

Worry and Mental Accounting with Protective Measures*

Christian Schade[°]

Howard Kunreuther[♦]

February 20, 2001

* This research has been supported by a grant from the German Research Foundation (DFG), grant-#: Scha 816 1/1. We would like to thank Jonathan Baron, Colin Camerer, Rachel Croson, Karen Gedenk, Il-Horn Hann, Jack Hershey, Steve Hoch, Abeer Hoque, Julie Irwin, Klaus Peter Kaas, Moti Levi, Mary-Frances Luce, Felix Oberholzer, Paul Rosenbaum, Andreas Schröder, Thomas Spengler, Eli Snir, Reinhard Tietz, and Martin Weber for helpful comments and discussions.

[°] Professor Christian Schade is Director of the Institute for Entrepreneurial Studies and Innovation Management, School of Business and Economics, Humboldt-Universität zu Berlin, Germany, email: schade@wiwi.hu-berlin.de

[♦] Professor Howard Kunreuther is Director of the Risk Management and Decision Processes Center, Wharton School, University of Pennsylvania, Philadelphia, USA, email: kunreuther@wharton.upenn.edu

Worry and Mental Accounting with Protective Measures

We examine the impact of worry on mental accounting effects under risk. Counter intuitively, worry has no main (positive) effect on willingness to pay (WTP) for protection, and mental accounting effects do not occur with all decision makers. Only those who tend to worry, seem to deal with the quantitative aspects of the decision situation and thus are affected by framing manipulations: We provide evidence for an interaction effect between worry and mental accounting occurring. Consequently, worriers even pay less for protection in specific decision situations.

Introduction

We examine the impact of trait worry, i.e. worry as a personality variable, on the magnitude of mental accounting effects under risk. Mental accounting effects have first of all been postulated and demonstrated for situations of *certainty* and for decision makers in general. Secondly, a greater tendency to worry would intuitively be expected to lead to a higher level of WTP for any protection. Altogether one would simply expect mental accounting effects to occur with all decisions makers also under conditions of risk; and people tending to worry would be expected to pay more for protection in any situation, i.e. independent of specific frames.

In our experiments, individuals faced relatively high-stakes decision situations with real risks and real payments. They were given a Panasonic Walkman that they could lose if a “mechanical defect” --- simulated by the roll of a die --- occurred. They were asked their maximum WTP for protection in scenarios which were designed to evoke different mental accounting principles: (1) bundling versus unbundling Walkman and warranty, (2) warranty with and without a no-claim rebate.

On the basis of our findings we are going to show that both intuitions specified above: expecting a main effect of worry on WTP and expecting framing manipulations to occur with all decision-makers, may be misleading in our decision situation.

Mental accounting effects will be shown to only occur with subjects that are tending to worry; thus mental accounting does not hold for decision makers in general under conditions of uncertainty. Even more surprising, an individual’s tendency to worry does also *not* in general lead to a higher level of WTP for protection, i.e. we find no evidence for a main (positive) effect of trait worry on WTP for protection. However, due to the fact that only high-worriers are affected by mental

accounting manipulations, we provide strong evidence for an *interaction effect between worry and mental accounting* occurring. Surprisingly, high-worriers will be demonstrated to even pay *less* for protection in specific decision situations.

We are going to explain this finding by only high-worriers dealing with the *quantitative aspects* of the decision situation. Only a person that deals with quantitative aspects *can* be affected by framing manipulations whereas others, low-worriers, are not affected but may tend to no-reflected, “stochastic” payments in any decision situation. Since worry has *no* main (positive) effect on WTP for protection, this may even lead to higher payments of low-worriers rather than high-worriers in specific scenarios as we are going to demonstrate. The missing main effect of worry on WTP may be due to the fact that probabilities were exactly specified and easily to digest (roll of die) in our experiments; thus our scenario left no room for probability simulations being potentially affected by the tendency of an individual to worry.

The next section of the paper provides a theoretical basis for understanding the impact worry may have on mental accounting with protective activities and proposes two testable hypotheses implied by the theory. The subsequent section reports on the results of a controlled experimental study that examines these hypotheses. The concluding section discusses the implications of these findings for adoption of protective measures, deals with potential alternative explanations of our findings based on affect and emotion, and strongly emphasizes the adequacy of our explanation.

Theoretical Construct

You cannot prevent the birds of worry and care from flying over your head.

But you can stop them from building a nest in your head. (Chinese Proverb)

Basic Considerations

We are investigating whether or not the *trait* variable worry, the degree a decision-maker generally tends to worry, influences her decision-making with respect to protective activities. Worry has originally been described as the cognitive *part* of anxiety (Liebert and Morris 1967). But as recent experiments have shown it is also *independent from anxiety* (Davey 1994). Worry and anxiety have different effects on cognitive abilities: Whereas anxiety impedes one's cognitive processing ability, worry may have a positive effect as long as the concerns are not pathological (see Davey 1994, for a literature review).

