

Kroll, Eike Benjamin; Müller, Holger; Vogt, Bodo

**Working Paper**

## Experimental evidence of context-dependent preferences in risk-free settings

KIT Working Paper Series in Economics, No. 12

**Provided in Cooperation with:**

Karlsruhe Institute of Technology (KIT), Institute of Economics (ECON)

*Suggested Citation:* Kroll, Eike Benjamin; Müller, Holger; Vogt, Bodo (2010) : Experimental evidence of context-dependent preferences in risk-free settings, KIT Working Paper Series in Economics, No. 12, Karlsruher Institut für Technologie (KIT), Institut für Volkswirtschaftslehre (ECON), Karlsruhe, <https://nbn-resolving.de/urn:nbn:de:swb:90-206837>

This Version is available at:

<https://hdl.handle.net/10419/41636>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# Experimental evidence of context-dependent preferences in risk-free settings

by Eike B. Kroll, Holger Müller and Bodo Vogt

No. 12 | NOVEMBER 2010

WORKING PAPER SERIES IN ECONOMICS



## **Impressum**

Karlsruher Institut für Technologie (KIT)  
Fakultät für Wirtschaftswissenschaften  
Institut für Wirtschaftspolitik und Wirtschaftsforschung (IWW)  
Institut für Wirtschaftstheorie und Statistik (ETS)

Schlossbezirk 12  
76131 Karlsruhe

KIT – Universität des Landes Baden-Württemberg und  
nationales Forschungszentrum in der Helmholtz-Gemeinschaft

Working Paper Series in Economics  
**No. 12**, November 2010

ISSN 2190-9806

---

[econpapers.wiwi.kit.edu](http://econpapers.wiwi.kit.edu)

# Experimental evidence of context-dependent preferences in risk-free settings

Eike B. Kroll, Holger Müller, and Bodo Vogt

**Abstract:** This study investigates context effects in general and the compromise effect in particular. It is argued that earlier research in this area lacks realism, a shortcoming that is a major drawback to research conclusions and stated management implications. The importance of this issue is stressed by previous research showing that behavioral anomalies found in hypothetical experimental settings tend to be significantly reduced when real payoff mechanisms are introduced. Therefore, to validate the compromise effect, an enhanced design is presented with participants making binding purchase decisions in the laboratory. We find that the compromise effect holds for real purchase decisions, and therefore is validated, and is not an artificial effect in surveys on hypothetical buying decisions. While conclusions and implications for marketing managers, derived in previous work assume that context effects hold for real market decisions, the results created by this enhanced design close this gap in the literature.

*Keywords: decision-making, anomalies, irrelevant alternatives, context effects*

JEL Classification D8, C9

---

## Acknowledgements

Results of the studies discussed in this article were presented at the 25th Annual Congress of the European Economic Association EEA 2010 (Glasgow) and at the Annual Conference of the Economic Science Association ESA 2009 (Washington D.C.). This article has substantially benefited from comments and remarks of participants of the contributed sessions on this research paper.

# 1 Introduction

In the field of individual decision-making, experimental economists have provided various results indicating anomalies of rational choice models such as the Allais paradox (Allais 1952) or the preference reversal phenomenon (Lichtenstein and Slovic 1971; Grether and Plott 1979). These anomalies occur in decisions that involve risk in the form of lotteries and are supposed to provide evidence of violations of expected utility theory.

The experimental evidence in turn has motivated theoretical work relaxing the axiomatic structure of rational choice models and incorporating the experimental results (Machina 1982; Quiggin 1982). Typically, these anomalies are addressed by modifications of rational choice theory, by modifying the utility function, for example by introducing reference-points (Kőszegi and Rabin 2007), introducing probability weights instead of linear probabilities (Yaari 1987) or both (Kahneman and Tversky 1979; Kahneman and Tversky 1992).

A different anomaly not considered by modifications of expected utility theory is the influence of the choice set itself on the preference order of a given set of alternatives. As an example, it has been shown that the ranking of a number of lotteries differs depending on the composition of the larger menu within a menu of other lotteries (Bateman et al. 2006). While this work does not consider choice behavior, it refers to the composition of a preference order between a subset of different alternatives that are not necessarily the best alternatives in a complete set of options.

While all of the anomalies mentioned above are concerned with decisions under risk, violations of rational choice models are not necessarily limited to this area of research. The marketing literature intensively discusses a variety of so-called context effects, which stipulate that the choice between two alternatives can be affected by adding a particular third alternative to the choice set (Simonson 1989; Simonson and Tversky 1992). This effect is similar to what Bateman et al. (2006) find for preference orders of lotteries, but in this case the actual choice of alternatives is affected rather than the preference order of alternatives that are not the preferred alternative in the set.

