



Economic incentives transform psychological anomalies

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Abstract

People acting in an anomalous way can do better by reducing their anomalies, and clever people and firms can profit by exploiting anomalies. Due to these reactions, anomalies and their frequency are not exogenously given (as is assumed in the 'psychological' and the 'axiomatic' approaches) but are endogenous and influenced by social processes. The here proposed 'incentive' approach focuses on the conditions under which, on the one hand, anomalies can be created and strengthened, and on the other, anomalies can be avoided. Public policy measures which influence the amount of resources expended on anomalies are discussed.

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1. Approaches to analyzing anomalies

Over the last twenty years, various characteristics of human behavior have been identified which systematically deviate from the predictions of unbounded procedural rationality, and in particular from conventional neoclassical economics. These characteristics of human behavior are often called 'anomalies',¹ though viewed through non-neoclassical spectacles such kind of behavior may indeed be quite normal.

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¹ See e.g. Thaler's series of articles entitled 'Anomalies', collected in Thaler (1992).

The best-known instances are: endowment effect (goods in a person's possession are valued more highly than those not held in the endowment); reference point effect (people do not evaluate final states of wealth, but mainly deviations from a specific reference point, which is most often the status quo); opportunity cost effect (out of pocket monetary cost is given greater weight in the decision calculus than opportunity cost of the same size); certainty and small probability effects (high and low chance events in particular are treated in a peculiar way by individuals; they consider certainty to be completely different from a very high probability and lend too much weight to small probabilities); anchoring effect (social states are evaluated from a particular starting point, the choice of which influences behavioral outcomes); availability bias (recent, spectacular or personally experienced events are overweighted when individuals take decisions); over-confidence effect (people are convinced that they know observable facts better than is actually the case); framing effect (the way a decision problem is formulated and the way the information is presented affect individual decisions); preference reversal effect (individuals tend to choose high probability lotteries with low outcomes over low probability lotteries with high outcomes, but they are ready to pay more for the latter lotteries). It is generally unknown what factors cause such departures from standard neoclassical subjective expected utility maximization. A possible reason for the existence of anomalies is the cost of optimization, an explanation which has already led to a set of literature² explaining such seemingly non-optimizing modes of human behavior as experimenting, imitating, following authority and tradition, unmotivated search, and following habits or a hunch (see Day, 1992).

With respect to the questions posed, the procedures used, and the results reached, behavioral anomalies have been approached in two quite different ways, which may be called the 'psychological' and the 'axiomatic' approaches.

The 'psychological' approach poses the question: 'What are the cognitive limitations of human beings?' The goal is to determine the nature of man, and to show that cognitive limits (and therewith anomalies) exist in important respects. This approach has mainly been pursued by social psychologists,³ but also by economists.⁴ The research has primarily been undertaken in the form of laboratory experiments and without applying monetary rewards. It has produced overwhelming evidence that anomalies do

² Most importantly, Heiner (1983), Day (1984), Conlisk (1988), Pingle (1991), Day and Pingle (1991).

³ Collections of articles are Kahneman, Slovic and Tversky (1982), Arkes and Hammond (1986) and Hogarth (1990); surveys are provided by e.g. Hogarth (1987) and Dawes (1988).

⁴ A collection of articles is Hogarth and Reder (1987), and Thaler (1992), and surveys are Schoemaker (1982), Shapira (1986), Thaler (1987a), Frey and Eichenberger (1989a).

indeed exist at the level of individual behavior under a wide set of conditions.

The 'axiomatic' approach accepts, and builds upon, the results found in the 'psychological' approach, but from a quite different point of view. The question pursued here is, 'How must formal decision theory be adjusted in order to integrate anomalies into economic theory?' (see the excellent survey by Machina, 1987). The goal is to transform 'anomalies' into 'regularities' in the sense that the maximization of individuals' objective function yields the behavior observed. For that purpose, the von Neumann–Morgenstern axioms are changed mostly in the direction of generalizing subjective expected utility maximization.⁵ A case in point is Kahneman and Tversky's (1979) prospect theory; overviews of the many others are given by Machina (1987); Weber and Camerer (1987) or Fishburn (1989). This procedure allows the integration of the (former) anomalies within the body of theory (see Smith, 1989, p. 164), though it is difficult to take several of them into account simultaneously. Moreover, some anomalies, like framing and availability effects do not lend themselves in a satisfactory way to the axiomatic approach.

