

*The behavioral anomalies found by experimental psychologists (Tversky, Kahneman, and others) relate to the individual level. They are often considered to be irrelevant by economists because competitive markets are assumed to eliminate them at the aggregate level. However, markets are only able to perform this role under very limited conditions that often do not obtain even in the near-perfect stock market. Moreover, democratic, bureaucratic, and bargaining processes may under different identifiable conditions weaken or strengthen the anomalies. At the aggregate level, institutions such as conventions and laws may arise to counteract anomalies.*

## Should Social Scientists Care About Choice Anomalies?

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### ANOMALIES AND ECONOMISTS

#### BEHAVIORAL ANOMALIES

The findings by experimental psychologists that individual behavior systematically violates rationality have recently caught the attention of social scientists, among them many economists. Kahneman and Tversky presented major anomalies in *Econometrica* (1979), and a series of essays are collected in Kahneman, Slovic, and Tversky (1982). A large number of anomalies of individual behavior are now known. Some of these have reached the status of "effects," such as the certainty effect, the sunk cost effect, the endowment

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effect, and the framing effect. A good deal of attention has been given, especially by economists, to the preference reversal phenomenon. In contrast, the choice heuristics of availability, representativeness, anchoring, and adjustment have been relatively neglected by economists (but see Camerer 1987).

It is not necessary to present and discuss those anomalies here; suffice it to say that they have not only been found and investigated by behavioral psychologists such as Kahneman, Tversky, Slovic, and Lichtenstein, but also by economists such as Thaler (1980, 1985), Grether and Plott (1979), and Kunreuther (et al. 1978, with Slovic 1978). Indeed, paradoxical counterevidence against Savage's (1954) axioms of rational behavior under uncertainty had been found much earlier by Allais (1953) and Ellsberg (1961). Excellent surveys exist on the topic: Slovic, Fischhoff, and Lichtenstein (1977) and Payne (1982) wrote from the point of view of psychology; Schoemaker (1980, ch. 2, 1982) analyzed the consequences of these paradoxes for expected utility maximization (based on the 1947 von Neumann-Morgenstern axioms and therefore generally considered to define rationality under uncertainty). More recently, we have the more descriptive treatments by Shapira (1986) and the more theoretical treatment by Machina (1987).

#### REACTION BY ECONOMISTS

Economists have reacted to findings about the paradoxical behavior of individuals in three different ways: (1) by taking them seriously, (2) by disregarding them, and (3) by explicitly rejecting them. These reactions will be discussed in turn.

##### Anomalies Are Taken Seriously

The most prominent economist in this group is Arrow (1982), who shows that deviations from individual rational behavior that he observes in intertemporal economic markets are consonant with the evidence found on anomalies by psychologists. The phenomena have also been taken seriously by a large number of economists attending a University of Chicago conference, Behavioral Foundations of Economic Theory (Hogarth and Reder 1987). At that conference, Arrow (1987, 213) explicitly accepted Simon's (1957, ch. 14, 15) bounded rationality concept rather than simple utility maximization, as a result of the paradoxes found.

Other economists have paid tribute to psychological findings by explicitly introducing particular concepts into economics. The best known are Scitovsky's (1976, 1981) application of Wundt's law of the optimal degree of excitement, Akerlof and Dickens's (1982) and Gilad and associates' (1987) use of cognitive dissonance, or Schelling's (1978a, 1980), Hirschmann's (1982), and Thaler and Shefrin's (1981) work on the possibility of restraining oneself by self-commitment.

### Anomalies Are Disregarded

The "business as usual" attitude more often found in verbal than in written form is nourished by the fear that economic analysis breaks down when orthodox rational choice models are given up or even weakened. Thus Russell and Thaler (1985, 1073) state that "with few exceptions, economists have tended to ignore the work of the cognitive psychologists and have continued to investigate markets with only rational agents." An important example is provided by neoclassical analysis in public finance, that is, in public economics (see Atkinson and Stiglitz 1980, or any issue of the *Journal of Public Economics*). In particular, it is standard procedure to apply expected utility maximization to derive the theorems on optimal taxation (for example, Allingham and Sandmo 1972, Sandmo 1976) or on optimal public prices (for example, Boes 1981). The evidence collected on systematic violations of this theory is not mentioned despite the fact that a careful evaluator (Schoemaker 1982, 552) concludes that "it is doubtful that the expected utility theory should or could serve as a general descriptive model."

