The Construction of Preference

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One of the main themes that has emerged from behavioral decision research during the past 2 decades is the view that people's preferences are often constructed in the process of elicitation. This concept is derived in part from studies demonstrating that normatively equivalent methods of elicitation often give rise to systematically different responses. These "preference reversals" violate the principle of procedure invariance that is fundamental to theories of rational choice and raise difficult questions about the nature of human values. If different elicitation procedures produce different orderings of options, how can preferences be defined and in what sense do they exist? Describing and explaining such failures of invariance will require choice models of far greater complexity than the traditional models.

The meaning of preference and the status of value may be illuminated by this well-known exchange among three baseball umpires. "I call them as I see them," said the first. "I call them as they are," claimed the second. The third disagreed, "They ain't nothing till I call them." Analogously, we can describe three different views regarding the nature of values. First, values exist—like body temperature—and people perceive and report them as best they can, possibly with bias ("I call them as I see them"). Second, people know their values and preferences directly—as they know the multiplication table ("I call them as they are"). Third, values or preferences are commonly constructed in the process of elicitation ("They ain't nothing till I call them"). The research reviewed in this article is most compatible with the third view of preference as a constructive, context-dependent process. (Tversky & Thaler, 1990, p. 210)

The expression of preference by means of choice and decision making is the essence of intelligent, purposeful behavior. Although decision making has been studied for centuries by philosophers, mathematicians, economists, and statisticians, it has a relatively short history within psychology. The first extensive review of the theory of decision making was published in the *Psychological Bulletin* by Edwards (1954), whose article introduced psychologists to the "exceedingly elaborate, mathematical and voluminous" (p. 380) economic literature on choice and reviewed the handful of relevant experimental studies then in existence.

Edwards's (1954) review was followed by a rapid proliferation of theories of choice and decision making, along with carefully controlled experiments designed to test those theories. This work followed two parallel streams. One, the *theory of riskless choice,* had its origins in the notions of utility maximization put forth by Jeremy Bentham and James Mill. The first formal economic theories based on these notions assumed that decision makers are (a) completely informed about the possible courses of action and their consequences, (b) infinitely sensitive to differences among alternatives, and (c) rational in the sense that they can rank order the possible choices and make decisions that maximize some subjective measure of value or welfare—usually designated by the term *utility.*

The second stream, the *theory of risky choice,* deals with decisions made in the face of uncertainty about the events that determine the outcomes of one's actions. Maximization also plays a key role in these theories, but the quantity to be maximized becomes, because of the uncertainty involved, *expected utility.* Tests of the theory that individuals behave so as to maximize expected utility have been the topic of hundreds of experiments, many of which studied reactions to well-defined manipulations of simple gambles as their basic research paradigm.

A basic assumption of rational theories of choice is the principle of *invariance* (Tversky & Kahneman, 1986; Tversky, Sattath, & Slovic, 1988), which states that the relation of preference should not depend on the description of the options (description invariance) or on the

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method of elicitation (procedure invariance). Without stability across equivalent descriptions and equivalent elicitation procedures, one's preferences cannot be represented as maximization of utility.

Between 1950 and 1960 another development was taking place that was to have a profound influence on the study of decision making. This was the work of Simon (1956), who sharply criticized the assumption of maximization in utility theory. Simon argued that actual decision-making behavior is better described in terms of *bounded* rationality. A boundedly rational decision maker attempts to attain some satisfactory, although not necessarily maximal, level of achievement. Simon's conceptualization highlighted the role of perception, cognition, and learning in decision making and directed researchers to examine the psychological processes by which decision problems are represented and information is processed.

In recent years the information-processing view has dominated the empirical study of decision making. Both streams of research, on risky and on riskless choice, have been merged in a torrent of studies aimed at describing and understanding the mental operations associated with judgment and decision making. The result has been a far more complicated portrayal of decision making than that provided by utility maximization theory. It is now generally recognized among psychologists that utility maximization provides only limited insight into the processes by which decisions are made.

