“Worry and Warranties”
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Worry and Warranties

We examine the role that worry plays in decision processes and choices made by individuals who have an opportunity to purchase a warranty against product defects. Our conclusion is that behavior of people who tend to worry is better predictable by standard models of mathematical psychology assuming that people process payments/losses and probabilities explicitly.
Introduction

Marketing research has only recently dealt with purchasing decisions for insurance [Johnson, Hershey, Meszaros, and Kunreuther (1993) (JHMK)] or warranties on the failure of consumer durables [Hogarth and Kunreuther (1995) (HK)]. This paper builds on these earlier studies but focuses on the role that worry plays in undertaking protective action. In particular, we examine the role that worry plays in the decision processes and choices made by individuals who have an opportunity to purchase a warranty against possible product defects.

Some indication of the importance of worry in the desire of reducing risks can be found in Baron et al. (1999). Our principal conclusion is that the behavior of people who tend to worry is better predictable by standard models of mathematical psychology, i.e. prospect theory and mental accounting – assuming that people process payments/losses and probabilities explicitly, than using these models to explain the behavior of those who tend not to worry. The latter group behaves in a less structured manner so that it is difficult to predict what they will pay for warranties under different conditions.

The next section of the paper provides a theoretical basis for understanding the choice processes associated with protective activities and proposes a set of hypotheses underlying our study. Section 3 reports on the results of a controlled study that tests these hypotheses using real products, actual warranty payments, and real risks. The concluding section discusses the marketing implications of these findings.
Theoretical Construct

This section develops a framework and hypotheses with respect how worry may influence people’s willingness to pay for product warranties which provide protection against uncertain losses. Of particular interest is determining whether differences in the attractiveness of certain types of warranties can be explained by behavioral choice models such as prospect theory.

Warranty decisions, prospect theory, and mental accounting: Explicit processing of payments/losses and probabilities

As a starting point for our analysis we assume that decision makers process payments/losses and probabilities explicitly. Prospect theory (PT) (Kahneman & Tversky 1979) has been one of the most influential approaches for characterizing a person’s choice process. The mental accounting approach to choice proposed by Thaler (1985), which is based on PT, argues that customers’ joint versus separate valuation of compound outcomes can be predicted by a "pain reduction principle". Individuals tend to segregate gains and to aggregate losses because each of these mental practices leads to a higher subjective well-being of the decision maker. If people are confronted with a number of losses they prefer aggregation because of diminishing sensitivity to an additional loss increment as the magnitude of the loss increases.

With respect to customers’ purchasing decisions on warranties, PT predicts that people are willing to pay more than expected value of the loss E(loss) for the warranty if the probability of having a defective product is relatively small but not below the threshold value: the over-
weighting of small probabilities more than compensates the risk taking property of the value function in the loss domain. PT also predicts that individuals tend to pay below the $E(\text{loss})$ if the probability of the defect is relatively large. Mental accounting predicts that if the warranty and product are sold together, the customer should pay more for the warranty than if they were marketed separately. We investigate these predictions in more detail below.

Worry as a personality trait - consequences for decision-making

*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)

We are investigating whether or not the *trait* variable worry, the degree a decision-maker generally tends to worry, influences his decision-making with respect to protective activities. In questionnaire experiments on insurance decisions, Schade and Kunreuther (1998) found an interaction effect of worry with the effects predicted by mental accounting. They measured worry on the basis of the simple item: "I tend to be (un-) concerned".

There is skepticism with respect to the explanatory power of personality variables in marketing research. The well-known early literature review of Kassarjian (1971) may have discouraged later researchers. He summarized his review of a dozens of personality and consumer behavior studies in the single word, *equivocal* and suggested guidelines for future and better research in this area. We are trying to meet his suggestions in our study on worry by suggesting a set of hypotheses regarding the role that worry plays in the choice process.
Worry has originally been described as the *cognitive part of anxiety* (Liebert and Morris 1967). But as recent experiments have shown it is at least in part *independent from anxiety* (Davey 1994). "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*.

These findings suggest that high-worriers will show a *higher involvement* and are *cognitively more active* than low-worriers in decisions under risk.