In fact, *anxiety* is an *emotion* while *worry* is *more of a cognitive phenomenon*: "Perhaps the most important, fundamental characteristic of worry is that it involves a type of internal verbal-linguistic activity, i.e. thinking" (Borkovec 1994). Not surprisingly, 70% of 300 college students related worry to thoughts (Borkovec and Lyonfields 1993). "Worrying is often seen as a constructive occupation that helps to solve potential problems in living. ... the student who is approaching final examinations may consider it appropriate and necessary to worry about them. This may have the dual benefit of motivating the individual and helping him or her to define and think through any potential problems in good time" (Davey 1994, p. 38). Subjects perceived the following benefits of worrying (Tallis, Davey, and Capuzzo 1994, p. 77):

- Worrying acts as a *stimulant*,

- *worrying clarifies thoughts and concentration,*
- *worrying gives the opportunity to analyze situations and work out the pros and cons,*
- *worrying adds to the problems and as such leads to exploration of different possibilities.*

Relationship Between Worry and Cognition

From these findings we conclude that high-worriers will show a *higher involvement* and are *cognitively more active* than low-worriers in decisions under risk. In decisions on protective measures, we consequently expect high-worriers to *carefully think through* the choice they have to make and utilize data on the risks and benefits of protection.¹ Low-worriers are likely *not to care* much about the risk and hence may not calculate values of objects, losses, and prices for protection. Note that worry is a different concept from that of risk attitudes. Being a high-worrier does not necessarily imply having a higher WTP for protection while being more risk averse has that effect.

There are similarities between these conclusions on worry and the findings on involvement and persuasion reported in the literature on consumer behavior (Petty and Cacioppo 1981).

Specifically, the *message content* is demonstrated to be only relevant under high involvement. .

¹ This hypothesis is also in tune with the idea underlying Stöber's "worry and degree of elaboration" study (Stöber 1996) with however mixed empirical findings. From our perspective, his respondents may just not have been "worried" enough because no real risks were involved.

Under low involvement, *non-content factors* such as the credibility or attractiveness of the message source are the important ones.

More formal descriptive models of cognition and choice, such as prospect theory (PT), underlying the mental accounting hypotheses of Thaler (1985), assume that decision-makers process probabilities, prices of protection, and outcomes explicitly. If only high-worriers are dealing with a risky decision situation in detail, the effects hypothesized on the basis of these theories should only hold for these people. The key general hypothesis that follows from this analysis is:

In decisions on protective activities, people tending to worry behave in a manner consistent with prospect theory and mental accounting; non-worriers are unaffected by the quantitative details of the decision situation.

To test this general hypothesis we measure the trait variable worry on the basis of the only personality questionnaire for *non-pathological* worry, the Worry Domains Questionnaire (WDQ) of Tallis, Eysenck, and Mathews (1992) in the 25 item version presented by Tallis, Davey, Bond (1994).³ In the WDQ subjects are asked about the degree they tend to worry in five different domains of their life, e.g. personal relations and work. Examples of statements are: "I worry that my future job prospects are not good" and "I worry that I am not loved". Answers to all 25 statements have to be given on the following rating scale: "Not at all" (score: 0), "A little" (score: 1), "Moderately" (score: 2), "Quite a bit" (score: 3), and "Extremely" (score: 4).

The sum of all ratings is the overall WDQ score varying between 0 and 100. A higher WDQ score is associated with a higher tendency to worry. Subjects in the normal work force have a mean score of 23.1, students have a mean score of 26.6, while clinical subjects (persons undergoing a psychiatric treatment because of extreme worry) have mean scores of 40.03 – or even 50.7, in another study – (Tallis, Davey, and Bond 1994).

³ The main experiment was carried out in Germany with the translation of Stöber (1996).

The subjects in our study had a median of 25, implying that their worry scores are very close to the other studies on non-clinical subjects. Note that there is no “natural” score for a split between high-worriers and low-worriers. We discriminate between the two groups by classifying individuals as high-worriers if they are at or above the median value and low-worriers if they are below it. A conclusive test of worry effects will be carried out with regressions based on continuous WDQ scores.

Worry Effects in Bundling and Rebate Scenarios

We investigate worry effects in *two scenarios* mirroring different mental accounting effects with *two treatments* in each scenario (see table 1). Respondents are facing the risk of the loss of an object in all our treatments. The first scenario (“bundling scenario”) compares the price that one is willing to pay for purchasing an object along with a warranty (“bundling condition”) should the item be defective with the situation where these items are sold separately (“unbundling condition”). The second scenario (“rebate scenario”) compares the effects of rebates to the individual should he purchase the warranty and then learn that the object is **not** defective (“rebate condition”) with the situation where no rebates are given (“no-rebate condition”).