In particular, a sizable body of research shows that description invariance and procedure invariance do not hold. Preferences appear to be remarkably labile, sensitive to the way a choice problem is described or "framed" and to the mode of response used to express the preference (Fischhoff, Slovic, & Lichtenstein, 1980; Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). These failures of invariance have contributed to a new conception of judgment and choice in which beliefs and preferences are often constructed—not merely revealed—in the elicitation process.

Psychologists' claims that people do not behave according to the dictates of utility theory are particularly troubling to economists, whose theories assume that people are rational in the sense of having preferences that are complete and transitive[1] and in the sense that they choose what they most prefer.

This article reviews the history of research on preference reversals, a line of information-processing theories and experiments that has demonstrated the failure of procedure invariance and has contributed to a view of preference starkly different from the view embodied in economic theories of choice.

Preference Reversals Among Gambles: Early Studies

The principle of procedure invariance is violated by preference reversals that are induced by changing from one mode of eliciting a preference to another, formally equivalent, mode of response.

An early demonstration of response-mode effects by Slovic and Lichtenstein (1968) used simple gambles as stimuli (e.g., .3 chance to win $16 and .7 chance to lose $4). Slovic and Lichtenstein observed that ratings of a gamble's attractiveness and choices between pairs of gambles were influenced primarily by the probabilities of winning and losing, whereas buying and selling prices (e.g., "What's the most you would pay for a chance to play this gamble?" or "What's the least amount for which you would sell a ticket to play it?") were primarily determined by the dollar amounts that could be won or lost. When participants found a bet attractive, their prices correlated predominantly with the amount that could be won; when they disliked a bet, their prices correlated primarily with the amount that could be lost. This pattern of correlations was explained as the result of a starting point (anchoring) and an adjustment procedure used when setting prices. Respondents setting a price on an attractive gamble appeared to start with the amount they could win and adjust it downward to account for the probabilities of winning and losing as well as for the amount that could be lost. The adjustment process was relatively imprecise, with the price response greatly influenced by the starting point payoff. Ratings and choices, on the other hand, appeared to be governed by different rules, leading to greater emphasis on probabilities.

Lichtenstein and Slovic (1971) hypothesized that if people process information differently when making choices and setting prices, it should be possible to construct pairs of gambles so that a person would choose one member of the pair but would set a higher price on the other. They demonstrated this predicted effect in several studies, including one conducted on the floor of the Four Queens Casino in Las Vegas (Lichtenstein & Slovic, 1973). A typical pair of gambles in that study (shown below) consisted of one bet with a high probability to win a modest amount (called the P bet) and one bet with a lower probability of winning a larger payoff (called the $ bet):

P bet: 11/12 chance to win 12 chips;
1/12 chance to lose 24 chips;
$ bet: 2/12 chance to win 79 chips;
10/12 chance to lose 5 chips,

where each chip was worth 25 cents. Each participant first made a choice and later indicated a minimum selling price for each bet. For this pair of gambles, the two bets were chosen about equally often across respondents. However, the $ bet received a higher selling price about 88% of the time. Of the participants who chose the P bet, 87% gave a higher selling price to the $ bet. This is no minor inconsistency. Lichtenstein and Slovic (1971) showed that persons who persisted in this pattern of pref-

[1] Persons' preferences are complete if, for all options x and y, they prefer x to y or y to x or are indifferent between them. Their preferences are transitive if, for all options x, y, and z, if they prefer x to y and y to z, then they prefer x to z. Completeness and transitivity are fundamental to utility theories.

erences (and some did) could be turned into "money pumps," continuously giving money to the experimenters without ever playing the gambles.