In decisions on warranties and insurance, high-worriers may thus *carefully think through* the choice they have to make and utilize data on the risks and benefits of protection. Low-worriers
may instead not care much about the risk and consequently may not calculate values of objects, losses, and warranty prices.¹

More formal descriptive models of decision-making, such as prospect theory, assume that decision-makers process probabilities and values of premiums and outcomes explicitly. If only high-worriers are dealing with the decision situation in detail, the effects hypothesized on the basis of these theories should only hold for these people. The key hypothesis that follows from this analysis is:

HI: There is an interaction effect between worry and the choice patterns predicted by standard models of decision making, i.e. prospect theory and mental accounting; People tending to worry behave in a manner consistent with prospect theory and mental accounting; people tending not to worry do not use any systematic choice procedure.

To test this hypothesis we will 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,

¹ Apparently there are similarities between our approach and 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, here. Under low involvement, non-content factors such as the credibility or attractiveness of the message source are more important. Our approach is however more specific since we are proposing a personality variable to directly influence behavior and since we are proposing worry to be relevant predominantly for protective measures.
Davey, Bond (1994). In the WDQ subjects are asked about the degree they tend to worry about different issues. Some examples of statements are: "I worry that my money will run out", "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. Subjects in the normal work force have a mean score of 23.1, students have a mean score of 26.6, clinical subjects have mean scores of 40.03 – or even 50.7, in another study – (Tallis, Davey, and Bond 1994). A higher WDQ score is associated with a higher tendency to worry. However 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 needs to be based on continuous WDQ scores.

Distribution forms and contract alternatives for warranties

We test our worry hypothesis in two marketing relevant scenarios. Scenario 1 examines whether selling warranties at the point of purchasing the product leads to a different valuation than selling them after the consumers have received the product. According to PT and mental accounting, if the product and warranty are offered in a bundle, then the individual will view this

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2 The main experiment was carried out in Germany with the translation of Stöber (1996).
as less painful than if they were offered as separate items. Figure 1 depicting the PT value function shows that two separate losses -A and -B are less painful if they are valued jointly $V[-(A+B)]$ than individually $[V(-A)+V(-B)]$. Selling warranties at the point-of-purchasing the product should thus have a positive effect on the attractiveness of the warranty and consequently on customers’ WTP for a warranty than if the warranty were sold separately. This is the standard story of bundling.

With warranties however the story may be more complicated because of the potential effects of endowment. If warranties are offered when the customer already has the product at home, the warranty is less attractive because it is unbundled from the product on one hand. But as shown in figure 2, if the initial wealth level is the reference point, the value of the product at the point of purchase will be calculated on the positive part of the PT value function ($V(+A)$), on the other hand. After the individual is endowed with the product it becomes part of his wealth and thus the value of a loss of the object will be calculated on the negative part of the PT value function ($V(-A)$). The valuation is higher on the negative part of the value function since this part is steeper (Tversky and Kahneman 1991): $|V(-A)| > |V(+A)|$.

Insert figures 1 and 2 about here

From a marketing perspective it is interesting to know which of the two effects is stronger: bundling or endowment, and if the magnitude of the difference can be predicted by the degree the decision-maker tends to worry. In questionnaire experiments reported in Schade and Kunreuther (1998) comparing these distribution alternatives for insurance policies and warranties, the valuation of insurance policies and warranties was higher in the bundling
condition than in the endowment condition. With respect to bundling and endowment the following subhypothesis for empirical tests is directly derived from H1:

_H2: Differences in valuation of the warranty between bundling and endowment conditions are most pronounced for high-worriers._

Only if potential losses as well as product and warranty payments are processed explicitly by the decision maker bundling or endowment may have any effect on choices. We are hypothesizing that only high-worriers are likely to process quantitative data explicitly (see H1); thus differences between bundling and endowment are only to be found in this group of people.

Scenario 2 examines differences between contract alternatives. In a questionnaire experiment JHMK found a higher WTP for insurance policies sold with a potential rebate if there were no claims. Using the prospect theory value function they argued that the potential rebate would be framed as a separate gain that more than compensates the additional premium for the necessarily more expensive rebate policy in the perception of the decision-makers because of diminishing sensitivity. In figure 3 JHMK’s argument is depicted: \( V(P(SP)-R) + V(R) > V(P(SP)) \). It was unclear to us whether warranties would be framed in the same way as insurance policies, since in reality individuals do not anticipate making claims on a warranty. They assume the product is high quality and will not have problems. Their reasons for purchasing a warranty may thus be different from buying an insurance policy. The steepness and curvature of the value function in the interval relevant for the decision may also differ between insurance policies and warranties since most warranties may be less expensive than insurance policies; the value function is steeper and less curved close to the reference point.
Loss aversion may thus be stronger than the diminishing sensitivity effect so that benefits from segregating the rebate cannot compensate for the impact of the higher cost of the warranty. This argument can be derived from figure 4 where the value function - holding all properties equal - is enlarged in the interval close to the reference point and payments are made smaller. Here, \( V(P(SP)-R) + V(R) < V(P(SP)) \).