Another study examines the influence of a menu of options from which only one option is available for choice in the experiment (Sonsino 2010). It can be shown that the

valuation of the option under consideration depends on the priming by the choice set shown previous to the valuation task of a single option.

An effect similar to the preference reversal phenomenon concerns the evaluation of bundles of alternatives. While rational choice theory assumes that the value of a bundle of items is the sum of the values of the single items, experimental data shows that the value of a bundle can decrease when a different set of items is added to the same bundle, depending on whether the bundle under consideration is presented juxtaposed or in isolation (List 2002).

Research revealing violations of rational choice theory consists of both hypothetical questionnaires and laboratory-based studies involving real consequences of choices. In order to evaluate whether or not it is necessary to consider such violations for application of economic theory, it seems necessary to use experimental methods to show that they are a robust and systematic phenomenon and not merely caused by choice error. This occurs because the introduction of economic commitments is likely to reduce anomalies (Camerer and Hogarth 1999; Hertwig and Ortmann 2001). Another established fact is that the introduction of real incentives significantly reduces response variance (Smith and Walker 1993). The argument is that the decision process requires mental effort from the subjects, which they try to minimize when questions are presented hypothetically (Camerer and Hogarth 1999). Only the provision of real consequences of the decisions gives adequate incentive for the rational decision-maker to invest mental effort to the task at hand. This in turn is intended to reduce errors in eliciting true preferences. In order to judge whether an anomaly has to be considered robust, the introduction of real incentives and the use of experimental procedures are vital to establish knowledge about departures from rational choice theory.

Experimental research aims at investigating decisions in real economic environments while the laboratory helps economists create and control such an environment. However, the situation in the laboratory remains an artificial one in the way that it differs from situations of everyday choice that people face in real life. Some argue that the anomalies identified in the laboratories do not occur when real market settings are applied (Cox and Grether 1996). The basic argument is that the anomalies occur in the laboratory in a situation that the subjects are largely unfamiliar with. The market mechanism is assumed

to help the participants to realize they may be making a mistake and by that reduces the anomalies under investigation.

This paper addresses context effects on choice behavior as it is known from the marketing literature. Considering the bulk of studies on the topic in marketing research, several drawbacks became salient and should be discussed briefly. First, researchers most often observe hypothetical choices in classroom surveys, hence excluding economic commitments for subjects. However, following the arguments in favor of rational choice models from risk research, anomalies can be significantly reduced when real incentives are introduced (Smith and Walker 1993; Camerer and Hogarth 1999; Hertwig and Ortmann 2001; List and Gallet 2001). In addition, in the majority of cases, participants perform forced choices, meaning that the option not to buy any of the alternatives under consideration is not included in the set of possible answers. In sharp contrast, there is experimental evidence that choice shares observed in forced decisions are prone to produce anomalies and differ from settings including a no-buy option (Dhar 1997; Dhar and Simonson 2003). Moreover, almost all studies on context effects provide artificial options, excluding real brand names as general information cues that are evidently of great importance in consumers' decisions. In particular, the importance of this issue is stressed by recent experimental results showing that brand familiarity significantly moderates the efficacy of context effects (Novemsky et al. 2007; Sinn et al. 2007).

To sum up this brief review, while context effects are well established within the marketing literature, the empirical evidence remains based on artificial designs in terms of inexperienced subjects making forced choices between fictitious options in a hypothetical setting. Therefore, this paper provides experimental results for purchase decisions in the lab for fast-moving consumer goods, which are purchased frequently and on a regular basis by the subjects under investigation. The results show that context effects are reduced by introducing real consequences, but remain a robust phenomenon even for real purchase decisions, thus violating the main assumption of stable underlying preferences.

## 2 Experiment

### 2.1 Experimental task

The experimental task is provided in form of a paper and pencil survey. Subjects are provided with each task individually and instructed to indicate a choice before moving on to the next task. This is to ensure that there is no skipping forward or backward during the experiment. The subjects make choices in two product categories involving two fast moving consumer goods (shampoo and toothpaste) chosen to ensure that subjects have a regular buying experience for the given products. Subjects are asked to perform a total of 10 purchase decisions with 5 decisions in each product category. Before the experiment, the participants are randomly assigned to two experimental treatments. In one treatment, the participants have the choice between two products in each category and in a second treatment, they can choose among three products. The products available consist of a low priced brand (L), a medium-priced brand (M) and a high-priced brand (H). The brands available in the treatment and product categories are listed in table 1.