This paper suggests that in order to understand anomalies in the economic and social context, a third approach, neglected by both the psychological and the axiomatic approach, is worth considering. What can be called the 'incentive' approach raises the question, 'How do individuals react when anomalies exist?' The goal is to show that individuals try to cope with problems, and opportunities raised by anomalies. People are not taken to be logical machines, but rather beings who are subject to cognitive limitations. Knowing this, they are able to respond systematically or 'rationally' (though not perfectly) to their 'irrationalities'.⁶ The procedure is to look at two kinds of incentives induced by anomalies. First, when individuals are prone to anomalies, other actors have an incentive to exploit this 'irrationality'. Such activities are not without cost, and the potential 'exploiters' have to consider net (marginal) benefits. Second, individuals subject to anomalies suffer utility (or profit) losses and therefore benefit from avoiding them. To reduce anomalies also entails cost, and the extent of the reduction undertaken depends on the (marginal) net benefits of doing so.

It will be shown (1) that the extent of anomalies depends on identifiable determinants influencing the marginal benefits and cost of exploiting, and reducing anomalies, respectively. (2) Anomalies will not in general be eliminated, as the benefits of reducing or exploiting them cannot always be

⁵ There is an analogy (see Frey, 1990) to social choice theory, where an attempt is made to adjust Arrow's axioms in order to allow the consistent aggregation of individual preferences to a social welfare or decision function.

⁶ This idea is also behind the discussion of self-commitment, see e.g. Schelling (1984).

expected to sufficiently outweigh the cost. Thus, the ‘standard argument within economics’ (Arrow, 1982, p. 7) that a competitive (economic) environment will eliminate ‘irrationalities’ is ill-founded. (3) The anomalies observed in real life are in general different from those observed in a laboratory setting, because they are transformed in response to the incentives to exploit and to reduce them. While the influence of incentives on anomalies have sometimes been studied in a laboratory setting, the incentives were taken as given. One exception are so-called ‘market experiments’ where incentives are created by mimicking a price system. These works are of great importance in understanding the relevance of anomalies (see the recent survey by Smith and Walker, 1990). But they are restricted to one particular decision-making system, namely the market: they disregard other decision-making systems such as democracy or bureaucracy (see Frey and Eichenberger, 1989a, 1989b). Moreover, market experiments usually only study the incentives to reduce, but not to exploit, anomalies⁷ and consider only a limited set of anomalies in a laboratory setting.

By contrast, our approach starts from incentives and inquires what the determinants of the incentives are for both exploiting and reducing anomalies. Section 2 differentiates between various types of anomalies and discusses which type is observable under what circumstances. Section 3 identifies opportunities and incentives to exploit anomalies, concentrating on the real life evidence of how exploitation takes place. In section 4 the incentives for reducing anomalies are considered. The propositions regarding the determinants of the marginal benefits and cost discussed are supported by a wealth of empirical evidence in the economic, psychological and behavioral science literature. Section 5 deals with the options available to influence anomalous behavior, and section 6 offers concluding remarks.

2. When and where are anomalies observable?

It is useful to distinguish three aspects where anomalies can or cannot be empirically observed. The first refers to the *cognitive capacity of human beings*. If human beings were perfect in the sense of not committing any logical error, no anomalies (in the sense of violations of assumed consistency axioms) would be observed. However, overwhelming evidence collected within the ‘psychological’ approach most strongly suggests that individuals’ cognitive capacities are severely limited (see also Simon, 1957), which leads to anomalies. These experimentally found anomalies define the capacity for anomalies in an incentive-free setting.

The second aspect deals with the incentives to *exploit anomalies and to set*

⁷ Market experiments, where short-selling is possible, are an exception, see e.g. Weber (1990).

traps. Anomalies in the sense of limited human cognitive faculties are not costly to individuals as long as such ‘irrationalities’ are not taken advantage of by other actors. An obvious way of making profits (or of increasing one’s utility) is to set up a ‘money pump’ where, after a succession of exchanges of goods and money, the exploiter contrives to hold on to the goods he or she started with, and in addition gains a certain amount of money at the victim’s cost (see Smith, 1985; Machina, 1989). Normally, such exploitation of anomalous behavior is undertaken by firms, and the victims are individuals, but this needs not necessarily be the case. It may also happen that firms act in an anomalous way, and individuals exploit them.⁸

Firms not only have an incentive to exploit the given stock of anomalies but also an interest in expanding the existing capacity of anomalies (which allows them to raise exploitation). New anomalies can be detected by investing resources in appropriate research, and known anomalies can be combined in such a way that they are magnified. The endowment and availability effects, for instance, can be called upon simultaneously, so that the victims are made to commit even larger errors which can then be profitably exploited.

The third aspect considers the incentives to *reduce anomalies resulting in trap failures*. Individuals do not necessarily fall prey to anomalies. At a given point of time, the traps set up by the firms may be empty for two different reasons: Individuals and activities that are anomaly-prone have been eliminated by a Darwinian process. People who have repeatedly been victims of anomalies have suffered losses in their wealth and their weight in the economic process is thereby reduced or even fully eliminated by bankruptcy. Alternatively, individuals have expended resources not to fall into the anomaly traps comparing the marginal benefit of not behaving anomalously and the marginal cost of reducing the probability of falling prey to an anomaly.