### Anomalies Are Rejected

Seven arguments as to why the paradoxes found are irrelevant for economists are most often brought forward.

(1) *Exclusion by definition*. "Should behavior in certain salient areas be found to violate rationality, it will be treated as beyond economics" (Zeckhauser 1987, 252). Such a narrow view (not shared by Zeckhauser) would have to be rejected by the economic approach to human behavior championed by Becker (1976), which explicitly claims (pp. 9-10) that the rational choice model is applicable to all areas where humans act, including, for example, the family (marriage, childbearing, divorce), crime, or suicide. Indeed, one can argue that such a restriction of the area of economic analysis

does not make sense, as it is possible to develop an economic theory not based on the classical or orthodox notions of rationality (Arrow 1987, 202). Simon's (1957) satisficing model or Kahneman and Tversky's (1979) prospect model provide possible alternatives.

(2) *Irrelevance of laboratory evidence.* It is often maintained that the effects found under laboratory conditions are not applicable to the "real world." However, if economic theory is indeed a general model of resource allocation, it should also be valid in a laboratory setting (Smith 1976). The burden of proof thus lies on those who want to exclude laboratory behavior.

A stronger rebuttal of this argument lies in the fact that there is now a considerable amount of empirical evidence that such anomalies also exist in real life. The best-known case is provided by the irrational behavior of individuals in the context of government-subsidized flood insurance, a behavior that is not explicable in terms of maximizing subjective expected utility (Kunreuther et al. 1978, Kleindorfer and Kunreuther 1982). Arrow (1982, 7) provides a dramatic example of the effect of framing for the choice of medical therapy, and other examples may be found in Robertson (1974), Schelling (1978b), Pratt, Wise, and Zeckhauser (1979), and Samuelson and Zeckhauser (1988). In the psychological literature there are examples of overconfidence on the part of military intelligence analysts and of systematic biases in behavior by gamblers in casinos or by scientific investigators (see Slovic, Fischhoff, and Lichtenstein 1977, 15-17).

(3) *Insufficient incentives to respond seriously to experiments.* It has often been argued that the paradoxes would disappear if irrational behavior had sizable negative consequences. This proposition has been extensively tested in the context of the preference reversal phenomenon (Grether and Plott 1979, Grether 1980, Pommerehne et al. 1982, Reilly 1982, Holt 1986, Karni and Safra 1987, Segal 1988). The conclusion is that irrational behavior does not vanish even when individuals have a strong (monetary) incentive for rational decisions. Hypothetical gamblers show the same result in Las Vegas replications (Lichtenstein and Slovic 1971). According to Schoemaker (1982, 553-54) there is "no evidence that suboptimal laboratory behavior improves when committing subjects financially to their decisions," a view intuitively supported by arguing that "it would require far more effort on the part of subjects to falsify responses deliberately than to respond truthfully" (Hogarth and Reder 1987, 12).

(4) *People learn.* While anomalies may occur in isolated instances, it can be argued that they are not prevalent because individuals learn to avoid errors.

But why would the paradoxes still be observed today, at a time when people have had a very long period to learn to choose according to the subjective expected utility model (going back to Bernoulli 1738), which has been taught to be "optimal"?

A more important rebuttal stresses the difficulties of learning (see Payne 1982, 397-98). It is not a simple or automatic activity; uncertainty, environmental instability, and improper assessment frameworks represent serious obstacles (Einhorn 1980, Brehmer 1980). Learning is possible only in a well-structured feedback situation that often does not obtain, and even then it tends to be slow and at times incorrect or even perverse (Einhorn and Hogarth 1978, 1981).

