

## Economics, Psychology and Protective Behavior

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Economics and psychology share many common interests regarding the behavior of people in the marketplace. However, these two disciplines have traditionally approached the description, prediction and explanation of market behavior in very different ways. Psychologists have employed laboratory experiments, survey questionnaires, and some naturalistic observations to develop an empirical base of knowledge. Economists have relied heavily on utility theory and its presumption of objective rationality which, as Simon and Stedry (1969) note, ". . . permits strong predictions to be made about behavior without the painful necessity of observing people" (p. 272).

Over the past quarter century, a small group of economists and psychologists have been challenging the validity of the traditional economic approach. George Katona and his colleagues showed that consumer expectations, perceptions, motives and intentions, measured by means of survey techniques, could predict economic behavior and guide public policy in situations where traditional theory was simply not adequate (Katona, 1975).

In parallel with Katona, Herbert Simon was drawing from empirical research on human cognitive limitations to challenge traditional assumptions about the motivation, omniscience and computational capacities of "economic man." As an alternative to utility maximization, Simon (1957) introduced the notion of "bounded rationality," which asserts that cognitive limitations force people to construct simplified models

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of the world in order to cope with it. To predict behavior

". . . we must understand the way in which this simplified model is constructed, and its construction will certainly be related to 'man's' psychological properties as a perceiving, thinking, and learning animal" (Simon, 1957, p. 198).

During the past 20 years, the skeleton theory of bounded rationality has been fleshed out. We have learned much about human cognitive limitations and their implications for behavior--particularly with regard to decisions made in the face of risk. Space does not permit a discussion of this work here; an extensive review is available in Slovic, Fischhoff and Lichtenstein (1976). Utility theory has been the target of repeated criticisms, both on theoretical and empirical grounds. One of the most recent and most vigorous attacks can be found in Kahneman and Tversky (in press). However, the case against the rationality of individual behavior tends to be dismissed by economists on the grounds that in the competitive world outside the laboratory, rational agents will survive at the expense of others. Thus, the study of irrationality can be downplayed as the study of transient phenomena (Simon & Stedry, 1969).

Our own experiences, as economist and psychologist collaboratively investigating people's protective actions in the face of risk, indicate that many manifestations of bounded rationality exhibited by intelligent citizens have important, non-transient social ramifications. The study of insurance behavior provides an example to which we now turn.

## I. Failure of the Market in Insurance

Insurance is perhaps the oldest arrangement for shifting the financial burden from an economic agent facing uncertain future losses to a risk-bearing institution. Economists have treated this problem as one in which the prices for different types of policies are set by the forces of supply and demand with individuals making theoretical contingent contracts to protect themselves against different states of the world. Observed market failures have been ascribed to adverse selection and moral hazard, problems which inhibit insurers from promoting their product (Arrow, 1963).

Because economists have focused primarily on market mechanisms for studying social problems, they have paid relatively little attention to the impact that alternative institutional arrangements would have on behavior if an insurance market fails. Because they have assumed that individuals are utility maximizers, they have devoted little effort to studying the decision processes that individuals follow when determining whether to undertake protective action. Psychologists, on the other hand, have been actively studying risk-taking decisions by means of laboratory experiments but have only recently begun to focus on the implications of their findings for public policy (Slovic, Fischhoff & Lichtenstein, 1976).

In this section, we will discuss a recently completed laboratory and field study that examined decision processes involved in the purchase of flood and earthquake insurance. The details of this study

are summarized in Kunreuther, Ginsberg, Miller, Sagi, Slovic, Borkan and Katz (1978) and Slovic, Fischhoff, Lichtenstein, Corrigan and Combs (1977). We will describe the study and its results through the use of the simple conceptual framework depicted in Figure 1. This framework emphasizes the central importance of institutional arrangements and decision processes in developing policies for solving specific problems and should have relevance to many societal decisions involving risk.

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#### A. Nature of the Problem

Natural disasters constitute an enormous problem. They annually cause several billion dollars in property damage, accompanied by an inestimable toll of human misery, anguish, and death.

The question facing public policy makers is: What are the relative costs and benefits of alternative programs for mitigating the social and economic disruption caused by natural disasters? In the case of floods, policy options that have been tried or considered include compulsory insurance, flood control systems, strict regulation of land usage, and massive public relief to victims.