Insert figures 3 and 4 about here

For the marketing of warranties it is interesting if rebates are making them more attractive, and if the magnitude of this effect differs between high-worriers and low-worriers. We are going to test the following subhypothesis which directly follows from H1:

\[ H3: \text{ Differences in valuation of rebate versus no-rebate policies are most pronounced for high-worriers.} \]

Again, mental accounting effects can only occur if the decision maker really deals with the quantitative data of the decision situation. This was hypothesized to be only the case for high-worriers (H1). Thus differences between these decision situations should be greater for these people.
Experimental Design and Results

We designed an experimental study testing our two subhypotheses. This section describes our study and presents the key findings. Both the two subhypotheses test for the magnitude of framing effects dependent on the trait variable worry and hence they relate directly to the main hypothesis on worry.

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: the WDQ. The experiment was carried out as a between-subjects design with four independent groups.

In the announcements students were told that by participating in our experiment they will have a five in six chance to go home with a Panasonic Walkman and that they will receive an additional payment of 10 DM (independent of whether they receive a Walkman or not). At the beginning of the experiment they were given 25 DM. They were obliged to buy a Walkman for 15 DM. The real price of the Walkman (WM) in a store was about 25 DM. Before paying for the WM, respondents were told that there is a one in six chance that it will be declared defective. In this case they would leave the room without the WM. At the end of the experiment a die will be rolled for each participant to determine which products are defective: If a six comes up, the product will be declared defective. A part of the remaining 10 DM could be used for purchasing a warranty protecting the participants against the risk of receiving a defective product. A person who purchased a warranty would be guaranteed to take a WM home.
There was no fixed selling price for the warranty. We used a modified Becker, DeGroot and Marschak (1964) mechanism for eliciting maximum WTP values but did not use an explicit, visible random mechanism to determine the actual selling price for the warranty. Instead, a secret price was pre-selected and put into a sealed envelope.

The secret price was in fact picked before the experiment randomly within the interval between 2.50 and 5.00 DM in the no-rebate and endowment conditions, within an interval between 15.00 DM and 20.00 DM in the bundling condition, and within an interval between 4.00 DM and 10.00 DM in the rebate condition. The subjects received no information on how this price was determined or from which interval the price was taken. We did not use the standard BDM procedure in order to avoid the problems caused by a two-stage lottery (Safran, Segal, and Spivak 1990). For a proof of the incentive compatibility of the “secret price” mechanism see the Appendix.

The mechanism was carefully explained to the subjects. It was made clear that it is designed to elicit their maximum buying prices. We explained that if they bid too high they may end up paying that high price, and if they bid too low they may end up without the warranty even if they would have liked to have had it for that price. Subjects were permitted to ask questions on the procedure. Some did, the answers were then carefully answered, and the mechanism was explained a second time if necessary. Respondents were then asked to put their maximum buying price for the warranty (Walkman with warranty) in an envelope and to complete the WDQ.3

3 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
The experiment took approximately 90 minutes. It was carried out in group-sizes of 6-10 respondents who were situated in separate booths. Different 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 the bundling, endowment, no-rebate, and rebate condition, respectively.

**Scenario 1: Bundling versus endowment**

In the bundling condition (n=32), the Walkman was directly offered together with the warranty. In the endowment condition (n=31), the Walkman was sold first, the respondents were endowed with the Walkman after payment, and the warranty was offered afterwards.

Attractiveness of the warranties in the two groups can directly be compared on the basis of WTP values, since E(loss) of the warranty was equal in both conditions. WTP for the warranty differed significantly between bundling and endowment conditions in the total group (p-value (MWU): .032, two-sided). Whereas mean WTP was 5.33 DM in the bundling condition it was only 3.55 DM in the endowment condition. The subjects with the highest 50% scores in the WDQ (high-worriers) showed a higher difference between the conditions (5.82 DM versus 2.87 how WTP for the warranty was determined. These variables did not interact with the variables in focus. Results on these variables will therefore not be reported in this article.
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).

