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Jena Economic Research Papers, No. 2008,044

Provided in Cooperation with:
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Suggested Citation: Matthey, Astrid (2008) : Manipulating reference states: The effect of attitudes on utility, Jena Economic Research Papers, No. 2008,044, Friedrich Schiller University Jena and Max Planck Institute of Economics, Jena

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JENA ECONOMIC RESEARCH PAPERS

2008 – 044

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by

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www.jenecon.de

ISSN 1864-7057

The JENA ECONOMIC RESEARCH PAPERS is a joint publication of the Friedrich Schiller University and the Max Planck Institute of Economics, Jena, Germany. For editorial correspondence please contact m.pasche@wiwi.uni-jena.de.

Impressum:

Friedrich Schiller University Jena
Carl-Zeiss-Str. 3
D-07743 Jena
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Jena Economic Research Papers 2008-044

Manipulating Reference States: the Effect of Attitudes on Utility

Astrid Matthey*

May 29, 2008

Abstract

In economic theory, utility depends on past, present and future outcomes. The experiment described in this paper suggests that utility also depends on people's attitudes, and that it can easily be manipulated through these attitudes. The results imply, first, that purely outcome-based models of individual utility may be incomplete. Second, that reference-states are not determined completely endogenously but can be influenced from outside. And third, that experiments in economics may be sensitive to subtle details of the experimental design.

JEL classification: D01, D10, C91

Keywords: utility, reference state, attitudes, priming, experiment

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I thank Ondřej Rydval, Tobias Regner, seminar participants at University of Jena and Max-Planck-Institute of Economics, and participants in the Conference on Economic De-growth, Paris, 2008, for helpful comments.

1 Introduction

Can individual utility change without that outcomes or expectations change? According to economic theory, it cannot: Individuals derive utility from their current (vNeumann and Morgenstern, 1944) or future outcomes (Caplin and Leahy, 2001), which they may compare to a reference state (Kahneman and Tversky, 1979; Matthey, 2008). The reference state is also determined by outcomes, e.g., the outcomes the individual received in the past (Campbell and Cochrane, 1999), the outcomes relevant others receive (Abel, 1990), the outcomes the individual expected (Koszegi and Rabin, 2006), etc. As long as neither of these outcomes changes, individual utility does not change.

The experiment described in this paper casts doubt on this view. It shows that reference states, and hence utility, also depend on the concepts that individuals encounter in their environment, even if these concepts are neither outcome-relevant nor are individuals aware of them.
Participants in the experiment first complete a priming task (see Dijksterhuis et al, 2005; Vohs et al, 2006). Each subject encounters one of three concepts: a concept focusing on material achievements, a neutral concept, or a concept focusing on social achievements. The priming does neither affect participants' outcomes, nor does it reveal any outcome-relevant information, nor are participants aware of being primed. Second, all subjects participate in a lottery, where they can invest all or part of their endowment. Applying prospect theory (Kahneman and Tversky, 1979), systematic differences in subjects' investments are then used to identify differences in reference states (Matthey and Dwenger, 2007). The results show that the reference states of subjects who are primed with the concept focusing on material achievements differ significantly from those of the subjects who are primed with the social or the neutral concept.[1] This means that individual utility has changed as the result of subjects' encountering the different concepts.

The findings have implications for economic theory and experimental methods. First, they provide further evidence that individual utility is not the stable construct as that it is usually treated in economic theory. Earlier research has already identified non-outcome based influences on utility and behavior, like framing (Tversky and Kahneman, 1986) and anchoring (e.g., Ariely et al, 2006). The results presented here suggest that even if preferences are stable and framing effects are absent utility can vary widely depending on - supposedly - subtle environmental factors. This further supports the view that purely outcome-based models of individual utility may be incomplete and may misinterpret differences in behavior. Second, the results show that individuals' reference states can be actively influenced from outside, with little effort and within short time. Hence, reference state formation is not a completely outcome-based, endogenous process, but can be manipulated. Finally, the results show that nuances of the design of economic experiments may lead to unintended priming effects through influencing subjects' attitudes. This may render the results of seemingly equal treatments or experiments non-comparable, and experimental results hard to interpret in absolute terms.

