

Editor's Introduction

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The *Journal of Risk and Uncertainty* will run occasional special issues on important topics in the field that are generating widespread research interest and that further our understanding of risk and uncertainty in a fundamental way. This is the first such special issue, and it focuses on the use of surveys to obtain experimental evidence on behavior toward risk and uncertainty. The contributors to this issue include researchers in economics, psychology, and marketing. This disciplinary diversity is consistent with the Journal's objective of fostering communication of research findings across disciplinary boundaries. The editors welcome suggestions regarding topics for future issues.

1. Sources of empirical evidence

Researchers wishing to test the properties of individual behavior under risk or uncertainty have a variety of sources of data. First, they could utilize data regarding actual behavior. In the case of the research by economists, this focus generally leads to use of data on market behavior. The strength of this approach is that these data reflect the outcome of actual decisions, but its main limitation is that reliance on such data may severely limit our domain of inquiry. How, for example, will consumers respond to hazard warnings on alcoholic beverages? Until a policy experiment of this type has been implemented, we will have no data on actual behavior that can be used in our analysis.

The second approach is to employ a highly stylized experimental context. Students or other willing participant groups are frequently the subjects in experimental studies that elicit responses to structured choice situations, such as those involving hypothetical lotteries. In some cases, financial incentives are offered to increase the reliability of the responses. Such studies may require individuals to make decisions that are quite different from those they usually make and may involve decisions with respect to problems that never arise in actual decision-making situations. However, by relying on such an experimental context, one has considerable latitude in terms of the experimental design to that one can structure a narrowly defined test of the theory.

A third source of empirical evidence can be viewed as a hybrid of the first two sources described above. In particular, one can couple the use of an experimental design with the study of either actual or simulated behavior on the part of actual

decision makers. For example, one could provide workers with alternative warnings for hazardous chemicals and assess the effect of these warnings on their risk perceptions, precautionary intentions, and reservation wage rates for the job. Use of a real world context and actual decision makers who are confronted with similar decisions as part of their job should yield more reliable responses than use of student subjects, who may find the study more hypothetical and not know how they would react to such a decision situation. As in the case of laboratory or classroom experiments, use of the experimental survey approach offers researchers considerable flexibility in terms of research design and in terms of the type of information they can elicit with respect to the individual's actions and risk perceptions with respect to a variety of experimental stimuli.

In some respects, this survey methodology is similar to the interview approach that has been used for several decades in the public expenditure valuation area. Analysts attempting to determine values of public goods, such as recreation facilities, have administered surveys to elicit individual willingness to pay for such facilities. These studies have consequently attempted to establish a market context for a good not regularly traded in a market.

In contrast, the studies in this volume focus primarily on creating variants of decision contexts that currently exist—workers' required wage rates for hazardous jobs, consumer responses to hazard warnings on standard consumer products, and homeowners' response to information about radon risks in their home. Respondents regularly must make such decisions so that the decision context is one in which they have substantial experience. Although the responses of some individuals in an experimental context may not be reliable, these difficulties appear to be less salient concerns than in the public finance area, where the issue of strategic misrepresentation has long been prominent. The corroborative evidence that exists indicates that carefully designed and administered surveys yield results that closely parallel actual behavior.

The four articles included in this special issue represent contributions to the third area of research in which a survey context is coupled with an experimental design. The first article by Baruch Fischhoff and Lita Furby provides a conceptual handbook for the design of such studies, particularly for studies dealing with the elicitation of risk-dollar trade-offs. Although the applicability of their framework is quite general, the authors also indicate how their approach can be implemented using individual valuations of environmental visibility as the principal case study. The second article by Shelby Gerking, Menno de Haan, and William Schulze provides an actual empirical study of the use of this methodology to assess workers' trade-offs between wages and mortality risk, thus providing an empirical illustration of the type of methodology discussed by Fischhoff and Furby.

The second pair of articles has a somewhat different focus. In addition to using such surveys to analyze risk-dollar trade-offs not unlike those reflected in hedonic wage studies, one can also employ this approach to analyze risk perceptions and the character of individual learning about risks. This class of concerns has

received little empirical attention except for situations in which experimental evidence could be gathered. Such influences are particularly pertinent with respect to our assessment of hazard warnings. The article by Wesley Magat, W. Kip Viscusi, and Joel Huber uses an open-ended memory recall technique to investigate how consumers respond to household chemical and insecticide warnings. The article by V. Kerry Smith, William Desvousges, Ann Fisher, and F. Reed Johnson uses a more directive quiz question approach to evaluate changes in consumer knowledge of radon risks.