**Table 1** Brands used in the experimental treatments

		Experimental Treatments	
		2 alternatives	3 alternatives
Product Categories	toothpaste	Signal, Odol-med3	+ Elmex
	shampoo	Nivea, Elvital	+ Wella

Six of the seven category-specific price scenarios contained a systematic trade-off between the two alternatives L and M, where the price of L increases while the price of M decreases. For the treatment with three alternatives, a high-priced brand was added to each price scenario that varied randomly around the market price. The fifth price scenario is a repetition of one of the four prior price scenarios in order to check for decision consistency at the individual level.

### 2.2 Experimental procedure

All participants in this experiment are students from different fields of study at the Otto-von-Guericke University Magdeburg. While it has to be noted that restricting the sample to university students does not necessarily allow for generalizing the results to the general population (Peterson 2001), student samples are deemed appropriate for effect



application research such as studies on context effects (Calder et al. 1981). For the products used in this study, the recruited students represent a target group for the specific product menu considered in this experiment. Furthermore, the recruited participants were filtered to ensure that they have brand knowledge and buying experience with the products offered during the experiment. This procedure is implemented to ensure that subjects are familiar with the products and do not exhibit uncertainty about the product features, creating a simple choice task for the experiment. All products used in the experiment are fast moving consumer goods in order to further increase familiarity of the choice situation for the participants.

A total of 152 participants were recruited and randomly assigned to the two treatments, with one offering two alternatives and the other offering three alternatives. Furthermore, one half of the sessions are run under hypothetical conditions where participants' choices are not realized. The other half is run under real conditions where participants face consequences from their choices. The detailed overview of participants and experimental treatments is provided in table 2.

**Table 2** Number of participants per treatment

N=152 Consequences	Choice Set		Total
	2 alternatives	3 alternatives	
Hypothetical Choices	35	33	68
Binding choices	43	41	84

All participants received a show-up fee of 5 Euro for participating in the experiment. For this study, payment was received by the participants two weeks before the experiment. This procedure is implemented in order to reduce the influence of the house money effect (Thaler and Johnson 1990) as far as possible. Within the time between payment and experiment, students usually turn over more money than the amount received and it is more likely that the payoff is not directly linked to the choices performed during the experiment.

The experiment is conducted at the MaXLab, the experimental laboratory at the University of Magdeburg. All participants are placed in experimental cabins in order to prevent communication between the participants. At the beginning of the sessions, all questions were distributed by the experimenter on a survey.

For the group with real consequences, the purchase decisions are realized at the end of the session. The experimenter draws a ball from an urn with 14 balls numbered from 1 to 14. The number on the ball indicates the choice scenario that is realized. If the participant selected the product for the given price in that scenario, she was obliged to buy the product. If the participants did not select the product for the given price in that scenario, she did not have the opportunity to buy a product in this experiment. This procedure is performed for each participant individually and each time the subject has the chance to check the equipment before the procedure is applied. This mechanism resembles a random payoff mechanism used in experimental research on anomalies in risky choice (Grether and Plott 1979).

### **3 Results**

At first glance, a noticeable particularity becomes salient. The third high-priced alternative H added to the choice set gains only an insignificant market share below 10% in the triplet choice sets under both hypothetical and real choice conditions. Therefore, it can reasonably be considered an irrelevant alternative for most of the participants of this study. Specifically, the choice share of this irrelevant alternative is negligible and remains within the margin of error.

As for the context-dependence of choice, comparing the choice shares of options L and M for the hypothetical condition, the data shows a significant increase of choice share for option M for the treatment containing a third alternative (see table 3). For toothpaste, the share of M increases from 46% to 84% and for shampoo, the share of M increases from 45% to 65%, showing in both cases a significant increase of choices for option M in the treatment with three alternatives (Chi<sup>2</sup>-Test, 1%-significance-level). Therefore, the experiment under hypothetical conditions confirms the influence of an added irrelevant alternative. Thus, context effects as known from marketing literature are confirmed for a case where the added alternative is considered an irrelevant alternative with negligible choice shares.

The same effect applies to the setting where the participants face real consequences of their purchase decisions. As for the context effect, the choice share of option M increases from 52% to 70% for toothpaste and from 36% to 42% for shampoo. The increase in

choice shares of option M is reduced as compared to the hypothetical (Chi<sup>2</sup>-Test, 1%-significance-level) setting, but the difference remains significant between the settings with two and three options (Chi<sup>2</sup>-Test, 10%-significance-level).

