays

II.1 Essay 1: Biases and debiasing in entrepreneurial financing decisions: An experimental study on gender stereotypes

Abstract

This research is the first to explore the impact of banking professionals' and entrepreneurs' gender, and debiasing on bank lending decisions to nascent entrepreneurs. By means of a $2 \times 2 \times 2$ between-participants questionnaire experiment ($N = 168$) we examine the effects of the banking professional's gender, the entrepreneur's gender, and debiasing on the outcome of a credit approval process. We observe a significant gender by gender by debiasing three-way interaction indicating that male banking professionals are neither influenced in their judgment by the entrepreneurs' gender, nor by the presence of debiasing, whereas female participants, under the conditions of debiasing, favor male and significantly disadvantage female entrepreneurs.

JEL Classification: M13; J16; J71; L26

Keywords: Financing decisions; entrepreneurship; bias; debiasing; gender; discrimination

Working paper version: Wollersheim, J., Döbrich, C., Spörrle, M., & Welppe, I. M. (2012). Stereotypes and debiasing in bank lending decisions to nascent entrepreneurs.

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II.2 Essay 2: Concerns about the age quake: How to mitigate age stereotypes in personnel evaluation

Abstract

Age discrimination in the workplace is widely acknowledged, yet little is known regarding effective interventions against it. We therefore experimentally investigate debiasing in two decision-making contexts of HR management: Study 1 ($N = 176$) analyzes the effect of direct debiasing (i.e., explicit informative warnings) on age discrimination in work performance appraisals with HR professionals. Study 2 ($N = 384$) replicates and extends this approach by examining the effects of direct as well as indirect (i.e., holding decision-makers accountable) debiasing strategies on the emergence of age stereotypes in hiring decisions. Our results confirm both the existence of age biases as well as the successful reduction of these biases by means of direct debiasing interventions. Direct debiasing significantly lowers the influence of age stereotypes on performance appraisal and hiring decisions for both male and female candidates, whereas indirect debiasing only reduces age discrimination towards older male candidates.

JEL Classification: M51; M54

Keywords: Age stereotypes; debiasing; hiring decisions; older applicants; age discrimination

Working paper: Döbrich, C., Wollersheim, J., Welpel, I. M. & Spörrle, M. (2012). Concerns about the age quake - how to overcome age stereotypes in hiring decisions.

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II.3 Essay 3: Debiasing the disposition effect: An experimental investigation of investor behavior

Abstract

This paper examines the impact of two different debiasing interventions on the emergence of the disposition effect (i.e., the individual tendency to realize gains too early and losses too late) in investment decisions of private investors. By means of a fully crossed 2×2 between-participants online-experiment ($N = 133$) using an established stock market simulation task, we examine the potential debiasing effects of rational warnings (present vs. not present) as well as emotional warnings (present vs. not present) on the emergence of the disposition effect. The disposition effect is eliminated by both debiasing strategies under investigation. The simultaneous presence of both interventions does not increase the solitary effect of any of the two interventions. Our study is the first to apply existing knowledge on debiasing interventions to the disposition effect within private investment decisions and provides the promising finding that biased investment decisions do not have to be considered unchangeable.

JEL Classification: G02; G11

Keywords: Disposition effect, loss aversion, bias, debiasing, emotion, investment decision

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III. Conclusion

1 Summary of results

This dissertation set out to determine whether cognitive biases in different economic decision situations can be mitigated or even offset by debiasing. Using the context of bank lending decisions, *Essay 1* illustrated that bank lending decisions to nascent entrepreneurs are influenced by the interaction of the gender constellation of nascent entrepreneurs and banking professionals with a combined debiasing technique. Refraining from this specific decision-making situation, this study provided first evidence that – under specific gender constellations of nascent entrepreneurs and banking professionals – debiasing matters in bank lending decisions. This study addresses the call for empirical work on debiasing by Fischhoff (1982) and Milkman et al. (2009).

Essay 2 analyzed debiasing in the corporate context of performance appraisal and hiring decisions. It showed in two different experimental settings that direct debiasing is suitable for enforcing rational and objective decision-making in the domain of personnel decisions. In contrast, and in line with previous research (e.g., Gordon, Rozelle, & Baxter, 1989), indirect debiasing in terms of holding decision-makers accountable for decision outcomes did not turn out to reduce age discrimination in hiring decisions. These results demonstrate that not all debiasing techniques, which had been used in *Essay 1* conjointly, exert the same influence on decision-makers when testing them individually and against each other.

Essay 3, finally, moved away from a corporate decision-making context towards investment decisions of individual private investors. It focused on three different direct debiasing techniques (first, informative warnings on the mode of operation of the disposition effect; second, information on typical investor emotions in trading; third, a combination of the latter debiasing strategies), since indirect debiasing in the form of holding decision-makers

accountable for decision outcomes turned out not to lead to a reduction of biasing influences on decision-making in *Essay 2*. The essay illustrates how these direct debiasing methods can be applied in financial decision-making, in this particular case, in order to mitigate the disposition effect in trading stocks. The results obtained indicate that the direct debiasing methods under investigation are suitable to eliminate the disposition effect. Further analyses revealed the preponderance of the combined direct debiasing methods over the individual methods as under this condition the least number of investors fell prey to the disposition effect.