Experimental Scenarios	Experimental Conditions (Framing Manipulations)
Bundling Scenario:	Unbundling
	Bundling
Rebate Scenario:	No-Rebate
	Rebate

Table 1: Experimental scenarios and conditions

The Bundling Scenario: According to PT and mental accounting, if a warranty is offered as part of a bundle when the object is purchased, then the individual should view the warranty payment as less painful than if it were offered separately after the item was purchased. More specifically a *mental aggregation of the two payments may be facilitated in the bundling rather than in the unbundling condition.* Figure 1, depicting the PT value function, shows that two payments $-A$ and $-B$ are less painful if they are valued jointly $V[-(A+B)]$ than individually $[V(-A)+V(-B)]$.

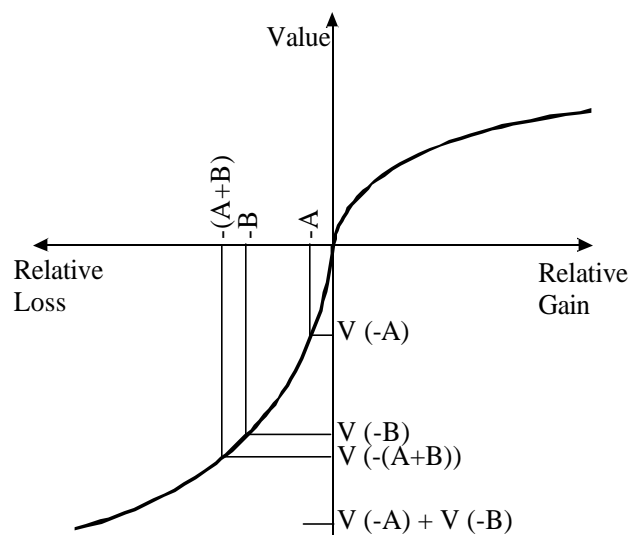


Figure 1: Separate and joint evaluation of payments according to mental accounting principles

All the principles of mental accounting are based on the assumption that individuals deal with the quantitative aspects of the decision situation. Under conditions of risk and uncertainty, we hypothesize that only those who tend to worry will do so. More specifically:

H1: The higher an individuals' tendency to worry, the larger differences in willingness to pay for protection between "bundled" and "unbundled" conditions are.

The Rebate Condition: In a questionnaire experiment Johnson, Hershey, Meszaros, and Kunreuther (1993) (JHMK) found that introducing a rebate to those who did not make a claim increased the attractiveness of insurance policies even if the premium on the policy was increased by the amount of the rebate. Using the PT value function, they argued that the potential rebate would be framed as a separate gain that was valued more than the additional premium because of diminishing sensitivity. In figure 2 JHMK's argument is depicted. If P is the price of insurance without a rebate and R the amount of the rebate, then $V(P-R) + V(R) > V(P)$.

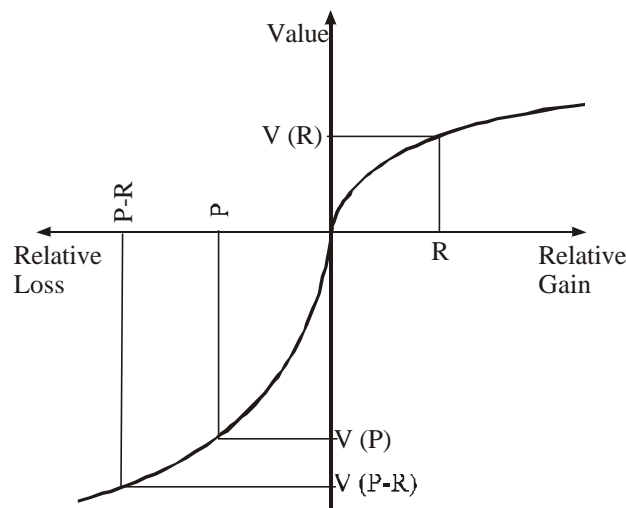


Figure 2: Effects of rebates on attractiveness of insurance policies according to JHMK

We suggest the following hypothesis H2 that is similar in spirit to H1 and is also derived from our general hypothesis:

H2: The higher an individuals' tendency to worry, the larger are differences in attractiveness of protective measures offered with rebates rather than without rebates are.

Experimental Design and Results

Design of the study

The laboratory experiment was conducted in the spirit of experimental economics (see e.g. Camerer 1995). We utilized real objects and real payments, an incentive-compatible preference-revealing mechanism, and a trait questionnaire from personality psychology to measure worry: the WDQ. The experiment was undertaken as a between-subjects design with four independent groups.

As part of the recruiting announcement, students were told that by participating in our experiment they would have a five in six chance to go home with a Panasonic Walkman and that they would receive an additional payment of 10 DM (independent of whether they receive a Walkman or not).

At the beginning of the experiment subjects were given 25 DM (approximately 15 US\$ at time of experiment). They were obliged to buy a Walkman (WM) for 15 DM. However, before paying for the WM, respondents were told that there is a one in six chance that the WM would be declared “defective”.⁶ In this case they would leave the room without the WM.