These early studies captured the attention of a few psychologists and other decision researchers who replicated and extended the findings. Economists were introduced to the preference reversal phenomenon by Grether and Plott (1979), who clearly recognized the threat this phenomenon posed to economic theories of choice: "The inconsistency is deeper than the mere lack of transitivity. . . . It suggests that no optimization principles of any sort lie behind even the simplest of human choices" (p. 623). Accordingly, they carried out a series of experiments "designed to discredit the psychologists' works as applied to economics" (p. 623). Their design was based on 13 criticisms and potential artifacts that would render preference reversals irrelevant to economic theory, including the fact that the experimenters were psychologists, which might have led the participants to behave peculiarly. Their manipulations included using special incentives to heighten motivation, controlling for income and order effects, allowing indifference in the choice responses, testing the influence of strategic or bargaining biases, and having economists conduct the study. To their surprise, preference reversals remained much in evidence despite their determined effort to eradicate them.

Grether and Plott's (1979) careful experiment served only to motivate more extreme attempts by economists to make preference reversals disappear. Pommerehne, Schneider, and Zweifel (1982) attempted to increase motivation by raising the face value of the payoffs and creating differences in expected value between the P and $ bets in a pair. They too found a substantial proportion of reversals, leading them to conclude, "Even when the subjects are exposed to strong incentives for making motivated, rational decisions, the phenomenon of preference reversal does not vanish" (p. 573).

Reilly (1982) was also skeptical of the adequacy of Grether and Plott's (1979) controls. To maximize respondents' understanding of the task, he conducted a study in which the money at risk was placed on a desk in front of the respondent and the size of potential losses in the gambles was increased to enhance motivation. Although the rate of preference reversals was somewhat lower than that observed by Grether and Plott, the phenomenon persisted to a substantial extent. Reilly conceded that these results provided "further confirmation of preference reversal as a persistent behavioral phenomenon in situations where economic theory is generally applied" (p. 582). Nevertheless, he maintained the hope that further strengthening of monetary incentives and the provision of additional information to the participants would make this troublesome phenomenon disappear, thus salvaging preference theory.

Preference reversals were also observed by Knez and Smith (1987), who allowed their participants to trade bets in an experimental market, and by Berg, Dickhaut, and O'Brien (1985), who used an arbitrage procedure that turned participants whose prices and preferences were inconsistent into money pumps. Chu and Chu (1990) and Cox and Grether (1994) were finally able to eradicate preference reversals in market settings characterized by repetition, feedback, and harsh penalties for being inconsistent.

Some economists have attempted to save utility theory by arguing that preference reversals can be accommodated by eliminating less central axioms rather than by abandoning transitivity (see, e.g., Holt, 1986; Karni & Safra, 1987). Other theorists, however, proposed more radical departures from utility theory. Both Loomes and Sugden (1983) and Fishburn (1985) designed theories that abandoned the requirement of transitivity.

Slovic and Lichtenstein (1983) responded to economists' repeated attacks and defensive posture by attempting to show how preference reversals fit into a larger picture of framing and information-processing effects that, as a whole, pose a collective challenge to preference theories far exceeding the challenge from reversals alone. They urged economists not to resist these developments but, instead, to examine them for insights into how people make decisions and the ways that the practice of decision making can be improved.

Hausman (1991) was also critical of economists' refusal to take preference reversals seriously. Writing "On Dogmatism in Economics: The Case of Preference Reversals," he traced economists' reactions to their reluctance to abandon a single systematic and parsimonious theory of choice that is also a theory of rational choice, in favor of psychologists' narrower and more complex theories. Nevertheless, he concluded, economists' reactions were hard to defend, creating "unreasonable barriers to theoretical and empirical progress" (p. 223).

Causes of Preference Reversals

Although the early studies established the robustness of the preference reversal phenomenon, its interpretation and explanation remained unclear, leading to a second wave of studies starting in the mid-1980s.