The formation of attitudes and their influence on behavior have long been studied in psychology (see, e.g., Pieters, 1988 and Poiesz, 1988, Warneryd, 1988, and the

[1] Alternative interpretations of the results are discussed in section 3.

literature cited therein). This research suggests that attitudes influence people's behavior and well-being, and may to some extent be subject to active interference by the individual herself (Bolle, 1989; Ng and Wang, 2001). The experiment presented in this paper complements this research in two ways. First, it directly tests the influence on a particular variable of people being exposed to different concepts, and does so in an incentivized and economically relevant setup. Second, it shows that attitudes, and hence utility, are subject to active interference by third persons, unnoticed by the individual herself.[2]

The remainder of the paper is organized as follows. The experiment is described in section 2. Section 3 discusses the theoretical background and the methodology. Section 4 shows the results. A discussion and brief conclusion are provided in section 5.

2 Experiment

The experiment consists of two stages. At the first stage, participants are primed with three different concepts. Priming is a method frequently used in psychological experiments to activate certain concepts in people's minds, without drawing participants' attention to this activation (for details see, e.g., Vohs et al., 2006). Participants in this experiment receive 20 groups of five words each that they have to sort into meaningful phrases of four words. The instructions include one sample phrase. There are three treatments. Half of the phrases are of neutral content, e.g., "Trees have green leaves.". These are the same in all treatments. The remaining phrases differ between treatments. In the first treatment (MAT), these phrases refer to material achievements, e.g., "Consultants earn high wages." The second treatment (CONT) is a control treatment, which includes only neutral phrases. In the third treatment (SOC), the non-neutral phrases refer to social achievements, e.g., "Volunteers help in sports clubs.". All phrases refer to common knowledge items. It seems highly unlikely that they induce participants to update their expectations regarding their future wealth. In addition, pre-experimental tests with student assistants who completed the tasks indicated that participants are not aware of being primed with specific concepts. This is in accordance with earlier experiments using priming (see, e.g., Dijksterhuis et al, 2005).

The second stage is identical across treatments. People receive an endowment of 5 Euro and can invest any amount between 0 and 5 Euro in a lottery. In this lottery, investments are tripled or lost, each with 50% chance. Not invested amounts are kept by the participants, i.e., the expected payoff is

$$E(\text{payoff}) = 5 - \text{investment} + 0.5 * 3 * \text{investment} = 5 + 0.5 * \text{investment} \quad .$$

In addition to stating their investments, participants are also asked for the minimum fixed amount of money they would have preferred over their participating in the lottery.

The experiment was run as a paper-and-pen classroom experiment in two undergraduate lectures at the University of Jena in fall 2007. There were 193 participants

[2]It should be noted that in contrast to the research in psychology, in this paper the term "attitude" is used as a lay person would, i.e., as an individual's perception and evaluation of the outcomes she and others experience. It therefore reflects a less specific concept than in certain fields of psychology.

overall. After participants had made their decisions, 25 of them were drawn randomly to be paid. Their lottery results were determined by throwing a coin, and payments were made after the lecture. All participants were aware of this procedure when making their decisions.
A translated version of the instructions is available from the author upon request.

3 Background and Methodology

There is by now broad agreement in the literature that individual utility from realized outcomes depends on the individual's outcome x and on the reference state r that she compares this outcome to (see Kahneman and Tversky, 1979):[3]

$$U(x) = u(x) + v(x|r)$$

There is, however, less agreement on how the reference state is formed. The most frequently suggested factors to influence r are: one's own previous outcomes (status quo or habit formation, see, e.g., Campbell and Cochrane, 1999; Gomes and Michealides, 2003), the outcomes of relevant others (social comparison, e.g., Abel, 1990), one's expected outcomes (e.g., Shalev, 2000; Koszegi and Rabin, 2006), or the outcomes one aspires for (e.g. Simon, 1959; Lopes and Oden, 1999, McBride, 2007, Matthey and Dwenger, 2007). As these examples show, models of reference formation assume the reference state to depend on the individual's or relevant others' *outcomes*, be them past, present, or future. Individual differences in the evaluation of these outcomes are captured by the functional forms of u and v, which are individual specific. However, u and v are assumed to be stable at least in the medium term. This means that although the form of u and v may change over a life-time, in the short-run individual utility depends only on the arguments of u and v, that is, on outcomes.