At the end of the experiment a die is rolled for each participant to determine which WMs are “defective”: If a six comes up, the product will be declared “defective”. A part of the remaining

⁶ The selling price of the Walkman was slightly lower than its objective value. Expected value of the risky Walkman is 5/6 of its store price of about 25 DM being equal to 20,83 DM. There was however no significant relationship between respondents’ estimations of store prices of the Walkman and their WTP for protection in our experiment.

10 DM could be used to purchasing a warranty against the risk that the WM was defective. A person who purchased a warranty would be guaranteed to take a non-defective WM home.

Remember that scenario 1 (“bundling”) consists of “bundling” and “unbundling” conditions, and scenario 2 (“rebate”) consists of “rebate” and “no-rebate” conditions. In the bundling condition, the warranty was offered and paid *together* with the Walkman. In the unbundling conditions, payments for Walkman and warranty were separated by a transfer of the Walkman.⁷ In the no-rebate condition, the warranty was offered *immediately after* the respondents had paid for the Walkman. The rebate differed from the no-rebate condition in that there was a rebate of *half the price of the warranty* if no loss occurred. The “warranty” was offered after respondents had received the Walkman. We used a modified Becker, DeGroot and Marschak (1964) mechanism for eliciting maximum WTP values. Instead of using an explicit, visible random mechanism to determine the actual selling price for the “warranty”, a secret price was pre-selected and put into a sealed envelope. We did not use the standard BDM procedure in order to avoid the problems caused by a two-stage lottery (Safra, Segal, and Spivak 1990).

⁷ Although respondents were endowed with the Walkman in condition 3, we did not find any evidence for an endowment effect occurring since WTP was lowest in this condition. Endowment effects have been demonstrated in a WTP/WTA disparity, i.e. minimum selling prices for a number of objects were found to be systematically higher than maximum buying prices (Knetsch 1989). Respondents were however not asked to sell the Walkman in condition 3 of our experiment but to buy a “warranty”.

⁸ Although respondents were endowed with the Walkman in condition 3, we did not find any evidence for an endowment effect occurring since WTP was lowest in this condition. Endowment effects have been demonstrated in a WTP/WTA disparity, i.e. minimum selling prices for a number of objects were found to be systematically higher than maximum buying prices (Knetsch 1989). Respondents were however not asked to sell the Walkman in condition 3 of our experiment but to buy a “warranty”.

Prior to running the experiment, the secret price was randomly picked from a price interval based on E(loss) as well as anticipated mean WTPs based on earlier pretests of the mechanism. In this experiment, prices were picked from an interval between 2.50 and 5.00 DM in the no-rebate and unbundling conditions (since $E(\text{loss}) = 2.50$ DM), from an interval between 15.00 DM and 20.00 DM in the bundling condition ($E(\text{loss}) = 2.50$ DM, but total price for Walkman (15 DM) plus “warranty”, here), and within an interval between 4.00 DM and 10.00 DM in the rebate condition ($E(\text{loss}) = 4.29$ DM)⁹. YOU HAD A COUPLE OF QUESTIONS ON THIS POINT THAT MAY BE CLARIFIED ON THE PHONE.

The mechanism was carefully explained to the subjects. It was made clear that it was designed to elicit their maximum buying prices for protection. We explained that if they bid too high they might end up paying that high price, and if they bid too low they might end up without protection that they would have wanted. Subjects were permitted to ask questions on the procedure and the mechanism was explained a second time if necessary. Respondents were then asked to put their maximum buying price for the warranty in an envelope and to complete the WDQ so they could be classified as a worrier or non-worrier.¹⁰

⁹ For simplicity the *risk neutral buying price* (RNBPRICE) for rebate protection is also labeled E(loss), here. In fact, this price is determined by adding E(loss) of standard protection and expected value of getting 50% of the buying price back: $\text{RNBPRICE} = 5/6 (1/2 \text{RNBPRICE}) + E(\text{loss})$. After simple manipulations we get $7/12 \text{RNBPRICE} = E(\text{loss})$ or $\text{RNBPRICE} = 12/7 E(\text{loss})$. With E(loss) being 2.50 DM in our experiment, RNBPRICE is 4.29 DM. Note that RNBPRICE is a constant multiple of E(loss) so that it “behaves” identical to E(loss) in further calculations (see below).

¹⁰ We added standard questions on age, field of study and knowledge, the Social Desirability Scale of Crowne and Marlowe (1960), and open-ended questions as well as statements with rating scales on how WTP for the warranty was determined. These variables did not interact with the variables in focus.

The experiment took approximately 90 minutes. It was carried out in group-sizes of from 6-10 respondents situated in separate booths. The instructions and preference-revealing mechanisms were pre-tested at the University of Pennsylvania, Philadelphia/ USA, in March and April 1998. The experiment was carried-out with 129 students of Goethe-University, Frankfurt/ Germany, in July and October 1998. The vast majority of the participants were business and economics students. We had four groups in each treatment with a total of 32, 31, 32, and 34 respondents, in experimental conditions 1-4.

Results on these variables will therefore not be reported in this article.