Tversky, Slovic, and Kahneman (1990) formulated the explanatory problem as follows. First, they defined a preference reversal as the following combination of responses:

$$H \succ L \text{ and } C_L > C_H,$$

where H refers to the high-probability gamble (earlier called the P bet), L refers to the low-probability gamble (the $ bet); C_H and C_L denote, respectively, the cash equivalent (or minimum selling price) of H and L; and $\succ$ and $\approx$ denote strict preference and indifference, respectively. Note that $>$ refers to the ordering of cash amounts and $X > Y$ implies $X \succ Y$; in other words, more money is preferred to less.

A preference reversal can be shown to imply either the intransitivity of the preference relation $\succ$, the failure of procedure invariance, or both.

If procedure invariance holds, an individual will be indifferent between his or her stated price (cash equivalent) X and the bet B; that is,

$$B \succ X \text{ iff } C_B > X \text{ and } C_B = X \text{ iff } B \approx X.$$

Therefore, if invariance holds, preference reversal implies the following intransitive cycle:

$$C_H \approx H \succ L \approx C_L > C_H,$$

where the two inequalities follow from the preference reversal, and the two equivalences follow from procedure invariance.

But two types of discrepancies between choice and pricing (i.e., failures of invariance) could also produce preference reversals: overpricing of L and underpricing of H. Overpricing of L is said to occur if the decision maker prefers the price over the bet when offered a choice between them (i.e., $C_L \succ L$). Underpricing of H occurs when $H \succ C_H$. Overpricing and underpricing merely identify the sign of the discrepancy between pricing and choice; the labels do not imply that choice represents one's true preference and that the bias resides only in pricing.

Tversky et al. (1990) developed a procedure for diagnosing whether any observed preference reversal was due to intransitivity, overpricing of L, underpricing of H, or both overpricing of L and underpricing of H, and they used this procedure in a new study.[2] The results were clear. The experiment yielded the usual rate of preference reversal (between 40% and 50%), but only 10% of preference reversal patterns were intransitive, and the remaining 90% violated procedure invariance. By far the major source of preference reversal was the overpricing of the L bet, which accounted for nearly two thirds of the observed patterns. These conclusions were further supported in a study by Bostic, Herrnstein, and Luce (1990), who used a somewhat different methodology.

The Compatibility Hypothesis

In the earliest studies on preference reversals, two information-processing concepts were proposed to account for the dependence on payoff cues in pricing gambles. These were starting point and adjustment strategies (e.g., starting with the amount to win and adjusting it downward) and the concept of compatibility. Lichtenstein and Slovic (1973) proposed a "general hypothesis that the compatibility or commensurability between a cue dimension and the required response will affect the importance of the cue in determining the response" (p. 20).

The finding by Tversky et al. (1990) that preference reversals were due primarily to overpricing the high payoff bets led to a reexamination and more precise formulation of the compatibility hypothesis by them and by Slovic, Griffin, and Tversky (1990). Slovic et al. proposed that the weight of a stimulus attribute in judgment or in choice is enhanced by its compatibility with the response mode.[3] The rationale for this *scale compatibility hypothesis* is twofold. First, if the stimulus scale and the response scale do not match, additional mental operations are needed to map the former onto the latter. This increases effort and error and may reduce the impact of the stimulus scale. Second, a response mode tends to focus attention on the compatible features of the stimulus.

The hypothesized link between compatibility and preference reversals was supported in a number of new studies reported by Slovic et al. (1990). In one of these studies, participants were presented with six pairs of H and L bets. Three pairs involved monetary payoffs, and three pairs involved nonmonetary outcomes, such as a one-week pass for all movie theaters in town, or a dinner for two at a good restaurant. If preference reversals are due primarily to the compatibility of prices and payoffs, which are both expressed in dollars, their incidence should be substantially reduced by the use of nonmonetary outcomes. This prediction was confirmed; the overall incidence of reversals decreased from 41% (monetary bets) to 24% (nonmonetary bets).