The hypothesis in this paper is that, in addition, reference states, and hence utility, depend on the attitude with which outcomes are evaluated, and that this attitude can change in the short and medium-term. To test this hypothesis, the experiment attempts to influence people's attitudes, and to identify differences in reference states that result from this influence. The way to identify these differences is through measuring differences in people's risk aversion. This approach has been used by Matthey and Dwenger (2007), and is described in detail there. It is based on prospect theory, which suggests that loss averse individuals who face prospective losses take more risk than individuals who face prospective gains. This is due to the value function being concave for gains, but convex for losses (see Kahneman and Tversky, 1979).
Given the same prospects, for people with higher reference states it is more likely that (some of) the possible outcomes are below their reference states. Accordingly, people with higher reference states are more likely to face losses from these prospects, and hence are less risk averse on average. Using this relation, and keeping the prospects that people can choose from the same, one can infer the influence of individuals' attitudes on their reference states from the influence on their risk aversion. In contrast

[3] In addition, utility has been shown to depend on the individual's expected outcomes, which she compares to her reference expected outcomes (see Caplin and Leahy, 2001; Matthey, 2008; Koszegi and Rabin, 2008). However, this component of utility is not of relevance here.

to survey studies of the reference state, one therefore does not have to rely on self-reports when determining whether the treatments lead to systematic differences in people's reference states.

The argument is as follows: participants are randomly distributed across treatments. Since it is possible that students who sit in the first rows differ systematically from those who sit in the last rows, the treatments were distributed equally across rows. This means that subjects' pre-experimental outcomes can be assumed to be randomly distributed. Participants in all treatments face the same lottery at stage two of the experiment, that is, a priori they face the same expected outcomes. Accordingly, past, present and expected future outcomes (given investments) do not differ systematically between treatments. The priming at stage one of the experiment intends to affect people's attitudes. If reference states depend on attitudes, and the priming influences these attitudes, then the reference states of participants in different treatments will differ systematically. But if reference states differ systematically, then expected outcomes are also evaluated differently. According to the relation between prospective gains and losses on one hand, and risk aversions on the other, this should be reflected in systematic differences in people's risk aversion between treatments. Hence, if one can find significant differences in average risk aversion between treatments, this implies that the treatments have influenced people's reference states, and hence their utility.

Another interpretation of systematic differences in subjects' risk aversion is possible, which is not based on reference states. Participants may distinguish between expected utility from income (EUI) and expected utility from terminal wealth (EUTW) (e.g., Cox and Sadiraj, 2006). The broader the range of outcomes that they take into account when making their investment decision, the less risk averse subjects will be under a concave utility function. Hence, if the treatments lead to systematic differences in investments, this could suggest that attitudes influence the range of outcomes that individual utility is based on.
Although this interpretation bears on a different theoretical effect than the one discussed above, the underlying argument is similar. In both cases, systematic differences in risk aversion between treatments indicate that individuals' attitudes influence the way they evaluate a given outcome, and the utility they derive from it. They also show that these attitudes can easily be influenced from outside. By focusing on the interpretation based on prospect theory, I therefore do not rule out alternative interpretations that are derived from this basic argument. Rather, prospect theory is chosen for the abundance of experimental and empirical evidence that exists in its support (see section 1).[4]

Finally, it should be noted that differences in risk aversion between treatments cannot be explained by framing effects, since the part of the experiment that is related to the lottery and subjects' investment decisions is identical across treatments.

4 Results

The results are summarized in table 1. Average and median investments are higher in the MAT treatment than in the CONT and SOC treatments. The same holds for

[4]In addition, it cannot be ruled out that the treatment influences risk aversion directly. However, to my best knowledge, such an effect has never been mentioned in the literature.

the minimum fixed amounts people would have preferred over their participating in the lottery ('minimum'), with the caveat that these amounts are not incentivized. A Wilcoxon rank-sum test shows that the differences between the MAT and the SOC treatments are significant at 5% (investment) and 1% (minimum) levels. With 16% and 25%, respectively, the average and median differences in investments are also non-negligible in size (25% and 33% for 'minimum'). Regressions including the available characteristics of the participants (age, sex, major) confirm the results, also showing significant differences in investments and minimum amounts for the MAT, CONT and SOC treatments (1% and 5% levels, see appendix for details).