2. Decision context

As the Fischhoff and Furby essay emphasizes, it is essential to structure a realistic and meaningful decision context so that the response of survey participants will be a reliable guide to actual behavioral responses. If one is interested in the implicit value that workers place on their lives, one cannot simply run a Gallup poll asking people to state their value of life. Nor is it likely that these individuals could react sensibly to an abstract lottery on life and death. To elicit a meaningful response, one must first establish a meaningful decision context. The Fischhoff and Furby article details a variety of elements that comprise the decision context: specification of what is to be received, specification of what is to be exchanged, and the social context of the decision. For commodity choice experiments, it is particularly important to define the attributes of the good carefully to avoid capturing valuations of attributes correlated with the main attribute of interest. In their analysis, the visibility attribute must be distinguished from other attributes such as health effects of air pollution. The decision context (social versus private decisions), the constraints on the behavior, and the number of iterations involved in the experiment must all be specified in a precise manner that creates a realistic and well understood decision situation.

The decision context for the Gerking, de Haan, and Schulze article was individual valuation of job safety. This study extended the Viscusi and O'Connor (1984) survey study of chemical workers' valuation of nonfatal job risks to the mortality risk case. Using a 1984 national mail survey, Gerking, de Haan, and Schulze elicited individuals' reservation wage responses to job risk categories specified on a risk ladder. Respondents were consequently asked to respond to a hypothetical risk change, where the level of the risk was stated in the questionnaire. This approach utilized a more direct and less detailed context than the Viscusi and O'Connor methodology, which presented chemical workers with alternative chemical labels for substances that would replace the chemicals with which they now worked, and which ascertained workers' own prior and posterior assessments of the overall risk level before asking the reservation wage questions. Since there is a large literature on market evidence regarding workers' wage-risk trade-offs, studies such as this that examine comparable trade-offs in experimental survey contexts provide a reliability test for the survey methodology.

The decision context for the third article, which is by Magat, Viscusi and Huber, was the same as for their earlier consumer studies reported in Viscusi and Magat (1987). In particular, consumers who regularly use the product class (toilet bowl cleaners and insecticides) were shown an experimental label and asked questions about the product. These consumers were recruited at a mall intercept and hardware store in 1985 in Greensboro, North Carolina and asked to examine the product as if they were about to use it for the first time. A comparison survey on actual usage patterns corroborated the experimental survey results for the experimental label designs patterned after products now on the market.

The fourth article by Smith, Desvougues, Fisher, and Johnson represents an extension of their earlier research on homeowners' responses to information on radon risk reported in Smith and Johnson (forthcoming). In this article, the authors examine individual responses to a series of questions regarding knowledge of radon risk for a sample of NY homeowners who were provided brochures on radon in 1986 and were interviewed at the end of 1986 and early 1987 in order to assess the actual effect that the risk information had on their knowledge of the risk.

3. Research methodology

As Fischhoff and Furby indicate, the elicitation of the information of interest can be done in a number of ways. The following procedures have been used to assess risk-dollar trade-offs. Consider a product whose risk to consumers will be reduced. Consumers could be asked a single question asking the most that they would be willing to pay for the product.¹ A second, iterative approach would be to ask consumers if they would pay successively higher amounts for the improvement, where this procedure continues until the reservation amount is reached.² A variant of this technique is to start with a very high willingness to pay amount and work down. A third approach is that of conjoint analysis, which is a technique relying on paired comparisons that is widely used in the marketing and psychology literature.³ The final approach is to offer individuals a series of paired product comparisons, altering the product attributes until a point of indifference is reached.⁴

The Gerking, de Haan, and Schulze article relies on the single question approach, or direct contingent valuation (i.e., a valuation that is contingent on the existence of a hypothetical market). This approach is dictated by necessity, given the mode of the survey—a written questionnaire. All truly iterative approaches and comparison techniques rely on interaction with either the interviewer or a computer. Although some iterative techniques tend to produce higher valuation numbers, they may not necessarily be more meaningful. If respondents know their willingness to pay amounts only with some error, the iterative approach may push individuals above their mean estimate of their actual willingness to pay.