Although the compatibility hypothesis can explain preference reversals between pairs of bets, the explanation does not depend on the presence of risk. Indeed, this hypothesis implies a similar discrepancy between choice and pricing for riskless options with a monetary component, such as delayed payments. Let (X, T) be a prospect that offers a payment of $\$X$, T years from now. Consider a long-term prospect L ($2,500, 5 years from now) and a short-term prospect S ($1,600, 1.5 years from now). Suppose that respondents (a) choose between L and S and (b) price both prospects by stating the smallest immediate cash payment for which they would be willing to exchange the delayed payment. According to the compatibility hypothesis, the monetary component X would weigh more heavily in pricing than in choice. As a consequence, respondents should produce preference reversals in which the short-term option is preferred over the long-term option in a direct choice, but the latter is priced higher than

[2] In this diagnostic procedure, the original preference reversal design was extended to include, in addition to the standard H and L bets, a cash amount X that was compared with both of them. That is, participants indicated their preferences between each of the pairs in the triple {H, L, X}. Participants also produced cash equivalents, C_L and C_H for both of the bets. By focusing on standard preference reversal patterns in which the prespecified cash amount X has been set to lie between the values of C_L and C_H generated by the respondent (i.e., $H \succ L$ and $C_L > X > C_H$), it is possible to diagnose each preference reversal pattern according to whether it was produced by an intransitivity, by an overpricing of L, by an underpricing of H, or by both. For example, if respondents indicated that $L \succ X$ and that $X \succ H$, then their preferences are intransitive because the method analyzes only those cases in which $H \succ L$. Alternatively, if respondents overprice the L bet, then their pattern of responses will be $X \succ L$ and $X \succ H$. (The respondents produce a price for L that is greater than X, but when offered a choice between X and L, they choose X.) This pattern is transitive, although it is a preference reversal.

[3] The significance of the compatibility between input and output has long been recognized by students of human performance. Engineering psychologists have discovered that responses to visual displays of information, such as an instrument panel, will be faster and more accurate if the response structure is compatible with the arrangement of the stimuli (Fitts & Seeger, 1953). For example, the response to a pair of lights will be faster and more accurate if the left light is assigned to the left key and the right light to the right key. Similarly, a square array of four burners on a stove is easier to control with a matching square array of knobs than with a linear array.

the former (i.e., S $\succ$ L and $C_L > C_S$). This was precisely the pattern observed by Tversky et al. (1990). Their participants chose the short-term option 74% of the time but priced the long-term option above the short-term option 75% of the time; the rate of reversals exceeded 50%. Further analysis revealed that—as in the risky case—the major source of preference reversal was the overpricing of the long-term option, as entailed by compatibility.

Additional support for the role of compatibility in preference reversals came from a study by Schkade and Johnson (1989). This study used "mouselab," a computer-based method for monitoring the time spent by each participant looking at probabilities and at payoffs as they priced bets, rated their attractiveness, or made choices. They found that the percentage of time spent on payoffs was significantly greater in pricing than in choice when respondents produced preference reversals, but there was little difference when respondents did not exhibit reversals. A second experiment produced a high percentage of reversals between pricing responses and attractiveness ratings, along with strong evidence demonstrating the use of anchoring and adjustment strategies. The selection of anchors (e.g., payoffs for pricing and probabilities for rating) appeared to be guided by compatibility.

Goldstein and Einhorn (1987) also found reversals between pricing and attractiveness ratings and attributed them to the way in which the subjective value of a gamble was mapped onto the response scale. Although their model can accommodate reversals of preference, it does not predict the variety of compatibility effects that other studies have observed.

Choice, Matching, and the Prominence Effect

Parallel to the early work on preference reversals, what appeared at the time to be a separate line of research was investigating of the difference between choice and matching responses through the use of a diverse array of two-dimensional stimuli, such as baseball players described in terms of their batting averages and number of home runs, typists described by their speed and accuracy, and so forth. The results, reported in Slovic (1975), were framed in terms of the ancient philosophical puzzle of how to choose between equally attractive alternatives. In these studies, participants first matched different pairs of options (making them equal in value), and, in a later session, chose between the matched options. Slovic found that participants did not choose randomly but rather tended to select the option that was superior on the more important dimension (e.g., batting average and typing accuracy). About a decade later, Tversky saw in this finding the seeds of a general theory of response-mode effects that had the potential to explain a wide variety of empirical findings, including preference reversals. This theory was explicated and tested by Tversky et al. (1988).