Three basically different situations in which it could be argued that ‘no anomalies exist’ can be identified: (i) Human beings have no cognitive limitation, i.e. the set of psychological anomalies is empty, and there is no capacity for anomalies. (ii) Firms do not expend resources to set up traps, and no anomalies will be exploited even though psychological anomalies exist. (iii) No anomalies will be exploited even though the firms have set up a large number of traps because, due to elimination and strong incentives to avoid them, nobody any longer falls into them. Under perfectly competitive conditions and no transaction cost, the following outcome would obtain: everybody subject to an anomaly is immediately fully exploited, causing the anomaly to disappear.

⁸ For simplicity of exposition, the exploiters in the following will be identified with firms, the victims with individuals.

The importance of anomalies is not necessarily reflected by the number of anomalies exploited and therewith observable but rather by the resources expended to set up traps, enlarge the capacity for anomalies, and reduce anomalies, as well as by the rate of elimination of people and activities prone to anomalies. The empirical evidence available suggests that anomalies are not, in general, completely eliminated.⁹ Also on the basis of real life observations of anomalies,¹⁰ we are bound to conclude that neither reduction nor exploitation are complete and that significant anomalies remain.

3. Opportunities and incentives to exploit anomalies

This section discusses how firms go about using anomalies to increase profit. By revealed behavior, the anomalies exploited indicate opportunities where the expected return of employing resource to set traps is positive (larger than for competing purposes). For the purpose of illustration several prominent anomalies are discussed in turn.

Reference point and anchoring effects. An actor who, in a bargaining situation, is able to set an anchor to his or her advantage, gains at the cost of the adversary. Setting an anchor is, of course, a time-honored strategy in wage negotiations and on similar occasions. Surprisingly, it still seems to work even when all negotiators are aware of it. One reason is likely to be purely psychological: anchors influence decisions of negotiators, though they should not from the economic point of view (for experimental evidence, see e.g. Northcraft and Neale, 1987). Other reasons are economic ones: it is difficult to predict what move is a strategically set anchor and which an unavoidable one. The latter obtains if the other side can be convinced that the anchor set is beyond one's control, for instance, that one is tied by rules or laws, by command from superiors, or by circumstances (such as Schelling's, 1960 'back-to-the-wall argument').

Endowment and sunk cost effects. A widely-used strategy by firms is to induce people to acquire a product in order to establish an endowment effect: once people have a good in their endowment (without having full property rights) they are much more likely to buy it (they have a higher marginal willingness to pay) than if they have not owned the good. This

⁹ Not even under the most efficient market, the stock market; for the U.S. market see e.g. Shiller (1989) or Thaler (1987b, c) and for a variety of countries, e.g. Kim (1988) or Levis (1989).

¹⁰ See e.g. Arkes and Blumer (1985), Shefrin and Statman (1985) or Statman and Sepe (1986) for the sunk cost effect, or Lichtenstein, Fischhoff and Phillips (1982), Russo and Schoemaker (1989) for the overconfidence effect, Samuelson and Zeckhauser (1988) for the status quo effect, or Christensen (1989) for the psychophysics of prices.

strategy applies to a wide variety of goods, an example being that of a book club sending books at regular intervals to people which, after a certain period, either have to be returned or paid for. The same is often undertaken for journal or newspaper subscriptions. The anomaly-exploiting firms are careful to allow sufficient time before the purchase decision has to be made in order to allow the endowment effect to sink in (which would happen more seldom if people had to either buy or return the product immediately).

Firms also exploit the (related) sunk cost effect by defining a 'collection' of goods (e.g. stamps, coins or medals). The consumer tends to look at the first units bought as a kind of sunk cost inducing them to buy the whole series.¹¹ To a certain extent, the film industry relies on the sunk cost effect when making follow-up films. In order to follow through the investment made in the first film (time and price of ticket) – which, up until then had been seen as complete – the audience feels forced to go and see the sequel.

The endowment effect is also exploited by other organizations apart from profit-oriented firms to further their own goals. Non-profit museums that want to prevent a painting on loan leaving their institution, routinely resort to the endowment effect in order to convince the community to either prevent the sale by law or to raise the money to buy it. Under these circumstances, virtually any painting is defined as belonging to the 'patrimoine national' simply because it is in a museum's and community's possession. The same people who claim that parting with the painting would be a huge loss would not even consider buying the painting if it was located elsewhere; for the same sum they would generally prefer to buy another work of art (see Frey and Pommerehne, 1989). Such organizations rationally exploit the difference between the willingness to be compensated and the willingness to pay found in many laboratory and real-life experiments.¹²

Politicians are also skillful in exploiting the endowment effect. In order to win the 1983 election (which, up until then, had looked rather doubtful), Mrs Thatcher played on the Falklands being part of Britain's national endowment, and, (partly) as a result of the national feelings aroused, was triumphantly re-elected. Clearly, few Britons would dream of wanting to acquire this island, even without sacrifice.