(5) *Experts as marginal actors suffice to produce the classical results.* The fact that many, and even the majority of, individuals are subject to anomalies in behavior does not lead to anomalies at the aggregate level, provided that there are a few actors who act rationally. The empirical evidence collected suggests, however, that even "experts" fall prey to at least some of the paradoxes. For example, it has been found that "bankers and stock market experts predicting closing prices for selected stocks showed substantial over-confidence" (see Slovic et al. 1977, 15). Machina (1987, 128) notes that even professional decision theorists of high class, Savage among them, have acted irrationally (according to their own definition) and that pointing out the errors has had little effect on future behavior. The paradoxes pointed out are thus not the result of a lack of intelligence or knowledge, but are due to deeper underlying characteristics of human nature (see also Schoemaker 1982, 555).

(6) *Anomalies are randomly distributed and average out in the aggregate.* This argument has been put forward forcefully by Becker (1962, 1976): individuals do err, but the errors occur in all directions and are therefore irrelevant for the aggregate level in which economists are interested.

(7) *Competitive markets eliminate anomalies.* This is the standard counterargument within economics (Arrow 1982, 7). If most agents' behavior is subject to anomalies, rational individuals can make a lot of money and will eventually take over all wealth. Therefore, rational behavior dominates the overall market. The tendency of only efficient actors to survive in the market—that is, in the case of firms only those maximizing profits—was suggested long ago by Alchian (1950) and Friedman (1953).

Arguments 1 to 4 relate to the individual level, which is of limited relevance; some economists even consider it to be of no importance per se. Also, theoretical and empirical evidence against the first four arguments has

already been adduced. Arguments 5 to 7 relate to the aggregate level and are therefore crucial from the economic point of view. The subsequent discussion will therefore concentrate on Arguments 5, 6, and 7.

#### PROCEDURE

This paper asks the question: How relevant are the anomalies found at the level of *individual* decision makers for economics, which is interested in *aggregate* phenomena? This problem has scarcely been treated. In the case of psychologists this is not surprising, as this discipline deals with individual-level phenomena. In economics, the stated irrelevance of individual-level paradoxes often is more the result of an underlying faith or ideology in "rationality" than the result of careful theoretical and empirical investigation. It may be noted that the question has also been disregarded in the newly arising area of economic psychology, as witnessed by two modern textbooks (Furnham and Lewis 1986, Lea, Tarpy, and Webley 1987) in which the problem is not even mentioned.

When the question of the relevance or irrelevance of the individual-level paradoxes is treated in economics, it is done in a narrow and unrealistic way: the subject has been how much the *market* is able to eliminate anomalies (see the many contributions in Hogarth and Reder 1987). A notable exception is Coleman's (1987, 181-85) sociological contribution to the Chicago Conference, where he points out that it would be a worthwhile research agenda to look at the social organizations intervening between the individual and aggregate levels.

This article takes a broader view than existing analyses in two respects:

- (1) *A multitude of decision-making systems* is considered. The economic market is only one such system. Others are democracy, bargaining, and administration (following Dahl and Lindblom 1953, for other classifications see Frey 1978).
- (2) The processes or institutions intervening between individual-level decisions and aggregate outcomes may work in all directions. They may not only *eliminate* or *weaken* individual-level anomalies, but they may also be *neutral* or even *strengthen* them. In the last two cases the anomalies are transferred to the aggregate level and are therefore relevant for economics.

Our analysis leads to four main general conclusions:

- (1) the *market* system eliminates individual anomalies only under very limited conditions, though there is a tendency to weaken them;

- (2) another *competitive* process exists, namely democracy, which under appropriate conditions eliminates anomalies;
- (3) institutions *other than competitive processes* exist that are capable of weakening anomalies; and
- (4) under some conditions nonmarket decision-making institutions may *strengthen* individual-level anomalies.

It follows that the paradoxes analyzed by Kahneman, Tversky, and associates should be taken seriously by economists.

The second section of this article analyzes the role of institutions in the relationship between the individual and the aggregate level. The following sections discuss four specific decision-making systems and institutions: the market, democracy and the state, bargaining and interest groups, and administration and public bureaucracy. Concluding remarks are offered in the final section.