#### B. Institutional Arrangements

The institutional arrangements that concerned us here focused on whether or not the purchase of disaster insurance should be required. It has been noted that, whereas few individuals insure themselves voluntarily against the consequences of natural disasters, many turn to the federal government for aid after suffering losses (Kunreuther, 1973). As a result, the taxpayer is burdened with financing the

recovery for those who could have provided for themselves by purchasing insurance. Policy makers have argued that both the government and the property owners at risk would be better off financially under a federal flood-insurance program. Such a program would shift the burden of disasters from the general taxpayer to individuals living in hazard-prone areas and would thus promote wiser decisions regarding the use of flood plains. For example, insurance rates could be set proportional to the magnitude of risk in order to inform residents of ~~the hazards of living there and deter further development of high-risk areas.~~

Without a better understanding of how people perceive and react to risks, however, there is no way of knowing what sort of flood-insurance program would be most effective. For example, it seems reasonable that lowering the cost of insurance would encourage people to buy it. Yet, there is evidence that people do not voluntarily insure themselves against natural disasters even when the rates are highly subsidized (Kunreuther, 1973). The reasons for failure of insurance markets need to be understood, as they have important implications for policy. Knowledge of how psychological, economic and environmental factors influence insurance purchasing may suggest ways to increase voluntary purchases--or indicate the need for compulsory insurance programs.

#### C. Decision Processes

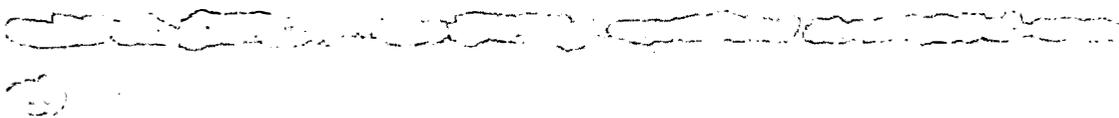
Our primary objective in this study was to determine the critical factors influencing the voluntary purchase of insurance against the consequences of low-probability events such as floods or earthquakes. Research methods included a field survey and laboratory experiments.

The field survey enabled us to discover differences between insured and uninsured homeowners in hazard-prone areas, while the laboratory experiments permitted us to identify causal relationships through controlled manipulation of relevant variables.

The basic sampling plan for the field survey involved face-to-face interviews with 2055 homeowners living in flood-prone areas throughout the United States and 1006 homeowners in 18 earthquake-prone areas of California. Approximately half of the sampled individuals were insured against flood or earthquake.

The analysis of the field survey data revealed that a significant number of homeowners in flood and earthquake-prone areas either knew nothing about the availability and terms of insurance or had inaccurate information. The survey also revealed that many residents had little idea of the probability or potential damage from a future disaster. Furthermore, the insurance decisions of persons who did have firm notions of expected losses, premium costs, etc., were often inconsistent with what would have been predicted by the expected utility model. One of the most surprising results was the large number of uninsured homeowners who expected no federal aid at all in the aftermath of a major disaster. This indicated that neglect of insurance could not be attributed to expectations of generous government relief.

In the laboratory experiments, subjects were presented with a series of gambles, each of which involved a specified probability of losing a given amount of money. Losses and probabilities were varied across gambles. In one experiment subjects were permitted to buy insurance against the loss at an actuarially fair rate. Additional experiments



varied the premiums so that insurance was offered at subsidized rates and commercial rates. In these experiments, subjects considered well-defined insurance problems in isolation and without real stakes at risk. To supplement this format, an elaborate farm management game was designed and run by a computer. While playing this game over a five-hour period, individuals had to decide for each year what crops they were going to plant, what fertilizers to use and what insurance they would purchase against various natural hazards. Subjects' earnings in the game determined their salary.

The results from the experiments consistently showed that people preferred to insure against relatively high-probability, low-loss hazards and tended to reject insurance in situations where the probability of loss was low and the potential losses were high. These results suggest that people's natural predispositions run counter to traditional economic theory (e.g., Friedman and Savage, 1948), which assumes that risk-averse individuals should desire a mechanism to protect them from rare, catastrophic losses that they could not bear themselves.