The two studies dealing with consumer knowledge of risks have a different emphasis. The Magat, Viscusi, and Huber study utilized both directive questions on consumers' precautionary intentions and an open-ended memory probe. The memory recall technique is more novel and more powerful. Consumers were asked to tell the interviewer how they would instruct a friend regarding the use of the product. The interviewer recorded the sequence of the responses and their character (e.g., whether the instructions dealt with antidotes, precautions, etc.). Thus, it was possible to analyze how different hazard warnings affect the amount of risk information recalled, its prominence in consumer memory, trade-offs with other types of information, and linkages in the types of knowledge grouped in consumer memory.

The Smith, Desvouses, Fisher, and Johnson study also was concerned with learning, but in their case the focus was on the processing and recall of information on a radon brochure. Their study used a series of factual quiz questions to test homeowners' knowledge. Perhaps the most interesting aspect of their approach was the administration of such questions over a period of time so that the importance of the forgetting of such information could be examined.

4. The research value of the survey approach

The studies included in this volume illuminate a variety of concerns that have been prominent in the risk literature. The Gerking, de Haan and Schulze study obtained individual estimates of the implied value of life rather than an average valuation for a sample. As a consequence, they were able to perform a detailed statistical analysis of differences in the value of life. In addition, this study provides for a test of the correspondence between survey responses and risk-dollar trade-offs estimated using market data. The valuation numbers are in the same general range as those obtained using data on actual labor market behavior.

The results reported in Magat, Viscusi, and Huber demonstrate that hazard warnings can be effective but that the cognitive limitations of consumers are consequential. Increasing the amount of risk information creates an information processing trade-off, as consumers recall less usage information. In addition, very extensive warnings create problems of information overload. Hazard warnings can be effective, but they must be designed to take into account consumers' information processing capabilities. The study by Smith, Desvouses, Fisher, and Johnson also indicates that hazard warnings are a potentially effective regulatory alternative. Their analysis demonstrates that information provision has a long-term effect on homeowner knowledge of radon risks. In addition, the nature and format of the information provided affects the accuracy of individuals' responses.

The ultimate role of such survey experiments in empirical research should increase to the extent that researchers wish to push the testing of theoretical hypotheses into new areas or more refined topics than can be addressed with

available data. Although much is known about the risk-dollar trade-offs for prominent risks involved in market behavior, such as risks on the job, this represents a very small class of risks. Surveys can potentially provide information on the valuations of quite different risk categories, such as chronic illnesses, or more refined risk measures, such as the value of different types of disability. Furthermore, whereas market studies focus on marginal risk changes, surveys can address the valuation of large variations in the risk level. The altruistic component of individual valuations can also be distinguished to ascertain the extent of the divergence between private and social valuations of risk.

Research on risk perceptions and risk-averting behavior is even less well developed, particularly with respect to decisions outside of abstract experimental choice contexts. These issues are seldom addressed by traditional empirical studies of actual behavior so that there is a broad range of new research issues—the link between information on risk perceptions, the effect of changes in risk perceptions on precautionary behavior, and limitations on the rationality of individual behavior, to name just a few. These and a broad range of other topics have been attracting the attention of an increasingly large group of researchers employing the experimental survey approach.

The reliability gained by using actual decision makers in these studies will depend on the extent to which the researchers create a realistic decision context and utilize a methodological approach that elicits individual beliefs and behavior in an accurate manner. Because of the potential divergence between experimental and actual behavior, the research designs should incorporate corroborative checks whenever possible. The results from these and related studies suggest that the coupling of the survey methodology with an experimental design that elicits individual responses to simulated or actual choice situations will become a major component of empirical research on risk and uncertainty.

Notes

1. This procedure is generally known as a direct or a one-step contingent valuation procedure. For a review of this approach in environmental contexts that generally do not involve risk, see R.G. Cummings, D.S. Brookshire, and W.D. Schulze (1984).

2. *Ibid.*

3. See Chapter 5 of Viscusi and Magat (1987).

4. *Ibid.*

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