Scenario 1 findings (“bundling”): Worry effects on bundling/unbundling differences (H1)

H1 states that there is an interaction effect between worry and the mental accounting effect of bundling versus unbundling product and warranty. According to H1, WTP differences between these conditions are expected to be greater for high-worriers rather than low-worriers. However since E(loss) of the “warranty” was equal in both conditions one would not expect WTP to differ based on standard expected benefit-cost calculations (normative prediction, the null hypothesis).

In fact, WTP for protection differed significantly between bundling and unbundling conditions in the total group (p-value (MWU): .032, two-sided). Mean WTP was 5.33 DM in the bundling but only 3.55 DM in the unbundling condition. For illustrative purposes, we initially split the group into high-worriers and low-worriers. The subjects with the highest 50% scores in the WDQ (high-worriers) showed a higher difference between the bundling and unbundling conditions (5.82 DM versus 2.87 DM) (p-value (MWU): .01). The difference practically disappeared for the subjects with the lowest 50% WDQ scores (4.77 DM versus 4.50 DM) (p-value (MWU): .746) (see table 1).

	Bundling (Condition 2) n=32	Unbundling (Condition 3) n=31
	WTP in DM	WTP
Total group	5.33	3.55
High-worriers	5.82	2.87
Low-worriers	4.77	4.50

Table 1: WTP for protection in bundling and unbundling conditions in total group and subgroups of low-worriers and high-worriers

A conclusive test of H1 was based on worry as a continuous variable. The interaction effect between worry and bundling was specified by multiplying the bundling dummy and WDQ scores.¹¹ To account for the mix between dichotomous and continuous predictor variables and for potentially non-linear relationships we ran *monotonic ordinal regressions*.¹² The Appendix (A1) reports regressions with all potential combinations of main and interaction effects, r^2 -values¹³, significance levels, and a short interpretation. We find that only the main effect of bundling as well as the interaction effect between bundling and high worry contribute to differences in WTP with the *interaction effect being the most powerful single variable* (having a highly significant

¹¹ For this way of specifying an interaction effect between a continuous independent and a qualitative independent variable in a regression see Jaccard, Turrisi, and Wan 1990, p. 42-49. The choice of the reference group in dummy coding is arbitrary. See also Cohen and Cohen 1983.

¹² This relatively new method is provided in SPSS Goldminer 2.0. It was introduced by Magidson 1996.

¹³ For the interpretation of r^2 -values in monotonic regressions see Magidson 1996 and 1998.

impact in part of the regressions). We are able to explain slightly more than 10% of total variance in WTP for the “warranty”.¹⁴

Decision on H1: Since high worry enlarges the difference in WTP between bundling and unbundling conditions, H1 could be confirmed.

Scenario 2 findings (“rebates”): Worry effects on rebate/no-rebate differences (H2)

In the following we are going to test H2 via a comparison of conditions 1 (basic condition) and 4 (rebates). The analysis is less straightforward than with H1. First of all, attractiveness of protective measures in the two groups cannot directly be compared on the basis of WTP values, since the “warranty” was normatively worth more in condition 4.¹⁵ It was worth 2.50 DM in condition 1 and 4.29 DM in condition 4 since respondents get money back in many cases. Relative attractiveness will thus be analyzed via WTP/E(loss) ratios¹⁶. Secondly, no effect of rebates could be found among individuals having a WTP smaller than E(loss) also undermining significance of this effect in the entire group. The results for this subgroup are presented in the Appendix (See A2). In order to test H2 on interactions effects with worry, we need a solid mental accounting effect to be analyzed. We therefore concentrated on the sub-sample of individuals having a WTP greater than E(loss).

¹⁴ Although a large fraction of the variance in WTP thus remains unexplained by these regressions, we judge this as a noteworthy contribution of normatively irrelevant aspects to WTP for protection.

¹⁵ Consequently, WTP was significantly higher for the rebate “warranty” (p-value: .04).

¹⁶ Labeling the risk neutral buying price of rebate protection E(loss) is a simplification. For the calculation

WTP/E(loss) ratios are much *lower* for protection with rebates than when rebates are not given. The *negative* effect of rebates differs from earlier findings and will be discussed below. The difference in ratios is .87 (p-value (MWU): .001, two-sided). For illustrative purposes, we again split the group into subgroups of high- and low-worriers. The negative effect of rebates is most pronounced for high-worriers. Here, the difference in ratios is 1.31 (p-value (MWU): .000). For low-worriers the difference is only .58 and non-significant (p-value (MWU): .357, two-sided). The results are reported in table 3.

A conclusive test of H2 was again based on worry as a continuous variable. The interaction between worry and rebate effects was specified by multiplying the rebate dummy and WDQ scores. As with bundling, we ran monotonic ordinal regressions. Regressions with all potential combinations of main and interaction effects, r^2 -values, significance levels, and a short interpretation are reported in the Appendix (See A3).

As with bundling, only the main (negative) effect of rebates as well as the interaction effect between high-worry and rebates significantly contribute to differences in the WTP/E(loss) ratios. We are able to explain more than 20% of total variance in WTP/E(loss).¹⁷

of this figure see FN 6.

