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

by Eike B. Kroll, Holger Müller and Bodo Vogt

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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.

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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 (Köszegi 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	Choice Set		
Consequences	2 alternatives	3 alternatives	Total
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 (Chi²-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 (Chi²-Test, 1%-significance-level) setting, but the difference remains significant between the settings with two and three options (Chi²-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 (Chi²-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.

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