Table 1: Summary statistics for MAT, CONT and SOC treatments

		MAT	CONT	SOC
investment	mean	3.84	3.48	3.23
	median	4	3.5	3
minimum	mean	7.9	5.48	5.86
	median	7.5	5	5
observations		48	75	69
Wilcoxon test MAT vs. SOC:		investment: p=0.0287, minimum: p=0.0087		

When making their investment decisions, the participants in all three treatments faced the same situation, i.e., the same expected outcomes given their investments. Hence, the lower average risk aversion in the MAT treatment implies that people in this treatment have a higher average reference state regarding monetary outcomes than people in the SOC treatment (Kahneman and Tversky, 1979). Since participants were randomly assigned to treatments, the difference in reference states can be attributed to people being exposed to different concepts at the priming stage.

5 Discussion

The experiment shows that individuals' reference states change when they encounter different concepts in their environment. This leads to a change in utility and behavior, even if individuals are neither consciously aware of the different concepts, nor are their outcomes affected by them.

When interpreting the results, it should be taken into account that the priming took place in the noisy environment of a classroom experiment, where participants' concentration on the task is naturally limited. Further, in such an environment communication between participants of different treatments cannot be ruled out completely, which must be expected to lead to a leveling of the treatment effects. In addition, the priming phase took only about five minutes, since constructing the phrases was fairly straightforward. The significant differences between treatments that arise in spite of these constraints point to the large potential effect that exposition to different concepts in one's environment may have on individual utility and behavior.

The findings have three major implications. First, they provide evidence that a purely outcome-based model of individual utility may be incomplete, and may lead to unexplained differences in welfare and behavior. Although individual attitudes will be hard to include in any model, the main dimensions of influence can be identified

and taken into account. This should be the subject of future research. Second, the results offer some new insights into the formation of reference states. They suggest that apart from an individual's own past, present and expected future outcomes and the outcomes of relevant others, reference states also depend on attitudes. In addition, these attitudes - and hence reference-states and utility - seem to be subject to easy manipulation by third persons. Finally, the results show that when conducting experiments in economics, even small nuances of the instructions or design can influence subjects' attitudes and hence their behavior. This can render the results non-comparable to other experiments, and hard to interpret in absolute terms.

If the results of this experiment can be confirmed by future studies, they also have implications for policy. In particular, they suggest that people who encounter less emphasis on material achievements in their environment have on average lower reference states regarding these achievements. They derive higher utility from any given level of material consumption. Put differently, with lower reference states a given level of utility requires less material achievements. This makes it easier for individuals to accept lower levels of consumption, or slower rises in material living standards. In times of shrinking natural resources, this may eventually contribute to a sustainable use of these resources without compromising individual utility.

Finally, two limitations of the study should be mentioned. First, as most laboratory studies, it was conducted with students rather than with a representative sample of the population. This may be of importance here, since with an age median of 21 and in a phase of professional orientation, this cohort may be particularly open to external influences. Second, the effect on reference states was measured less than ten minutes after the priming, and it is hard to predict to what extent it would persist in the medium-term. Both points should be addressed in future studies before the results can be generalized.

Appendix

Table 2: Linear regression with investment and minimum as dependent variables

	investment		minimum	
	coeff.	st.error	coeff.	st.error
MAT	(dropped)			
CONT	-.7161557	.3376422**	-3.198367	.9192918***
SOC	-.9213009	.3428013***	-2.479156	.93191***
AGE	.0690919	.0394413*	.0628623	.1072228
IKM	.61531	.3332486*	1.10208	.9060231
MAT*FEMALE	-.8904332	.4217957**	-1.355829	1.14666
constant	2.59446	.9283854***	7.11155	2.52386***
R^2	0.0495		0.0651	

MAT, CONT and SOC denote the treatments. The differences between the treatments are significant at the 1%-level (***) and 5%-level (**), respectively. Age is weakly significant at 10% (*), with older participants investing more. Female participants do not invest differently in general, but they react less in the MAT treatment. IKM denotes the major "Intercultural Management". These students seem to be a somewhat specific group, with only the very best high school graduates being accepted into this program. Their investments are higher in general (significant at 10%). No other majors have a significant effect.

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