Tversky et al. (1988) noted that choice and matching operations were fundamental to measurement in both the physical and the social sciences. To determine the heavier of two objects, for example, one can place them on two sides of a pan balance and observe which side goes down. Alternatively, one can place each object separately on a sliding scale and observe the position at which the sliding scale is balanced. Similarly, to determine the preference order between options, one can use either choice or matching (where matching includes rating scales, cash equivalents, etc.). Note that the pan balance is analogous to binary choice, whereas the sliding scale resembles matching. In proper physical measurement, procedure invariance holds: The ordering of two objects with regard to weight is identical with either the pan balance or the sliding scale. However, as previously seen, choice and matching often disagree when used to measure preferences.

Table 1
Highway Safety Problem Used to Assess the Prominence Effect

Problem: About 600 people are killed each year in Israel in traffic accidents. The ministry of transportation investigates various programs to reduce the number of casualities. Consider the following two programs, described in terms of yearly costs (in millions of dollars [M]) and the number of casualties per year that is expected following the implementation of each program. Which program do you favor?

Program	Expected number of casualties	Cost	Percentage of respondents choosing
X	500	$55M	67
Y	570	$12M	33

Note. From "Contingent Weighting in Judgment and Choice" by A. Tversky, S. Sattath, and P. Slovic, 1988, *Psychological Review, 95*, p. 373. Copyright 1988 by the American Psychological Association.

Generalizing from the results of Slovic (1975), Tversky et al. (1988) formulated the *prominence hypothesis:* The more prominent (important) attribute will weigh more heavily in choice than in matching. This hypothesis was tested and supported through a series of problems, including the highway safety problem shown in Table 1. Number of casualties was presumed to be the prominent dimension in this problem. When asked to choose between the two safety programs, 67% of the respondents chose X, the program that saved more lives at a higher cost per life saved. Other groups of respondents received the same problem except that one of the four values was missing. They were asked to fill in the missing value to make the two programs equally attractive. It is possible to infer a person's response to the choice task from their response to the matching task. For example, if the cost for Program X was missing and the respondent filled in a value less than $55 million to make the two programs equally attractive, one would infer that this person would choose Y over X when the cost for X was $55 million. In fact, the overwhelming number of matches favored the more economical Program Y that saves fewer lives. Only 4% of the inferred choices favored Program X. Similar responses were observed across a variety of other problems. In every case, the primary dimension was given more weight in choice than in matching. This effect gives rise to a marked discrepancy between the preferences derived from choice and from matching, thus violating procedure invariance. Because pricing a gamble or judging its cash

equivalent is a matching response, one can view preference reversals among bets as a special case of the choice–matching discrepancy, in which probability of winning is the prominent dimension that receives greater weight in choice.[4]

Tversky et al. (1988) suggested that different heuristics or computational schemes appear to be used in the two kinds of tasks. Choice invokes more qualitative reasoning, such as the use of a lexicographic strategy (i.e., selecting the alternative that is ordinally superior on the most important attribute). Lexicographic reasoning is cognitively easier than making explicit tradeoffs and is also easier to justify to oneself and to others. Matching, on the other hand, requires a more quantitative assessment. Tversky et al. proposed that ordinal considerations loom larger in the ordinal procedure of choice than in the cardinal procedure of matching. The prominence effect may thus be seen as an example of a general principle that Fischer and Hawkins (1993) later labeled *strategy compatibility.*

Tversky et al. (1988) also developed a hierarchy of contingent trade-off models to accommodate the various compatibility effects observed in studies of judgment and preference. In these models, the trade-offs between attributes depend on the nature of the response.