Although our results reveal that hypothetical studies on context effects are likely to overstate the impact of adding a third alternative, the effect remains robust for real purchase decisions. Therefore, this study provides evidence that a context effect remains a systematic effect that applies even to real purchase decisions and is prevalent in hypothetical decision-making. Furthermore, this study introduces a third alternative that receives almost no choice share and can be considered irrelevant. This means that the results stated in this paper show a rather extreme case for context effects, since the added product is very unattractive for the participants in its price-quality-tradeoff.

**Table 3** Choice Shares compared by experimental condition

	Product category	toothpaste		shampoo	
	Options available	2 alternatives	3 alternatives	2 alternatives	3 alternatives
hyp.	L	53%	15%	55%	35%
	M	46%	84%	45%	65%
	H	-	1%	-	0%
real	L	48%	20%	64%	52%
	M	52%	70%	36%	42%
	H	-	10%	-	6%

The purpose of this study is to show the impact of context effects in individual choice behavior when subjects are familiar with the task and face real consequences of their decisions. In order to check whether decision error leads to the anomaly under consideration, we implement further checks for the validity of the results for the case involving real purchase decisions. To do so, the compliance rate is checked for the randomly selected decision that is binding and realized (Voelckner 2006). Overall 93% fulfilled their buying obligation without declaring discomfort or a complaint by doing so. It seems reasonable to assume that these participants were fully aware of the consequences when indicating their decisions. Additionally, participants were asked to provide direct satisfaction statements before leaving the experiment and after fulfilling their transactions. Only two of the subjects indicated regret after fulfilling their buying obligation while none of those with the realization of a no-buy option indicated regret. The degree of satisfaction with the experimental outcome adds to the impression that

subjects have a sufficient face validity of their choices (Wertenbroch and Skiera 2002). Finally, the check scenario with a repetition of a choice allows examination for decision consistency for each individual subject to exclude choice error as an explanation for the phenomenon. In the treatment with two alternatives 93% of the subjects show consistent choices and in the treatment with three alternatives 91% are consistent in their indicated choices showing no difference between the experimental treatments in this regard (Chi<sup>2</sup>-Test, n.s.). This fact provides further evidence that the anomaly under consideration in this experiment is not caused by mental overload or increased error probability due to the increased complexity of the choice task.

## 4 Conclusion

The list of experiments showing violations of expected utility is long and growing. Nonetheless, the normative axioms can still be acceptable for theoretical purposes in economics if the violations are random (Quiggin 1982). The effect shown in this experiment is systematic and the inclusion of an additional alternative can shift preferences in a predictable manner.

Another argument in favor of expected utility theory is that people behave more in line with theoretical predictions when they are experienced in the type of decision-making. While this argument can hold for the commonly used decisions under risk, this paper provides a choice setting between options that the subjects are highly familiar with. Even in an everyday choice context, context effects are systematic and robust for this type of choices. The implementation of real consequences reduces context effects, but the magnitude remains significantly large.

## 5 References

- Allais, M. (1952). Le comportement de l'homme rationnel devant le risqué: Critique des postulats et axiomes de l'école américaine. *Econometrica*, 21(4), 503-546.
- Bateman, I., Day, B., Loomes, G., Sugden, R. (2006). Can ranking techniques elicit robust values? *Journal of Risk and Uncertainty*, 34(1), 49-66.
- Calder, B.J., Phillips, L.W., Tybout, A.M. (1981). Designing research for application. *Journal of Consumer Research*, 8(2), 197-207.