¹⁷ The fraction of explained variance in WTP for the “warranty” is higher here than with bundling where it was only slightly higher than 10%. Still, a large fraction of the variance in WTP however remains unexplained. But again we would like to emphasize this being an important contribution of normatively irrelevant aspects to WTP.

	Basic (Condition 1) n=21 E(loss)=2.50 DM	Rebate 50% (Condition 4) n=26 E(loss)=4.29 DM
	WTP/E(loss)	WTP/E(loss)
Total group	2.64	1.77
High-worriers	3.06	1.75
Low-worriers	2.39	1.81

Table 3: Rebate versus standard policy on the basis of WTP/E(loss); individuals having a WTP of at least E(loss); total group and subgroups of low-worriers and high-worriers

Decision on H2: Since high worry enlarges the (negative) rebate effect, H2 could be confirmed.

Discussion, Conclusions, and Implications

The negative effect of rebates differs from earlier findings and at first blush is somewhat surprising. Our explanation for this finding is that a positive effect of rebates only occurs if payments are substantial, as in the experiments of JHMK. If payments are relatively small as in our experimental situation, all payments are processed close to the reference point. In this case loss aversion with respect to the extra payment for the more expensive “rebate warranty” is likely to be stronger than the effect of diminishing loss sensitivity. The extra cost may consequently be perceived as being more painful than the perceived gain due to the segregation of the potential rebate.

Consider the following two examples. In Example 1 an insurance policy without rebates costs \$300 and a policy with rebates costs \$450. The difference will be processed in an interval where

the marginal impact of an additional dollar on the perceived loss is low. However the potential gain of \$150 due to the potential rebate payment will be processed in an interval where the marginal impact of an additional dollar on perceived gain is still high. This leads to the typical positive rebate effect.

In Example 2 the payment for protection without rebates is only \$50 and the payment for protection with rebate is \$75. Here, the \$25 difference will be processed in an interval where the marginal impact of an additional dollar on perceived loss is very high. The potential gain of \$25 will also be processed in an interval where the impact of an additional dollar on perceived gain is high. Since the value function is steeper in the loss domain, this potential gain is perceived as less than the higher price of the warranty. Letting P = price of the warranty without a rebate and R =the magnitude of the rebate then this result implies that $V(P-R) + V(R) < V(P)$. This argument is also depicted in figure A4 in the Appendix showing the prospect theory's value function enlarged in the interval close to the reference point.

More experimental research is necessary to specify the situational characteristics determining positive or negative effects on the attractiveness of protection with and without no-claim rebates. An interesting set of experiments would systematically vary the value of the object to be protected, the cost of protection, and the percentage of the insurance premium to be given as a rebate if no claim is made during the year.

Our findings also suggest that packaging the warranty with the object at risk encourages individuals to buy protection. High-worriers are willing to pay more for the warranty in bundled rather than unbundled situations. Low worriers don't appear to differentiate between these two

cases. This result is consistent with existing sales practices. Service contracts or warranties are normally offered at the time that the item is purchased in the store.

Since both H1 and H2 are confirmed by the data, we conclude that worry may in fact be a variable enlarging mental accounting effects in decision making under uncertainty. In our experimental study we restricted attention to a decision situation where loss probabilities were exactly specified. A challenging topic for future research is how pervasive a role worry plays on WTP for protective measures when one varies the nature of the risk and the types of information individuals have on the probability of different outcomes and their resulting losses.

We interpret our results as showing that high-worriers process payments/losses and probabilities explicitly while low worriers are not as careful in making these calculations. It would be interesting to investigate whether different individuals in different decision situations process quantitative factors differently. Worry may only be but one of the variables determining the degree of elaboration on the central characteristics of a decision situation. One might also want to attempt to determine the nature of the decision processes of low-worriers who appear not to be influenced by quantitative factors.¹⁸

A potential alternative interpretation may be based on affect and emotion. As Rottenstreich and Hsee (2000) show for the PT weighting function, the shape of the function may depend on the amount of affect in a specific decision situation. Assuming that the same holds for the value function and that high-worriers exhibit more affect in a decision under risk, mental accounting may work better with these persons because their value function is more shaped in a way PT assumes

¹⁸ Low-worriers may rely on other, more qualitative decision determinants. Such determinants of WTP for protection are analyzed for the case of low-probability hazards in Schade and Kunreuther (2000).

for all decision makers whereas value functions for low-worriers are relatively flat. Hence this group of decision-makers is less affected by mental accounting. Although this alternative explanation is appealing at first sight, we do not think that this is the appropriate explanation of our findings. First of all, the literature on affect and emotion investigates situation-dependent emotions across all subjects rather than personality dimensions (as we do). Secondly, worry is not a purely emotional phenomenon as pointed out earlier, so it must not solely be affect that differs between high-worriers and low-worriers. Also, the impact (of the shape) of the value function on a decision may be more reflective of how careful a decision maker is dealing with a decision situation rather than how emotional.

