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THE COMPENSATING VARIATION APPROACH:
THE CASE OF LIVES SAVED
VERSUS
LIVES TAKEN

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THE COMPENSATING VARIATION APPROACH: THE CASE OF

LIVES SAVED VERSUS LIVES TAKEN

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Abstract

In recent years many empirical studies have reported substantial differences in people's responses to willingness-to-pay vs compensation questions in the context of measuring potential economic losses. This paper offers an alternative explanation to this phenomenon. We claim that such differences stem from comparing answers to bounded vs non-bounded questions and that the situation between an interviewer and an interviewee can be seen as partial-information bargain scenario. Our approach is exemplified in the most extreme of cases - projects involving the loss of lives.

Introduction

The purpose of this paper is two-fold: to offer an explanation for the disparity between willingness-to-pay (WTP) and willingness-to-accept (WTA) measures, and to examine some policy implications of our theoretical conclusion. It is well accepted in conventional welfare theory that there are two methods for measuring changes in an individual's welfare: (1) the individual's maximum willingness to pay for a good or service (WTP), and (2) the minimum level of compensation required for the individual to relinquish the good or service (WTA). Economic theory implies that the two procedures should yield similar estimates as long as income and wealth effects are small (Willig (1976)). However, in recent years many empirical studies have reported substantial differences in people's responses to willingness-to-pay versus compensation questions in the context of potential economic losses (e.g., Knetsch and Sinden (1984), Knez et al. (1985) or Cummings et al. (1986)). These studies have found that compensation-based measures of losses generally exceeded willingness-to-pay measures by a factor of 3 or more (more than 20 times in one study).

Two recent contributions attempt to draw the discussion in two different directions. Gregory (1986) examined the huge empirical differences found between the WTP and WTA measures. The paper describes the results of experiments that provide support to the interpretation of the observed disparity between the two measures as real and psychologically meaningful, and presents an alternative conceptual framework, based upon prospect theory (see Bell (1982) on this concept).

On the other hand, reporting an experiment involving the avoidance of tasting a bitter substance, (sucrose octa-acetate, or SOA) Coursey et al

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(1987) show that under some circumstances an initially large difference between values measured can be greatly reduced by repeated trials. The jury, however, is still out; Knetsch and Sinden (1987), for example, argue that the generalization of the SOA study to other evaluations of market exchange may be limited due to problems in the study design. They claim that in repeated trial studies in which the conditions of actual market exchanges were more closely approximated, the initial large disparities between the measures showed little or no change. Finally, both studies agree that a large disparity may well persist outside markets.

In this paper we claim that large differences in the two measures are likely to persist (especially outside markets) when one uses the compensating variation methods to evaluate the costs and benefits of different programs. We offer an explanation for the phenomenon which is based on standard theory rather than prospect theory. To illustrate our point we use the extreme example of programs which affect human lives (where "repeated games" or learning, even if indeed they do lower disparities, are of course impractical). The paper is organized as follows: first we describe the asymmetry between valuing lives saved and lives taken, then we discuss the consequences of the asymmetry found and offer conclusions and implications.

Lives Saved Versus Lives Taken in the WTP-WTA Context

Consider the case of an individual (or a group of individuals) faced with certain death in the absence of treatment (e.g., kidney failure). The essence of the asymmetry between WTP and WTA can be traced using the compensating variation criterion recommended by Mishan (1975): If an

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individual who is alive due to a medical treatment is asked how much he requires in compensation for taking his life (as a result of curtailing the program, for example), he will probably demand an infinite compensation. However, the same individual facing a certain death, due to absence of medical treatment, will offer only a finite amount to save his life. This asymmetry can be illustrated using an example from Weinstein et al. (1980, p 375)[1]:

> "... The provision of renal dialysis to a patient with kidney failure is one example. In that case, the prospect of death is immediate, most of us would forego nearly all our assets for a procedure that would save our lives (i.e. reduce the probability of immediate dealth from 1.0 to 0.0), and we would refuse nearly any compensation to sell our rights to such a procedure."

Our main point follows immediately: The differences in monetary values between lives saved and lives taken stems from the fact that the value of a life taken is often estimated by an unbounded question (how much money do you require in compensation) but the value of a life saved is often estimated by a bounded question (how much money are you willing to pay). The amount one can offer for anything (including his own life) is clearly bounded by the present value of one's assets and life-time earnings. It is most probably even lower. If one is required to pay all of one's assets and sell her/his future earnings she/he is doomed to starvation and misery for the rest of her/his life, and so she/he will probably prefer death. Thus, for each individual there may exist a finite sum that, if he/she is required to part with it, he/she will be indifferent between life and death. This sum should, by the compensating variation criterion, represent the value of life saved. However, in the case of lives taken, because this is an

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[1] Weinstein et al do not discuss the source or consequences of their example.