Reliance on the prominent dimension makes a good reason for choice. Demonstration of the prominence effect thus focused attention on the importance of reasons, arguments, and justifications in choice. In earlier work, the search for good reasons to eliminate options from consideration had been shown to guide the choice strategies observed and modeled by Tversky (1969). Slovic (1975) also invoked justifiability to explain people's preferences for the option that was superior on the prominent dimension when faced with a choice among equally valued alternatives. Montgomery (1983) argued that people search for and construct dominance structures[5] in decision problems because they provide a compelling reason for choice. The axioms of utility theory may act as compelling arguments or reasons for making a particular decision when their applicability is detected or pointed out (Tversky & Kahneman, 1986).

Additional evidence for a reason-based conception of choice is provided by Tversky and Simonson (1993) and Shafir, Simonson, and Tversky (1993). Shafir et al. argued that a reason-based conception fits well with a constructive interpretation of choice. Different frames, contexts, and elicitation procedures highlight different aspects of the options and bring forth different reasons and considerations that influence the decision.

Construction of Preference

The study of preference reversals has been one of several lines of research leading to a conception of choice quite different from the classical assumption that the decision maker has a complete preference order for all options and selects the option highest in that order. This new conception applies to judgments and choices among options that are important, complex, and perhaps unfamiliar, such as gambles, jobs, careers, homes, automobiles, surgical treatments, and environments. In these decisions, preferences are not simply read off some master list but are constructed on the spot by an adaptive decision maker (Payne, Bettman, & Johnson, 1992, 1993). Construction strategies include anchoring and adjustment, relying on the prominent dimension, eliminating common elements, discarding nonessential differences, adding new attributes into the problem frame in order to bolster one alternative, or otherwise restructuring the decision problem to create dominance and thus reduce conflict and indecision. As a result of these mental gymnastics, decision making is a highly contingent form of information processing, sensitive to task complexity, time pressure, response mode, framing, reference points, and numerous other contextual factors.

Krantz (1991) portrayed this new conception of decision making as attempting to solve several distinct problems in the absence of firm trade-offs or values. He challenged the normative status of utility theory as well as its descriptive status:

> The normative assumption that individuals *should* maximize *some* quantity may be wrong. Perhaps . . . there exists nothing to be maximized. Ordering may be partial . . . because the calculations are impossible in principle: People do and should act as *problem solvers, not maximizers,* because they have many different and incommensurable . . . goals to achieve. (p. 34)

Practical Implications of Preference Construction

The study of preference aims not only to understand decision making but to improve it. The constructive view has much to offer in this regard. For as Delquié (1993) has observed, prescriptive decision analysis basically concerns constructing preferences in situations in which the right choice is not readily apparent. The analysis requires a process that is transparent, logical, and free of arbitrariness. Truth ultimately resides in the process, rather than in the outcome.

Valuing the Environment

One practical application of preference construction addresses the method of contingent valuation (CV), which has been used by economists for more than 25 years to value environmental actions such as wetlands protection, water and air quality improvements, and wildlife resources. The CV method posits a hypothetical market and asks people to imagine what they would pay in this market for a proposed change in the environmental state of interest. However, valuing environmental changes is exactly the kind of complex, unfamiliar task in which one would not expect to find stable, well-articulated pref-

[4] A nice example of prominence is the finding that personal safety looms larger in choices between options that vary in both safety and cost than in the pricing of such options (Magat, Viscusi, & Huber, 1988). Safety is more prominent than money and, thus, is given greater weight in choice than in pricing.