Insert table 1 about here

H1 was tested via a regression hypothesizing a pure interaction effect between worry and the
experimental conditions. In order to process WDQ scores as a continuous variable we carried
out a regression of the following form: 4

\[ WTP = a + b \times BUNDENDOW \times WDQSUM \]

With:

\[ WTP = \text{Willingness to pay for the warranty} \]
\[ BUNDENDOW = \text{dummy-variable with bundling = 1 and endowment = 0} \]
\[ WDQSUM = \text{individual summed scores in Worry Domains Questionnaire} \]
\[ a = \text{constant} \]
\[ b = \text{interaction parameter} \]

An OLS-regression lead to a highly significant positive interaction parameter b (p-level = .008,
two-sided). The explained percentage of total variance in WTP was 11.1% and could not be
improved by including main effects, i.e. BUNDENDOW and WDQSUM. 5,6

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4 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.
Result: Bundling leads to higher WTP than endowment for high-worriers. Bundling does not change WTP over endowment for low-worriers. This finding lends support for H2.

Scenario 2: Rebates on warranties

In the no-rebate condition the Walkman was sold first but the participants were not actually endowed with it. After the payment they were offered the warranty. The rebate treatment differed from the no-rebate treatment in terms of the contractual conditions. Half of the actual payment for the warranty was promised to be paid back (and was actually paid back) in case the warranty was not used - that is, if the Walkman was not declared defective.

Rebate policies are worth more to the consumer since he is getting something back in many cases, and the insurer also has to sell them at a higher price in order to cover his costs. The so-called „fair price“ is the E(loss) of a warranty or insurance policy. In our experiment, E(loss) for the warranty is 2.50 DM in the no-rebate and 4.29 DM in the rebate condition.

The first measure to look at when comparing the relative attractiveness of rebate versus no-rebate warranties is the percentage of people buying the warranty for at least its E(loss). Rebate and no-rebate warranties however do not differ significantly on the basis of this measure (p-

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5 Including both main effects, r² was 11.5%.

6 Residuals were normal distributed (Kolmogorov-Smirnov-test of deviation; p-value: .749, two-sided). Exactly the same r²-values and significance levels were found in a monotonic ordinal regression utilizing SPSS Goldminer 2.0 (for this method see Magidson 1996).
value (Chi-Square) = .331, two-sided, in the total group; no significance also in the subgroups of high- and low-worriers).

If the percentage of individuals willing to pay at least E(loss) does not differ, the crucial criterion for a comparison of relative attractiveness of rebate and no-rebate warranties is what can be earned from the people buying the warranty for at least E(loss). Sometimes individuals may be willing to pay high premiums on E(loss), e.g. 5.00 DM for the no-rebate and 6.50 DM for the rebate warranty. We therefore decided to analyze the WTP/E(loss) ratio of those individuals who actually have a WTP being at least equal to E(loss) as our central criterion for the comparison of the relative attractiveness of rebate versus no-rebate policies. For example, the individual willing to pay 5.00 DM for the no-rebate warranty has a ratio of 2, since E(loss) is 2.50 DM for this warranty. All individuals having a WTP for the warranty below E(loss) are excluded from the analysis since warranties cannot be sold to these people anyway.7

Table 2 shows the results for this measure for the total group as well as for high-worriers and low-worriers.

Insert table 2 about here

WTP/E(loss) ratios of those having a WTP of at least E(loss) is much lower for warranties with rebates than when they are not given. The difference in ratios is .87 (p-value (MWU): .001, two-sided). The negative effect is most pronounced for high-worriers. Here, the difference in ratios is

7 Neither treatment nor worry nor interaction significantly affected the dependent variable for individuals having a WTP being smaller than E(loss). A table with results and significance levels for this group is added to the appendix (see table A1).
1.31 (p-value (MWU): .000). For low-worriers the difference is only .58 and non-significant (p-value (MWU): .357, two-sided).

To test that the difference between the two conditions is most pronounced for high-worriers (H3), a regression of the following form was run for all having a WTP being at least equal to E(loss):

\[
\text{WTP/E(loss)} = a + b \times \text{BASREBATE} \times \text{WDQSUM}
\]

with:

\[
\text{WTP/E(loss)} = \text{ratio between WTP and E(loss) of the respective warranty}
\]

\[
\text{BASREBATE} = \text{dummy-variable with no-rebate condition} = 0 \text{ and rebate condition} = 1
\]

\[
\text{WDQSUM} = \text{individual summed scores in Worry Domains Questionnaire}
\]

\[
a = \text{constant}
\]

\[
b = \text{interaction parameter}
\]

We hypothesized a pure interaction effect between worry and the experimental conditions on the WTP/E(loss) ratio as the dependent variable of those persons buying the warranty for at least E(loss). An OLS-regression lead to a highly significant parameter estimate (p-value: .000). The regression explained 25.1% of the total variance in the dependent variable and could only slightly be improved by including the main effects, i.e. BASREBATE and WDQSUM.\(^8\,9\)

\(^8\) Including both main effects, \(r^2\) was 30.0%.