## INSTITUTIONS INTERVENE BETWEEN THE INDIVIDUAL AND THE AGGREGATE LEVELS

### THE INDIVIDUAL, THE AGGREGATE, AND THE SCOPE OF MARKETS

A  $2 \times 2$  matrix serves to illustrate the logically possible relationships between the level of individual decision-making and aggregate outcomes (Table 1).

Cell A comprises the normal case dealt with in economics: there are no anomalies (that is, violations of rationality in the sense of the von Neumann-Morgenstern axioms) either at the individual or at the aggregate level. Cell B includes cases where only the *process* of aggregation produces aggregate-level anomalies. Well-known and important examples are the preference aggregation paradox (Arrow 1951, Sen 1970, Coleman 1966, and the social choice literature), problems connected with public goods, and Schelling-type problems (Schelling 1978b). Cell C comprises cases in which the institutions involved in the aggregation process are able to produce "normal" aggregate results. The best-known (and so far unique institution considered) is the perfectly competitive economic market. In Cell D are cases presenting a problem and challenge to economics, where individual-level paradoxes are transferred to the aggregate level. In other words, the aggregating institutions are either neutral or strengthen the paradoxes, or else they are not able to sufficiently weaken them to make them irrelevant for practical purposes.

TABLE 1

		Aggregate level anomalies	
Individual level anomalies	do not exist	do not exist	exist
		no problem A	creation B
	exist	elimination C	maintenance D

Cells C and D are the subject of this article. In view of the fact that economists tend to take Cell C to be the only applicable one, it is sufficient to provide *relevant examples* for processes and institutions falling into Cell D in order to show that the individual-level paradoxes found should be taken seriously.

#### THE RANDOM DISTRIBUTION ARGUMENT

On the basis of Table 1 it is possible to discuss Argument 6 of the preceding section, which states that the anomalies are randomly distributed and that they therefore are eliminated in the aggregate by the law of large numbers. Russell and Thaler (1985, 1074, see also Thaler 1987a, 96) reject this argument: "Since the errors that have been identified are systematic (i.e. in a predictable direction) this statement is simply wrong." Both these arguments are, however, not far-reaching enough. Irrespective of whether the individual anomalies are randomly distributed or systematic, there may be institutions that either eliminate or maintain them at the aggregate level. Thus, systematic anomalies *may*, but need not, be eliminated through appropriate institutions. On the other hand, as will be argued in the following sections, institutions exist that block the effect of the law of large numbers when the underlying distribution is random. Thus it turns out that neither Argument 6 nor the counterargument are relevant once the importance of the aggregating processes and institutions is accepted.

## AGGREGATION THROUGH THE MARKET

A fully efficient, perfectly competitive market working under ideal conditions eliminates anomalies existing at the individual level. Put positively: "rationality . . . is most plausible under very ideal conditions" (Arrow 1987, 201). This result leads to two questions: (1) Do such markets exist in reality? and (2) What happens in a less than fully competitive market?

Considerable theoretical and empirical evidence has been collected to suggest that the markets that exist, including financial markets, which are often thought to correspond most closely to the ideal competitive market, are not able to eliminate individual-level anomalies. According to Arrow (1982, 7-8), even if everyone else is irrational, it does not follow that a rational actor is able to exploit the existing arbitrage possibilities: If a firm invests in research and development (R&D), the depressed current profits may be the only information irrational investors consider (this is a case of the biased availability heuristic). A rational investor who correctly takes the current stock market price to be below the expected value of future higher profits produced by the R&D investment may not realize any part of this gain during the gestation period. If the rational investor's discount rate is sufficiently high, there is no possibility to exploit the irrational behavior of others even in the long run, and the aggregate effect of a depressed stock market price remains despite good profit prospects.

In a later article, Arrow (1987, 209 et seq.) reminds the audience that the fully competitive market of general equilibrium theory must include markets for *all* future goods, but "we certainly know that many—in fact most—markets do not exist." This being the case, the information gap must be filled by some kind of conjecture, and through this process there is wide enough scope for individual-level anomalies to enter. With respect to this particular problem, incomplete markets have closely analogous consequences to the existence of market power.