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"unbounded" question, there is no limit to the compensation one can demand for "selling" his right to live. Thus the value of life taken seems much higher than the same life saved.

This extreme example lucidly illustrates the logic that belies the example of Weinstein et al. (1980) and similar results obtained in Gregory (1986) or Thaler (1983)[2] - once people have something it is very hard to take it away. Thus, we suggest that the true reason for the empirical discrepancy between compensation required and willingness to pay is not different intrinsic values, but an unbounded vs a bounded question. In other words, the subject does not view the question by the researcher as a statement of value, but perceives it as a game situation - how much will the other side (who wants my property) be willing to give me if I were to relinquish the asset?

The relations between the interviewer ("representing" those who "want the asset") and the interviewed (who "owns" the asset) can be described as a partial information bargaining problem. The response to the question, "how much are you willing to pay ....", is always bounded by the ability to pay. However, in response to the compensation question, the subject may try to assess the highest amount the other party is willing to pay (and thus refuses small amounts as in Gregory (1986)). Clearly, the "real" value, or the reservation price, serves as an upper bound for the willingness-to-pay scenario and a lower bound for the compensation required. Although the discrepancy is clearly highest for life-threatening situations, it is evident elsewhere as well. In fact, the "learning" process, described by

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2   And can be easily extended to other environments outside the realm of life and death decisions.

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Coursey et al (1987) may be a process in which the subjects learn about the experimenter, rather than about their own preferences. Thus, one might perhaps seek the answer in the "loss aversion" phenomenon in equilibrium solutions to non-cooperative games rather than in prospect theory.

Policy Implications

In cost - benefit studies, the asymmetry between WTP and WTA measures may seriously hamper practical decision making. In the extreme case of human life, because the "cost" of life taken is infinite, it will become very difficult to decrease the size of one life saving facility in order to expand another life saving facility even if it results in saving more people at a lower cost. In other words, we may be stuck with the status-quo, unable to reallocate resources among medical programs.

In this respect, we reach a conclusion similar (but not identical) to that in the literature spawned by Broome (1978), who claimed that because the monetary compensation required for loss of life is infinite, cost-benefit analysis will be inapplicable for judging any proposal involving death[3]. Our argument is that since willingness to pay measures are bounded by the individual's ability to pay and willingness to accept measures are unbonded (or can be seen as bounded by the ability to pay of the party offering the compensation), it is not surprising that we accept such substantial differences in people willingness to pay vs compensation questions in the context of measuring potential economic losses. This might lead to different conclusions when performing cost-benefit evaluations.

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[3] Further contributions to the lively debate that ensued include Buchanan and Faith (1979), Jones-Lee (1979), Williams (1979), Mishan (1981) and Ulph (1982).

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Our point is supported by large discrepancies in estimates of the value of life in empirical studies. A recent survey, (Fisher et al. (1989)) contends that the best measures of the value of life are based upon WTP or WTA studies of small changes in the risk of death. These, however, offer a wide range of values (between $1.6 million to $8.5 million (in 1986 dollars)). It is easy to see that a choice of one bound versus another can dramatically affect project choices.

Conclusions and Extensions

The paper offers an alternative explanation for a well known empirical finding that compensation-based measures of losses generally exceed willingness to pay measures. We suggest that, in practice, subjects view the compensation determining process as a game and act accordingly. Our approach is exemplified in the most extreme of cases-projects involving the loss of lives.

One might claim that lives taken are different from lives saved (even when these are the same lives) because life is one of the few things that a person might sell that drastically affects his ability to enjoy the proceeds. This inability to enjoy the proceeds might explain the infinite (or very high) price that one might demand for his life and the result should not be interpreted as a bargaining strategy in response to an unbounded question. Note, however, that in the example described in this paper, one might be required to pay all of his assets and future earnings to save his life. Thus quality of life is implicitly built into the equation. It is not clear to us that one can "enjoy" living and whether living in

starvation and misery for the rest of someone's life is a preferred situation to death.

It should be noted, however, that in those cases where the task is only to rank order different alternative programs for achieving a prespecified goal, one can avoid using the compensation variation method altogether. Instead one can employ the cost-effectiveness technique where the outcome of each alternative is measured in physical units (rather than monetary values). Using physical units as the measure of outcome makes the analysis insensitive to whether these units are gained or lost. In the case of programs involving fatalities, the use of measures such as number of lives saved/taken, number of years of life saved/taken, or the number of healthy years equivalent gained/lost[4] can serve as a substitute for the monetary value of human lives.

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[4] More on that concept see Mehrez and Gafni (1989). In brief this measure of outcome stems directly from the individuals' utility function. It combines outcomes of both length of life and quality of life thus serves as a common unit of measure for all programs, allowing comparisons across programs.

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