When asked about their insurance decisions, subjects in both the laboratory and survey studies indicated a disinclination to worry about low-probability hazards. Such a strategy is understandable in view of the fact that limitations of people's time, energy and attentional capacities create a "finite reservoir of concern." Unless we ignored many low-probability threats we would become so burdened that any sort of productive life would become impossible. Another insight gleaned from the experiments and the survey is that people viewed insurance as an investment. Making claims and receiving payments (by insuring

against probable losses) makes them think they are getting more for their premium dollars. Insuring against hazards that don't occur seems a waste of money.

D. Policies and Incentives

Our study has led us to conclude that the primary cause of failure for the disaster insurance market is consumer disinterest. If insurance is to be marketed on a voluntary basis, then consumer's attitudes and information processing limitations must be taken into account. Policy makers and insurance providers must find ways to communicate the risks and arouse concern for the hazards. One method found to work in the laboratory experiments is to increase the perceived probability of disaster by lengthening the individual's time horizon. For example, considering the risk of experiencing a 100 year flood at least once during a 25 year period, instead of considering the risk in one year, raises the probability to .22 and may thus cast flood insurance in a more favorable light. Another step would have insurance agents play an active role in educating homeowners about the proper use of insurance as a protective mechanism and providing information about the availability of insurance, rate schedules, deductible values, etc. Of course, these actions may not be effective. It may also be necessary to institute some form of mandatory coverage, perhaps having banks and other financial institutions require disaster insurance as a condition for a mortgage.

## II. Future Directions

As the world has become safer on the average, it has become

potentially more dangerous at the extreme. Thus, even as technology has increased life expectancy, it has multiplied the potential for catastrophic losses due to carcinogenic chemicals, radiation releases, warfare, dam failures, etc. Reduction of technological risks typically entails substantial costs, including reduction of benefits as well. When weighing the benefits against the risks of technology, the ultimate question becomes "How safe is safe enough?" We believe that economic psychology (or psychological economics) can help provide answers to this difficult question. The framework in Figure 1 may be a useful starting point for addressing questions of acceptable risk in a way that will be helpful to system designers and policy makers. Thus, for example, when designing a set of regulatory mechanisms or incentive systems to cope with a particular hazard in society, careful attention must be paid to the current institutional arrangements and decision processes of the groups affected by that problem. Current programs imply a set of risk-benefit tradeoffs and values of life which may be inappropriate for today's society when scrutinized in this way. On the other hand, the costs incurred by changing these current programs also have to be recognized.

At present, economists and psychologists seem to favor different approaches towards determining acceptable levels of risk. Economists have traditionally favored a market approach in which they assume that the forces of supply and demand will determine an optimal balance between the risks and benefits associated with any activity. There has been a growing recognition in recent years that environmental and technological problems involve both public and private risks. The public good (or bad)

aspects of the risk call for governmental regulation or the use of other social institutions to cope with problems of market failure (Lave, 1972). These programs are typically not designed with concern for people's information processing limitations, nor are the public's judgments of risks and benefits of current and proposed systems usually considered.

Psychologists have preferred to ask people to express their risk preferences directly (see e.g., Fischhoff, Slovic, Lichtenstein, Read and Combs, 1976). Such an approach enables policy makers to gain insight into current attitudes and values. It also allows for widespread citizen involvement in decision making and thus has political appeal. Its principal drawback is that people may not really know what they want or why they attach certain costs and benefits to different activities. In fact, different ways of phrasing the same question may elicit different preferences. Furthermore, people's values may change so rapidly as to make systematic planning impossible. Even if their risk preferences were stable over time, it might be difficult to translate their desires into meaningful policies without substantial implementation costs.

Policy decisions regulating risk must ultimately consider both what people say they want and what their market behavior implies they want. These two approaches to assessing public preferences should be complimentary rather than competing. Integrating these approaches and developing them to a level sufficient to engender public acceptance poses an exciting opportunity for collaboration between economists and psychologists.

### III. Conclusion

Policy makers responsible for protecting society from natural and technological hazards need to understand the ways in which people think about risk and uncertainty. Without such understanding, well-intended policies may not achieve their goals and, indeed, may even backfire. Because rationality is "bounded," utility theory is not a trustworthy guide for policy. The understanding that is needed must come instead from systematic, multidisciplinary empirical investigation.

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## Footnote

1. The author's names are listed alphabetically. Howard Kunreuther is Professor and Head of the Department of Decision Sciences, The Wharton School, University of Pennsylvania. Paul Slovic is a Research Associate at Decision Research, A Branch of Perceptronics, Eugene, Oregon.

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