Further experiments and empirical studies would be useful to determine whether the results on warranties generalize to other forms of protection such as installing deadbolt locks against burglaries, steering wheel clubs against car thefts or designing more earthquake resistant homes. Such data will be useful in develop a more general theory of worry and protective behavior.

Appendix

AI: Table with results of monotonic ordinal regressions of WTP in bundling versus unbundling conditions with different combinations of predictor variables:

Regression #	Variables included	$L^2(Y)$ of variable ¹⁹	p-value of variable	r^2 of regression	p-value of regression
1	Bundling	.26	.61	.115	.06
	Worry	.25	.62		
	Interaction	2.52	.11		
2	Bundling	7.49	.024	.057	.054
	Worry	.50	.48		
3	Bundling	.07	.79	.112	.03
	Interaction	2.63	.1		
4	Worry	.06	.81	.112	.03
	Interaction	7.16	.0075		
5	Bundling	7.13	.028	.053	.03
6	Worry	.14	.71	.001	.71
7	Interaction	7.16	.0075	.111	.0075

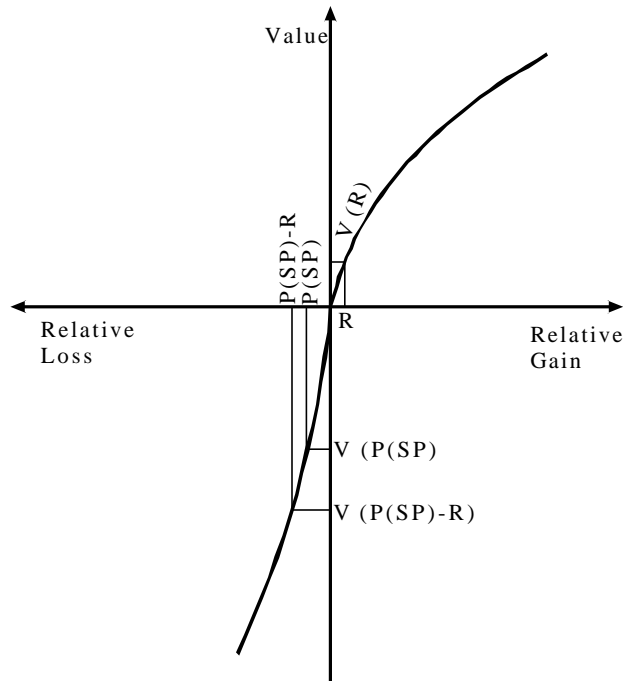
Interpretation of AI: Significance levels in regression #1 are somewhat unsatisfactory but the interaction effect is the by far most powerful variable according to $L^2(Y)$ and p-value. The importance of the interaction effect is also indicated by the fact that total r^2 of the regressions is always about double as high when this variable is included --- in regressions #1, 3,4, and 7 --- rather than excluded --- in regressions 2, 5, and 6. In regressions 1 and 3, the interaction effect is about marginally, in regressions 4 and 7 highly significant.

¹⁹ $L^2(Y)$ is the likelihood-ratio chi-square difference statistic used to assess the statistical significance of the effect estimate of the respective predictor variable (see Magidson 1996 and 1998).

A2: Table reporting WTP/E(loss) for rebate versus basic condition; individuals having a WTP below E(loss); difference in total group: p-level (MWU) = .404, two-sided; difference in group of high-worriers: p-level (MWU) = .400, two-sided; difference in group of low-worriers: p-level (MWU) = .852, two-sided

	Basic (Condition 1) n=11 E(loss)=2.50 DM	Rebate 50% (Condition 4) n=8 E(loss)=4.29 DM
	WTP/E(loss)	WTP/E(loss)
Total group	.45	.32
High-worriers	.63	.23
Low-worriers	.39	.35

A4: Effects of rebates on the attractiveness of protection with low payments:



A3: Table with results of monotonic ordinal regressions of WTP/E(loss) in bundling versus unbundling conditions with different combinations of predictor variables:

Regression #	Variables included	$L^2(Y)$ of variable ²⁰	p-value of variable	r^2 of regression	p-value of regression
1	Rebates	.18	.67	.239	.004
	Worry	.11	.74		
	Interaction	1.57	.21		
2	Rebates	.56	.45	.237	.001
	Interaction	1.93	.16		
3	Rebates	10.5	.005	.104	.014
	Worry	.00	.98		
4	Worry	.49	.48	.234	.0014
	Interaction	11.72	.0006		
5	Rebates	10.66	.005	.104	.0048
6	Worry	.16	.69	.002	.69
7	Interaction	12.67	.0004	.218	.0004

Interpretation of A3: As with bundling, significance levels in regression #1 are somewhat unsatisfactory but the interaction effect is again the by far most powerful variable according to $L^2(Y)$ and p-value, here. The importance of the interaction effect is again indicated by the fact that total r^2 of the regressions is more than double as high when this variable is included -- in regressions #1, 2, 4, and 7 --- rather than excluded --- in regressions 3, 5, and 6. In regressions 4 and 7 the interaction effect is highly significant.