Other well-known attacks against the elimination thesis have been brought forward by Russell and Thaler (1985) for consumer goods markets and by Miller (1988) for financial markets. They argue that the notion that "competition will render irrationality irrelevant is apt only in very special cases, probably rarely observed in reality" (Russell and Thaler 1985, p. 1071). A sizable number of empirical studies for financial markets claim to find aggregate anomalies even here. When individuals are risk averse—the normal assumption in economics—risk taking has to be compensated, and risk and return should be positively correlated. According to Banz (1981) small

companies attain a higher rate of return than larger companies with a similar degree of risk; Basu (1977) finds a higher rate of return for firms with a lower price/earnings ratio; Bacharach and Galai (1979) find that the estimated risk of companies is affected by the actual stock prices; Bowman (1982) calculates a negative relation between the traditional risk measure (simple variance) and average return across industries. Shiller (1981, 1984, 1987a) shows that the volatility of stock prices is too high relative to the discounted value of dividends (see the controversial discussion by Kleidon 1986, 1987, Marsh and Merton 1986, and Shiller 1986, 1987b, and most recently the anomaly-confirming results of Joerding 1988, and West 1988); De Bondt and Thaler (1985, 1987) find that stocks which *first are losers* systematically tend to become winners, and vice versa (see Brown and Harlow 1988 for supporting evidence, Chan 1988 for a critical review). Thaler (1987b, 1987c) shows that seasonalities (January, weekend, holiday, Monday, and intraday effects) have systematic consequences for financial markets, results that are corroborated in part by evidence gained in experimental markets (Coursey and Dyl 1986, Forsythe et al. 1984).

Akerlof and Yellen (1985a, 1985b, 1987) explore the degree to which rational actors eliminate profits by speculation in nonperfect markets. They find that "near-rational actors" who are not *at* but only *in* the neighborhood of the profit-maximizing equilibrium experience small losses. The incentive to behave "fully rationally" and to thereby compete away all profits and eliminate individual-level anomalies is small, although the loss caused to society is much larger. Similar conclusions are reached by Haltiwanger and Waldmann (1985) and in a more competitive surrounding by Jones and Stock (1987).

To summarize, serious theoretical reasons as well as empirical observations have accumulated to support the belief that in economic markets as they exist in reality—and this includes financial markets and even wagering markets (Thaler and Ziemba 1988)—individual-level anomalies are not eliminated at the aggregate level. It follows that if elimination is claimed it must be proven for the specific market and time period in question. At best there may be a general tendency for individual-level anomalies to *weaken* in well-functioning markets. This conjecture is supported by market model experiments that suggest that "market models based on rational choice principles (including the subspecies of satisficing) do a pretty good job of capturing the essence of very complicated phenomena" (Plott 1987, 141). (It should, however, be noted that the definition of "rationality" used in this quotation does not conform to the von Neumann-Morgenstern axioms.)

Another piece of evidence supporting the notion that anomalies are weakened by well-functioning markets relates to Brookshire and Coursey's (1987) and Coursey and associates' (1987) findings that anomalies in the form of the endowment effect (Thaler 1980), the reluctance to trade (Kahneman and Tversky 1984), or the buying-selling discrepancy (Knetsch and Sinden 1984, Marshall et al. 1986, Cummings et al. 1986) decrease, but do not disappear, when an appropriately specified market for the elicitation of the value of a given public good exists (see also Knetsch and Sinden 1987).

### DEMOCRACY AND THE STATE

A fully competitive two-party democratic system with continuous elections and log-rolling to allow arbitrage leads under appropriate conditions to a Pareto-efficient outcome and eliminates anomalies at the aggregate level (see, for example, Hinich and Ordeshook 1971, and Riker and Ordeshook 1973). The forces of political competition thus lead to the same result as in the case of a fully efficient market. But this particular institutional setting is even more unlikely to obtain in reality.