[5] A dominance structure is a choice situation in which one option is as good or better than another on all relevant aspects.

erences, making it a likely candidate for constructive processes. Irwin, Slovic, Lichtenstein, and McClelland (1993) used knowledge of constructive preferences to examine and critique the CV approach. They developed a preference reversal experiment in which they asked participants to choose between improved air quality and an upgraded computer and to indicate their cash equivalents for each improvement. Irwin et al. found, as predicted by the prominence hypothesis, that participants chose improved air quality as more valuable, presumably because choice invokes reasons, and there are stronger, more noble reasons for preferring air quality over a computer upgrade. They also predicted, and found, that people placed a higher monetary value on the computer upgrade, presumably because of the strong implicit price cues associated with a better computer. Preference reversals (preference for improved air quality in choice and the computer upgrade in pricing) were observed in 41% of the respondents.

Kahneman and Ritov (1994) also hypothesized and found prominence effects leading to reversals between choices and monetary values for environmental interventions, although the specific nature of these effects was somewhat different from that observed by Irwin et al. (1993).

With the findings of Irwin et al. (1993) in mind, Gregory, Lichtenstein, and Slovic (1993) launched a critique of the CV paradigm. They argued that if monetary values are constructed during the elicitation process in a way that is strongly influenced by context, one should take a deliberate approach to value construction, in a manner designed to rationalize the process. They recommended the use of multi-attribute utility theory (von Winterfeldt & Edwards, 1986), which provides a systematic framework for eliciting and integrating the multiple dimensions of complex values. In this way, a CV survey would serve as an active process of value construction, rather than a neutral process of value discovery, and the designers of a CV study would function "not as archaeologists, carefully uncovering what is there, but as architects, working to build a defensible expression of value" (Gregory et al., 1993, p. 179).

Informed Consent

The role of preference construction as an active process was perceived in a very different way by MacLean (1991), a philosopher interested in the role of informed consent in clinical medicine. MacLean described the move away from the traditional model whereby authority is delegated by the patient to the physician toward a new model of shared decision making, in which enlightened physicians give primary responsibility to the patient. The physician thus acts as an expert advisor, providing information and counseling. The shared decision-making model thus respects the patient's autonomy in the face of decisions that are difficult and momentous. It also protects the physician against the charge of imposing an unwanted treatment on the patient.

MacLean (1991) argued that if preferences are constructed in the process of informing, framing the options, and eliciting the response, the rationale behind the shared model of consent cannot be defended. Rather, this model makes the physician's role more difficult and risky. The physician is helping to construct preferences, which he or she should do consciously yet in a way that avoids domination. MacLean offered no simple guidelines for the physician but argued that the process must be more involved and interactive than the normal approach, if the value of informed consent is to be realized.

Preference Management

The fact that preferences are highly labile, which psychologists have worked so hard to demonstrate, has been known to practical philosophers for ages. If preferences are so readily manipulable, why not manage them for one's own benefit? For example, people can choose their goals and aspiration levels. Thus, the Talmud asks, "Who is it that is rich?" and answers, "One who is content with his portion."[6] People are advised by those wiser than themselves to "put things in perspective," by comparing their misfortunes with far worse troubles or by considering how unimportant some present problem will seem 10 years from now.

The constructive theory may help people do a better job of managing their preferences. Thus MacLean's patients and physicians might be advised to sift and weigh alternative reasons or justifications, to work toward developing a rationale for action. A strong rationale might buffer the patient from regret and make it easier for him or her to accept the consequences of the decision. If the patient is an intuitive decision theorist, this process could invoke utility functions and maximization rules. However, quite different justifications could be equally legitimate if they have been thoughtfully derived.

An appreciation of framing effects could also help people manage their preferences more effectively (Thaler, 1985). Suppose, for example, that a person with $5,600 in a bank account misplaces a $100 bill. Rather than isolating and dwelling on this painful loss, assimilating it into one's total account may ease the sting by exploiting the perception that $5,500 is not that different from $5,600.

The concepts of preference construction and preference management reflect the deep interplay between descriptive phenomena and normative principles. The experimental study of decision processes appears to be forging a new conception of preference, one that may require serious restructuring of normative theories and approaches toward improving decision making.

[6] Not being a Talmudic scholar, I am indebted to David Krantz (1991) for this example.

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