²⁰ $L^2(Y)$ is the likelihood-ratio chi-square difference statistic used to assess the statistical significance of the effect estimate of the respective predictor variable (see Magidson 1996 and 1998).

References

- Becker, G. M., M. H. DeGroot and J. Marschak (1964): Measuring Utility by a Single-response Sequential Method, in: Behavioral Science, Vol. 9, 3, pp. 226-232.
- Borcovec, T.D. (1994): The Nature, Functions, and Origins of Worry, in: Worrying; Perspectives on Theory, Assessment, and Treatment, ed. by G.C.L. Davey and F. Tallis, Chichester et al.: Wiley, pp. 5-33.
- Borcovec, T.D. and J.D. Lyonfields (1993): Worry: Thought Suppression of Emotional Processing, in: Vigilance and Avoidance, ed. By H. Krohne, Toronto, pp. 101-118.
- Camerer, C. (1995): Individual Decision Making, in: Handbook of Experimental Economics, ed. By J. H. Kagel and A. E. Roth, Princeton, pp. 587-616.
- Cohen, J., and P. Cohen (1983): Applied Multiple Regression for the Behavioral Sciences, 2nd ed., Hillsdale (NJ).
- Crowne, D. P./Marlowe, D. (1960): A New Scale of Social Desirability Independent of Psychopathology, in: Journal of Consulting Psychology, Vol. 24, S. 349-354.
- Davey, G.C.L. (1994): Pathological Worrying as Exacerbated Problem-Solving, in: Worrying; Perspectives on Theory, Assessment, and Treatment, ed. by D. Davey and F. Tallis, Chichester et al., pp. 35-59.
- Jaccard, J., R. Turrisi, and C. K. Wan (1990): Interaction Effects in Multiple Regression, Series: Quantitative Applications in the Social Sciences, Newbury Park, London, New Delhi.
- Johnson, E. J., J. Hershey, J. Meszaros, and H. Kunreuther (1993): Framing, Probability Distortions, and Insurance Decisions, in: Journal of Risk and Uncertainty, Vol. 7, pp. 35-51.
- Kahnemann, D. and A. Tversky (1979): Prospect Theory: an Analysis of Decision under Risk, in: Econometrica, Vol. 47, pp. 263-291.
- Knetsch, J. L. (1989): The Endowment Effect and Evidence of Nonreversible Indifference Curves, in: American Economic Review, Vol. 79, pp. 1277-1284.
- Krahnen, J.P., Ch. Rieck and E. Theissen (1997): Inferring Risk Attitudes from Certainty Equivalents: Some Lessons from an Experimental Study, Frankfurt University Working Paper.
- Liebert, R.M. and L.W. Morris (1967): Cognitive and Emotional Components of Test Anxiety: A Distinction and some Initial Data, in: Psychological Reports, Vol. 20, pp. 975-978.
- Magidson, J. (1996): Maximum Likelihood Assessment of Clinical Trials based on an Ordered, Categorical Response, in: Drug Information Journal, Vol. 30, pp. 143-170.

- Magidson, J. (1998): Goldminer 2.0 User's Guide, SPSS Statistical Innovations Inc., Belmont (MA).
- Petty, R. E. and J. T. Cacioppo (1981): Issue Involvement as a Moderator of the Effects on Attitude of Advertising Content and Context, in: *Advances in Consumer Research*, Vol. 8, pp. 20-24.
- Safra, Z., U. Segal, and A. Spivak (1990): The Becker-DeGroot-Marschak Mechanism and Nonexpected Utility: A Testable Approach, in: *Journal of Risk and Uncertainty*, Vol. 3, pp. 177-190.
- Schade, Ch. and H. Kunreuther (2000): Decision Determinants and Clusters with Insurance against Highly Ambiguous, Very Low Probability Hazards, Unpublished Manuscript.
- Stöber, J. (1996): *Besorgnis und Besorgtheit*, Frankfurt am Main et al..
- Tallis, F., G.C.L. Davey and A. Bond (1994): The Worry Domains Questionnaire, in: *Worrying; Perspectives on Theory, Assessment, and Treatment*, ed. by G.C.L. Davey and F. Tallis, Chichester et al.: Wiley, pp. 285-297.
- Tallis, F., G.C.L. Davey and N. Capuzzo (1994): The Phenomenology of Non-pathological Worry: A Preliminary Investigation, in: *Worrying; Perspectives on Theory, Assessment, and Treatment*, ed. by G.C.L. Davey and F. Tallis, Chichester et al.: Wiley, pp. 61-89.
- Tallis, F., M.W. Eysenck and A. Mathews (1992): A Questionnaire for the Measurement of Nonpathological Worry, in: *Personality and Individual Differences*, Vol. 13, pp. 161-168.
- Thaler, R. (1985): Mental Accounting and Consumer Choice, in: *Marketing Science*, Vol. 4, pp. 199-214.