Democracy has a crucial effect on the transfer process, apart from its efficiency property through political competition. Democracy can be considered to be that institutional setting that allows and encourages diversity of opinions: the same problem is looked at from many different angles or in light of many different *frames* (to use Kahneman and Tversky's [1984] term). The diversity of frames brought about by the democratic process helps to overcome one-sided views and some individual-level anomalies. In a constitutional system, such as the American one, the institution of checks and balances as well as freedom of opinion and the press further strengthen this tendency. The force of this elimination process becomes even more vivid if one looks at the opposite institutional setting. In an authoritarian system the political leadership *imposes* one particular frame, and people are forced to follow and use this frame when social questions are discussed. The constitution and the law in a democratic society are important institutions that weaken individual-level anomalies, a function that seems to have been overlooked in scientific discourse. Whether these institutions have spontaneously arisen or have been designed, they are a reaction to the individual's interest in reducing the cost produced by individual-level anomalies at the aggregate level. A legal provision to this effect is more likely to emerge if the cost of establishing and maintaining it is low compared to the cost of anomalies (see, in general,

North 1986, Coleman 1988, Ullmann-Margalit 1977, Schotter 1981). Four types of legal provisions designed to weaken individual anomalies may be distinguished:

- (1) Actors who may be particularly prone to anomalies may not make some types of decisions. For instance, children and the insane do not have voting rights and are not allowed to form contracts.
- (2) Aggregate inconsistencies can be eliminated by appropriate legal norms. Constitutions typically include formal procedures to solve such cases; often the judges of the highest court, who are independent of the democratic process, are given the authority to do so.
- (3) The law reduces the number of alternatives between which a particular individual has to choose, thereby (see Payne 1982, 386-87) facilitating decisions and reducing the occurrence of individual-level anomalies. (But there is a cost in terms of a more restricted possibility set.) There are a great many cases of such agenda restrictions. In many areas, contracts have to follow a rigidly set structure imposed by law. Insurance contracts, are an example. In the case of marriage contracts, only a very limited set of alternatives is available. Democratic systems also tend to restrict the number of types of basic education and to limit the entry of private schools. Another instance is money, where national alternatives are generally reduced to the type issued by the central bank. In these cases the reduction of alternatives between which an individual may decide may be interpreted as an effort to reduce individual-level anomalies. (Of course other, not necessarily competing, interpretations of these phenomena are possible.)
- (4) The law opens the possibility for individuals to retract their decision, thus supporting the possibility of learning through repetition. It is possible to revoke some contracts. For example, goods purchased at the door may be returned within a certain time period, or, in the case of an important life decision, divorce is allowed. There are also institutional provisions designed to directly support individuals in their decision, such as consumer education and information provided by the government. Thus the legal system helps to establish stable conditions with well-identified feedback mechanisms necessary for successful learning.

While there are legal institutions in democracies that serve to weaken the effects of individual-level anomalies, there is no reason to assume that they completely eliminate them. Indeed, in the current politicoeconomic process of a democracy rather than the constitutional or rules level (see Buchanan 1977, Frey 1983), strong forces tend to *strengthen* individual anomalies. A democratic government punishes successful individuals and firms by taxa-

tion and supports unsuccessful individuals and firms based on the solidarity principle or because they have stronger political arguments. If individuals and firms prone to anomalies or irrational behavior have a higher probability of being poor and showing losses, and the rational ones of being successful—which is, of course, related to the survival of the fittest in the market (Alchian 1950, Friedman 1953)—then this intervention by democratic governments blocks the anomaly-reducing process of the competitive market. The effects produced by anomalous actors are strengthened and those by rational actors weakened. As this redistribution process through taxation and subsidies is of considerable magnitude in modern societies, this strengthening of anomalies by the intervening effect of democratic institutions should not be disregarded. To summarize, in a democracy a broad set of institutions weakens anomalies in individuals' actions. On the other hand, current interventions by governments tend to strengthen already existing individual-level anomalies at the aggregate level. As a result, it may be concluded that a consideration of democratic institutions provides no reason to neglect individual-level paradoxes, but rather reasons to take them seriously into account.