\(^9\) Residuals were normal distributed (KS-test of deviation; p-level = .874, two-sided). In a monotonic, ordinal regression \(r^2\) was 20.9%, the p-value of the interaction parameter was again .000; including
Result: This finding implies that high-worriers strongly prefer warranties without rebates to those with rebates. Low-worriers do not show clear preferences for either of the two warranties. This result supports H3.

The negative main effect of rebates on the valuation of warranties differs from earlier findings indicating a positive impact of rebates on the valuation of insurance policies (JHMK 1993). As we discussed earlier, rebates on warranties may be perceived as a signal that product quality is unusually high (i.e., little chance of defects) in a real decision-situation. With insurance policies, damages are normally outside the control of the insurance company. Hence getting a rebate would be viewed as a bonus if no claims were made on one’s insurance policy.

The perception of the situation may be completely different with warranties since here the producer has an influence on the quality of the product. The consumer might wonder why he should buy a warranty in the first place if the product is so good that half of the money will be given back if there are no defects found and the warranty will not be used. A rebate might therefore even be viewed as a reason not to buy the warranty. Subjects might have carried these real-world considerations into our experiment, even though the probability of a defect was specified precisely (i.e., 1/6 in all conditions).

An additional explanation can be provided by prospect theory as illustrated in Figure 4 above. With the extra payments for rebates being close to the reference point the effect of diminishing sensitivity may not be strong enough to overcompensate the effect of loss aversion. The extra

both main effects r² was 23.5%, here.
cost for the more expensive rebate policy may be perceived as being more painful than the perceived gain due to the segregation of the rebate.

If for example an insurance policy without rebates costs $300 and a policy with rebates costs $450, the difference will be processed in an interval where the decision maker is not very sensitive anymore. However the potential gain of $150 due to the potential rebate payment will be processed in an interval where the decision maker is very sensitive. This leads to the typical positive rebate effect. If one the other hand the payment for a warranty without rebates is only $50 and the payment for the warranty with rebate is $75 the $25 difference will be processed in an interval where the decision maker is still very sensitive. He is also very sensitive to the gain of $25 but since the value function is steeper in the loss domain this potential gain counts less than the higher price of the warranty.

However our experimental results strongly support subhypotheses H2 and H3. Thus our key hypothesis on worry (H1) underlying these hypotheses is also strongly supported.

**Implications for marketing**

According to our study warranties should be sold at the point of purchase of the product rather than after the product has left the store. Higher selling prices can be realized with high-worriers at the point-of-purchase without losing anything from the low-worriers. This result is consistent with existing sales practices. Circuit City for instance sells warranties that are directly tied to the product. Although we are not aware of any insurance policies being sold this way, there is no
reason why point-of-sales selling should not also work with insurance policies covering theft and damages of eyeglasses, furs, furniture etc. at the time of purchasing the items. The institutional arrangements for such insurance currently differ from warranties in that a policy is normally sold by a special company and via insurance representatives rather than by the store selling the item.

With warranties, rebates may not work in the same way as they do with insurance policies (JHMK). Marketers don’t lose much when selling warranties with rebates to low-worriers but they may lose a lot when high-worriers purchase the product. The amount high-worriers are willing to pay above $E(loss)$ is much lower for warranties with rebates than for standard warranties.

In general, the trait variable worry may be an important discriminator for determining max WTP for protective activities. In our experimental study we restricted our attention to interactions effects of worry with choice patterns predicted by standard models of decision-theory 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.

In our experiment, only some of the respondents seem to have processed payments/losses and probabilities explicitly. Behavioral decision theory might benefit from investigating whether these quantitative factors are processed by different individuals in different decision situations.
Worry may only be but one of the variables determining the degree of elaboration on the central characteristics of a decision situation.
Appendix

Proof of incentive compatibility of “secret price” mechanism

Mechanism:

A secret selling price \( p \) for an item is pre-posted by the seller.

The buyers receive no information on how the price is determined.

The buyer bids \( b \) for the item.