- Camerer, C.F., & Hogarth, R.M. (1999). The Effects of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework. *Journal of Risk and Uncertainty*, 19(1), 7-42.
- Cox, J.C., & Grether, D.M. (1996). The preference reversal phenomenon - Response Mode Markets and Incentives. *Economic Theory*, 7(3), 381-405.
- Dhar, R. (1997). Consumer Preference for a No-Choice Option. *Journal of Consumer Research*, 24(2), 215-231.
- Dhar, R., & Simonson, I. (2003). The Effect of Forced Choice on Choice. *Journal of Marketing Research*, 40(2), 146-160.
- Grether, D.M., & Plott, C.R. (1979). Economic Theory of Choice and the Preference Reversal Phenomenon. *American Economic Review*, 69(4), 623-638.
- Hertwig, R., & Ortmann, A. (2001). Experimental practices in economics: A methodological challenge for psychologists? *Behavioral and Brain Sciences*, 24(3), 383-541.
- Kahneman, D., & Tversky, A. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(1), 297-323.
- Kahneman, D., & Tversky, A., (1979). Prospect Theory: An analysis of decision under risk. *Econometrica*, 47(2), pp.263-292.
- Kivetz, R., Netzer, O., Srinivasan, V.S. (2004). Alternative Models for Capturing the Compromise Effect. *Journal of Marketing Research*, 41(3), 237-257.
- Köszegi, B., & Rabin, M. (2007). Reference-Dependent risk attitudes. *American Economic Review*, 97(4), 1047-1073.
- Lichtenstein, S., & Slovic, P. (1971). Reversals of preferences between bids and choices in gambling decisions. *Journal of Experimental Psychology*, 89(1), 46-55.
- List, J.A. (2002). Preference Reversals of a Different Kind: The "More Is Less" Phenomenon. *American Economic Review*, 92(5), 1636-1643.
- List, J.A., & Gallet, C.A. (2001). What Experimental Protocol Influence Disparities Between Actual and Hypothetical Stated Values? *Experimental and Resource Economics*, 20(3), 241-254.
- Machina, M.J. (1982). "Expected Utility" Analysis without the Independence Axiom. *Econometrica*, 50(2), 277-323.
- Novemsky, N., Dhar, R., Schwarz, N., Simonson, I. (2007). Preference Fluency in Choice. *Journal of Marketing Research*, 44(3), 347-356.
- Peterson, R.A. (2001). On the use of college students in social science research: Insights from a second-order meta-analysis. *Journal of Consumer Research*, 28(3), 450-461.
- Quiggin, J. (1982). A Theory of Anticipated Utility. *Journal of Economic Behavior and Organization*, 3(4), 323-343.

- Simonson, I. (1989). Choice Based on Reasons: The Case of Attraction and Compromise Effects. *Journal of Consumer Research*, 16(2), 158-174.
- Simonson, I., & Tversky, A. (1992). Choice in Context: Tradeoff Contrast and Extremeness Aversion. *Journal of Marketing Research*, 29(3), 281-295.
- Sinn, F., Milberg, S.J., Leonardo, D., Goodstein, R.C. (2007). Compromising the compromise effect: Brands matter. *Marketing Letters*, 18(4), 223-236.
- Smith, V.L., & Walker, J.M. (1993). Monetary Rewards and Decision Cost in Experimental Economics. *Economic Inquiry*, 31(2), 245-261.
- Sonsino, D. (2010). The irrelevant-menu affect on valuation. *Experimental Economics*, 13(3), 309-333.
- Thaler, R.H., & Johnson, E.J. (1990). Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management Science*, 36(6), 643-660.
- Tversky, A., & Simonson, I. (1993). Context-Dependent Preferences. *Management Science*, 39(10), 1179-1189.
- Voelckner, F. (2006). An empirical comparison of methods for measuring consumers' willingness to pay. *Marketing Letters*, 17(2), 137-149.
- Wertenbroch, K., & Skiera, B. (2002). Measuring Consumers' Willingness to Pay at the Point of Purchase. *Journal of Marketing Research*, 39(2), 228-241.
- Yaari, M.E. (1987). The Dual Theory of choice under risk. *Econometrica*, 55(1), 95-115.

# Working Paper Series in Economics

---

recent issues

- No.12** *Eike B. Kroll, Holger Müller and Bodo Vogt*: Experimental evidence of context-dependent preferences in risk-free settings, November 2010
- No. 11** *Siegfried Berninghaus, Werner Güth and Stephan Schosser*: Voluntary contributing in a neighborhood public good game - an experimental study, November 2010
- No. 10** *Axel Schaffer, Léopold Simar and Jan Rauland*: Decomposing regional efficiency, October 2010
- No. 9** *Tobias Lindner*: Das Bundestagswahlrecht aus Perspektive der Social Choice-Theorie, October 2010
- No. 8** *Andranik S. Tangian*: Decision making in politics and economics: 4. Bundestag elections 2009 and direct democracy, October 2010
- No. 7** *Martin Ruckes and Thomas Rønnde*: Dynamic incentives in organizations: success and inertia, October 2010
- No. 6** *Siegfried Berninghaus, Sven Haller, Tyll Krüger, Thomas Neumann, Stephan Schosser, Bodo Vogt*: Risk attitude, beliefs, and information in a corruption game – An experimental analysis, September 2010
- No. 5** *Ingrid Ott, Susanne Soretz*: On the role of productive government spendings for convergence of a growing economy with heterogenous specialists, August 2010
- No. 4** *Anna Chernobai, Christian Menn, Svetlozar T. Rachev, Stefan Trück*: Estimation of operational value-at-risk in the presence of minimum collection threshold: An empirical study, August 2010
- No. 3** *Omid Rezaia, Svetlozar T. Rachev, Edward Sun, Frank J. Fabozzi*: Analysis of the intraday effects of economic releases on the currency market, August 2010