### BARGAINING AND INTEREST GROUPS

Incentives to form stable interest groups to engage in bargaining processes are unequally distributed in a society. Producers (including the suppliers of labor) are represented by strong interest groups, while consumers and tax payers are only weakly active in the bargaining process, if at all (Olson 1965, Moe 1980). Anomalies among individual producers, also reflected in the corresponding interest group, are strengthened at the aggregate level by the intervening bargaining process. At the same time, rational behavior on the part of producers receives a higher weight at the aggregate level. In contrast, both types of behavior are scaled down at the aggregate level in the case of individual anomalies among consumers and tax payers. The net outcome at the aggregate level is open. There is no reason to believe that bargaining processes eliminate the anomalies existing at the individual level. More can be said about the endowment effect (Thaler 1980, Samuelson and Zeckhauser 1988). As long-established interests tend to be better organized than newer ones (Olson 1982), the endowment effect and its interpretation as a "status quo bias" is strengthened, giving this particular phenomenon greater aggregate weight.

## ADMINISTRATION AND BUREAUCRACY

This particular aggregation process works by formal rules that represent a special type of "rationality" (again, different from that based on the von Neumann-Morgenstern axioms). Administrative rationality functions with formal chains of command, but there is also considerable mutual interdependence between the various hierarchical levels due to informational requirements (Breton and Wintrobe 1982).

Administrative processes tend to impose one legalistic "frame" (in the sense of Kahneman and Tversky 1982) on all problems and thus achieve the opposite effect of democracy: Individual-level anomalies tend to be strengthened. This may be exemplified in the treatment of opportunity cost. Thaler (1980) found that individuals systematically undervalue opportunity cost compared to out-of-pocket cost. This tendency is strengthened by the administrative process. Both public and private bureaucracies are steered by budgets that only record monetary receipts and outlays. Opportunity costs do not normally appear in budgets and are therefore of little interest to bureaucrats, as long as they fall on people other than themselves. It may be observed that a valuable plot of land or a building on public property remains unused for long periods of time because the costs are not directly visible in the budget.

Administrative procedures are capable of eliminating *some* individual paradoxes because they are, at least in principle, based on the idea of formal consistency. But members of the public bureaucracy pursue goals of their own (Tullock 1965, Downs 1967, Niskanen 1971) and are well able to distort formal rules for that purpose. To reach their own goals they may be able actively to exploit some individual-level anomalies. A case in point is the endowment effect (Thaler 1980). Public administrators may find it advantageous to keep property in their hands even when it would be profitable to sell it. They then appeal to the bias of individuals, strengthened by means of propaganda, not to part with their possessions (even though they would never have bought them at the price they could reach). This applies to cultural property with which the administrators of public museums are unwilling to part and to cases in which the endowment effect is purposely used to support individuals (see Frey and Pommerehne 1987).

On the basis of these considerations it would be difficult to argue that the administrative process is an effective eliminator of individual-level anomalies. Rather, the opposite is true.

## CONCLUDING REMARKS

The relevance of paradoxes in individual behavior found by psychologists and economists depends on the social processes intervening between the individual and aggregate levels. These processes are guided and formed by decision-making institutions, of which the market is only one among several.

We can make the following conclusions with respect to specific decision-making systems:

- (1) The *market* eliminates individual-level anomalies under only very restricted conditions, unlikely to obtain in reality. Empirical evidence suggests that full elimination cannot even be trusted to occur in financial markets. Nevertheless, there is a tendency for the market to weaken individual-level anomalies at the aggregate level.
- (2) *Democracy* and *state* activity in the current politicoeconomic process strengthens individual anomalies through taxing rational and economically successful actors and through subsidizing irrational and unsuccessful actors. At the constitutional level, on the other hand, the legal system tends to weaken individual-level anomalies by excluding actors prone to irrationality, directly eliminating aggregate-level inconsistencies by reducing the number of alternatives in uncertain and difficult decision areas, and facilitating repetitive decisions. More important, democracy as a decision system encouraging a diversity of opinions constantly produces many "frames" for a particular problem, thereby helping to avoid individual anomalies. In a dictatorship only one frame is allowed and this more often leads to aggregate-level anomalies.
- (3) A *bargaining* system leads to countervailing predictions because of the *unequal intensity* with which interest groups are organized. Insofar as well-organized groups are particularly prone to fall prey to paradoxes, social bargaining strengthens aggregate-level anomalies.
- (4) An *administrative* social decision-making system tends to weaken aggregate-level anomalies because it is based on principles of formal consistency. However, one frame imposed by bureaucracies—the budget—strengthens anomalies at the individual level. Moreover, public bureaucrats have an incentive to exploit such anomalies for their own purposes, thus strengthening them in the aggregate.