The allocation rule is:

\[
\begin{align*}
& b \geq p \Rightarrow \text{item } + (b - p) \\
& b < p \Rightarrow b
\end{align*}
\]

Proof of incentive compatibility (our approach is similar to the proof of the incentive compatibility of the Vickrey-auction in Krahnen/Rieck/Theissen (1997):

Let \( v \) be the bidder's valuation of the item. If \( v \geq p \) and the bidder places a bid \( b < p \) she will not be awarded an item for \( p \) and the expected profit is 0. If she places a bid \( b \geq p \) she will be awarded an item at \( p \). In this case her profit is \( v - p \). Thus the only thing she might have to worry about is the value of \( p \). Let the distribution function \( F(p) \) represent her expectations about \( p \) and let \( \bar{p} \) denote some highest possible value of \( p \), i.e. \( F(\bar{p}) = 1 \). The bidder’s expected profit is

\[
(1) \quad E(\pi) = \int_{b}^{\bar{p}} (v - p) \cdot f(p) \, dp
\]

where \( f(p) \) is the density of \( p \). This can be rewritten as
\( E(\pi) = v \int_{\bar{p}}^{p} f(p) \, dp - \int_{\bar{p}}^{p} f(p) \, dp = v [1 - F(b)] - \int_{\bar{p}}^{p} f(p) \, dp \)

If we denote the primitive function of \( F(p) \) by \( G(p) \) we get

\( E(\pi) = v [1 - F(b)] - [G(\bar{p}) - G(p)] - (b F(b) - G(b)]. \)

Since \( p \) is a pre-posted price, \( \bar{p} \) cannot depend on \( b \). Thus maximizing \( E(\pi) \) with respect to \( b \) yields

\( -v f(b) + b f(v) = 0 \quad \text{and} \quad b = v \)

Hence, the optimal bid is just the bidders valuation. Note, that we did not make any assumptions about the distribution of \( p \). The result holds for \textit{any} expectation about the distribution of \( p \) as long as there is no interval where \( f(p) \) is zero or negative.

**WTP/E(loss) ratios in rebate and no-rebate conditions of those having a WTP < E(loss)**

Insert table A1 here
Figures 1 and 2: Bundling (left) and endowment effect (right)
Figures 3 and 4: Rebates with high (left) and low payments (right)
Tables

<table>
<thead>
<tr>
<th></th>
<th>Bundling (n=32)</th>
<th>Endowment (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTP in DM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total group</td>
<td>5.33</td>
<td>3.55</td>
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<tr>
<td>High-worriers</td>
<td>5.82</td>
<td>2.87</td>
</tr>
<tr>
<td>Low-worriers</td>
<td>4.77</td>
<td>4.50</td>
</tr>
</tbody>
</table>

Table 1: Experimental results on bundling versus endowment
<table>
<thead>
<tr>
<th></th>
<th>No-rebate policy</th>
<th></th>
<th>Rebate 50%</th>
<th></th>
</tr>
</thead>
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<tr>
<td></td>
<td>n=21</td>
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<td>n=26</td>
<td></td>
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<tr>
<td>E(loss)=2.50 DM</td>
<td></td>
<td></td>
<td>E(loss)=4.29 DM</td>
<td></td>
</tr>
<tr>
<td>WTP/E(loss)</td>
<td></td>
<td></td>
<td>WTP/E(loss)</td>
<td></td>
</tr>
<tr>
<td><strong>Total group</strong></td>
<td>2.64</td>
<td>1.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High-worriers</strong></td>
<td>3.06</td>
<td>1.75</td>
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</tr>
<tr>
<td><strong>Low-worriers</strong></td>
<td>2.39</td>
<td>1.81</td>
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</table>

Table 2: Rebate versus no-rebate policy on the basis of WTP/E(loss); individuals having a WTP of at least E(loss)
<table>
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<tr>
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<th>Rebate 50%</th>
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</thead>
<tbody>
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<td>n=8</td>
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<tr>
<td>E(loss)=2.50 DM</td>
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<td>E(loss)=4.29 DM</td>
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<tr>
<td>WTP/E(loss)</td>
<td></td>
<td>WTP/E(loss)</td>
</tr>
<tr>
<td>Total group</td>
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<td>.32</td>
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<tr>
<td>High-worriers</td>
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<td>.23</td>
</tr>
<tr>
<td>Low-worriers</td>
<td>.39</td>
<td>.35</td>
</tr>
</tbody>
</table>

Table A1: Rebate versus no-rebate policy on the basis of WTP/E(loss); 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
References

Baron, J., J. Hershey, and H. Kunreuther (1999): Attitudes Toward Risk Reduction (mimeo)