2 Directions for further research

The findings of this thesis have demonstrated the usefulness and applicability of direct debiasing measures in different decision-making contexts. The results obtained in this dissertation offer several directions for future research which will be outlined in the following paragraphs. The specific suggestions for future research of individual studies in specific decision-making contexts have been argued in the sections covering future research avenues of the respective essays.

Over the last few years, both psychological research (e.g., Krueger and Funder's list of 42 cognitive biases (Krueger & Funder, 2004)), as well as economic and business research (e.g., Carter et al.'s list of 76 decision biases (Carter et al., 2007)) have substantially advanced in detecting and highlighting biases in decision-making. However, the current research focus has still not moved away from cataloguing biases to rather finding ways to correct or even prevent them. A comparison of a PsychInfo search done by Lilienfeld et al. (2009) on June 19th, 2008 with today's publication numbers (searched on June 1st, 2012) reveals that articles covering the key words "cognitive bias" and "cognitive biases" have increased from 1,211 to 18,597, whereas articles on "debias" and "debiasing" have only climbed from 158 to 328 hits. Milkman et al.'s (2009) call for further empirical research ("We hope judgment and decision-making scholars will focus their attention on the search for improvement strategies in the coming years and seek to answer the big question: How can we improve decision making?" Milkman et al., 2009, p. 379) seems not to have experienced full reception in recent research yet. The four experiments composing this dissertation can be considered as a first step in this direction, as they outline the first empirically based results on how to improve decision-making. Future research should therefore take our results into account and explore further tools and possibilities to improve decision-making by different debiasing methods. In

particular, the effectiveness of direct debiasing should be tested in further areas of decision-making, such as strategic decision-making or medical decision-making. It might turn out that other debiasing strategies are even more effective in other decision-making areas. The determination of which debiasing strategy to apply best in a specific decision-making situation should fundamentally depend on the specific kind of bias that is to be minimized (e.g., Arkes, 1991; Kahn et al. 2006; Kaufmann et al. 2009). Moreover, future debiasing research should try to leave the lab and make use of natural experiments (e.g., study the impact of debiasing in investment decision-making by providing debiasing information exclusively to premium customers of an online broker in order to determine the impact of debiasing on variation of portfolio values) or field studies (e.g., share information on age-based discrimination and its incongruity with research findings within an HR department and compare the ratio of older new hires before and after the campaign) in order to confirm the effectiveness of debiasing in practice. Finally, research should focus on specific personal or situational factors which influence the effectiveness of debiasing. Factors, such as emotions, personal traits, or environmental circumstances might exert heavy influence on the impact of debiasing and should therefore be tested as potential moderators. All in all, the forthcoming debiasing research agenda should include three major areas: The empirical investigation of optimal pairs of biases and pertaining most effective debiasing techniques, the rigorous empirical research of theoretically proposed debiasing techniques, and further research into influencing factors on human judgment and decision-making processes in order to detect additional opportunities to tie in with debiasing.

3 Implications

The results obtained in this dissertation provide empirical evidence supporting the assumption that debiasing is suitable for diminishing decision biases. As we increasingly move towards a knowledge-based economy, a knowledge worker's (and of course an entrepreneur's) "primary deliverable is a good [i.e., rational and objective] decision" (Milkman et al., 2009, p. 379). However, influencing factors on decisions to be taken, such as information overload, time pressure, and increasing complexity in a globalized world, complicate (or sometimes even eliminate) bias-free decision-making. Interestingly, the exposure to decision biases and the discussion of potential debiasing techniques have lately even reached popular awareness over the last few months, at least in Germany (e.g., Dobelli, 2011; Frankfurter Allgemeine Zeitung, 2012; Kahneman, 2011). This dissertation shows that the application of direct debiasing techniques can help to address this issue that will even aggravate over time. It has illustrated that debiasing can be applied successfully both in the corporate (*Essay 1* and *Essay 2*) and the financial domain (*Essay 3*) as the specific decision-making context. Related research, however, suggests that these findings may be transferrable to other domains as well (e.g., Dobelli, 2011). Overall, the results of this dissertation demonstrate that direct debiasing might be considered as a tool for effective decision support, resulting in better decisions (however, we naturally only looked at four specific decision-making contexts; if a generalization of these findings to other decision-making contexts is admissible, is left for further discussion and to both the judgment of the reader and further empirical research). The empirical results presented in this dissertation suggest that especially direct debiasing can enhance the outcomes of decision-making processes and make sure that decision-makers become aware of potential biases entrapping them to make suboptimal decisions which do not maximize expected utility (cf. Stanovich & West, 2000). There are

multiple advantages of including debiasing in decision-making processes, especially in situations under risk and uncertainty, including higher utility, lower costs, increased satisfaction with decisions made, and a greater decision-making effectiveness. Practitioners and investors should therefore be informed and made aware of prevailing biases usually occurring in their specific decision-making areas and be warned of their detrimental influences. Such debiasing interventions may be fruitfully applied to mitigate the effects of decision biases in many decision areas. The increasing popularity of books and newspaper article series, as mentioned above, will therefore automatically contribute to more objective and rational decision-making and debiasing as readers are made aware of typical decision traps and might hopefully remember them when confronted with a comparable real decision-making situation.

In sum, this dissertation hopes to establish direct debiasing techniques as a valid tool for decision support in multiple areas of decision-making so that it can become a standard for cautious and farsighted decision-making in the future.

4 References

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