Considering the four social decision-making systems as a whole, we observe that: (1) There are tendencies besides those inherent in competitive economic markets to weaken individual-level anomalies; those who look only at such markets for elimination processes are therefore too pessimistic.

(2) There are marked tendencies in various institutions to strengthen individual paradoxes at the aggregate level. It must be concluded that the findings of Kahneman, Tversky, and their associates *are* relevant for an economic science that does not restrict itself to the study of a model of fully competitive economic markets. It follows that using the *maximization of subjective expected utility* as an explanatory model may lead to misleading results at the aggregate level.

A solution to the difficulties posed by the traditional model of subjective expected utility maximization may be sought in two quite different directions:

- (1) An effort may be made to *reformulate the expected utility model* so as to embody the paradoxical effects found at the individual level. This approach has been undertaken by a number of scholars (see Loomes and Sugden 1982, 1987, Encarnacion 1987, Machina 1982, 1987). This attempt to come to grips with the anomalies faces two problems:
  - (i) Do the reformulations do justice to the anomalies found? Are they able to capture the essence of the particular kinds of irrationality found? The views of scholars engaged in this endeavor are in conflict on this point. It may be well to remember March's (1978, 597) caution that "by suitably manipulating . . . one can save classical theories of choice as 'explanations' of behaviour in a formal sense but probably only at the cost of stretching a good idea into a doubtful ideology." However, despite these dangers, the success of these reformulations cannot necessarily be negated.
  - (ii) The second problem in this approach is directly connected with the aggregation process discussed in this article. As has been argued (Table 1), institutions may eliminate, weaken, or strengthen and create anomalies appearing at the aggregate level. This means that even if the reformulation of the expected utility maximization model is able to incorporate individual-level anomalies, the task remains to determine in what way the institutions shaping the aggregation process deal with those anomalies. Finding a "satisfactory" individual-level formulation is thus only part of the task.
- (2) Another way of coping with the individual-level anomalies is to endeavor to find a formulation of the decision process of actors that is as immune as possible to these irrationalities. One way—following Stigler and Becker (1977)—is to push back the emphasis on individual preferences and to concentrate instead on the *constraints*, that is, on the individual's possibility set. The relevant constraints do not consist only of restraints imposed by income, price, and time, but also include subjective or cognitive constraints (Frey and Foppa 1986, Frey 1988). This approach may be useful in order to include the cognitive limitations emphasized by psychologists as well as by some economists. A careful analysis of various types of constraints may allow

the individual's possibility set to be narrowed down so much that it is of little importance which particular point in this set is chosen, as the consequences on the aggregate are minor. Further research should illuminate which of the two strategies for coping with individual-level anomalies is more fruitful.

This article proposes that individual decision-making theory should be closely integrated with the new institutional economics: with the analysis provided by the comparative theory of institutions (Alchian and Demsetz), public choice (Buchanan, Tullock, Downs, and Olson), transaction costs (Furubotn, Pejovich, Williamson, and North), and law economics (Posner and Hirsch). Our analysis suggests a new role for institutions that so far seems to have received little attention: institutions emerge as a result of the benefits and costs produced by individual-level anomalies and serve to weaken such anomalies at the aggregate level. However, under some identifiable conditions, existing institutions bring about the opposite effect of strengthening or creating new such anomalies at the aggregate level.

Future research should spell out in detail the ways in which social processes weaken or strengthen individual anomalies, how these processes are influenced by institutions, and what effects emerge at the aggregate level.

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