Framing. Instead of announcing a price increase to consumers, a firm does better to announce a price decrease relative to what could have been the price rise. Here framing seems to establish a new reference point with the

¹¹ An alternative explanation may be that a complete series has a higher resale value than pieces sold individually. However, in many cases this is not the case.

¹² The ratio between the mean compensation demanded and the mean willingness to pay has been found to exceed 4 in Knetsch and Sinden (1984, 1987); other authors find even ratios of 6, 10, and up to 60. See Brookshire and Coursey (1987); Coursey, Hovis and Schulze (1987), and the survey by Harless (1989, p. 368).

result that even a moderate rise compared to what could have occurred is taken to be a gain by the consumers affected (a real-life example is provided in Russo and Schoemaker, 1989, p. 27). The question is, of course, whether the (potential) consumers can be made to accept the new reference point favorable to the firm.¹³ Consistent with the influence of reference points and frames, firms typically formulate labor contracts specifying a relatively low flat sum plus a per unit compensation and not a (financially equivalent, higher) flat sum minus a deduction for units below a given goal because the incentives for work seem to be more favorable to the firm when workers are ‘rewarded’ for working towards a goal, than when they are ‘punished’ for not meeting it (see Lazear, 1991; for experimental evidence see Neale and Northcraft, 1986).

In the political sphere, framing is one of the most important devices used by the government to win the support of the population. In authoritarian systems, an official frame is imposed and everybody is forced to employ the corresponding language and concepts. In communist countries, for example, individuals were made to look at economic problems in terms of Marxist ideology, and not, for example, in terms of efficiency. If alternative information and points of view are lacking, the government is able to exploit its citizens to a certain degree, as the frames chosen will be to the politicians’ benefit. A democratic system, on the other hand, can be defined as a system in which not only different frames are allowed to exist, but in which the incentives motivate the competing parties to present several different frames. In a democracy, in the absence of a coalition of parties against the voters, there is therefore little or no exploitation by framing.

Availability. In the economic sphere there are many occasions where firms take advantage of the consumers’ dependency on the recency or vividness of events. A large part of advertising relies on this bias. Availability is also particularly exploited when more expensive flight insurance is offered at airports to passengers who are already more than aware of the possibility of a plane crash (Eisner and Strotz, 1961). Stock market anomalies such as the ‘neglected firm effect’ (the more intensely a firm is analyzed by professional analysts, the lower is performance of its stock, see Arbel and Strebel, 1983) can be exploited too. Russo and Schoemaker (1989, p. 87) tell of a Californian capital management firm which outperformed the average stock market by buying (low-priced) stocks of firms not in the public’s attention and selling (high-priced) stocks of firms with public vividness.

Firms may also take advantage of the heuristics which people employ in

¹³ It helps when people find it ‘reasonable’ to attach a change in the reference point to another event. Thus, price increases are considered much fairer when they are related to the cost increases ‘causing’ them than when they are made to exploit an excess demand situation. See Kahneman, Knetsch and Thaler (1986).

order to reduce anomalies or to deal with difficult decision problems (Kahneman, Slovic and Tversky, 1982). Thus, the strategy of eliminating by aspect (Tversky, 1972) can be exploited via discount strategies (Thaler, 1980), pricing items slightly below supposed thresholds (e.g. pricing at \$6.99 instead of \$7.00; Nagle, 1987), or clever information display (Puto, 1987).

In politics, governments have always been eager to exploit taxpayers by relying on 'fiscal illusion' (e.g. Pommerehne and Schneider, 1978; or Oates, 1988). Indirect taxes included in prices are less available and are therefore felt less than when they are added to the posted price, and direct taxes are less visible when income is paid out net of taxes compared to taxes which have to be paid after having received the gross income. Differences between countries in this respect are crass. In many European nations with representative democracies, direct and indirect taxes are included in price or income, while in the more direct democracies of Switzerland and the United States the voters have forced their governments to tax more openly, thus reducing the governments' possibility of exploiting their availability bias.

Small probabilities. Lotteries exploit people's attraction to the high sum to be won, especially the jackpot. Individuals tend to compare the low ticket price to the possible huge gain, both expressed in dollars (scale compatibility; Tversky, Slovic and Kahneman, 1990). They disregard the small probability of winning induced by the larger number of tickets sold. Lotteries also attract customers by giving them the option of choosing a 'lucky' number, thus capitalizing on the illusion of control (Langer, 1975; Hogarth, 1987, p. 19).

4. Incentives to reduce anomalies

The reduction of anomalies achieved, or the trap failure rate is determined by four major factors.

4.1. Perception

Individuals falling prey to an anomaly are often aware that they act in a non-rational way and that they could improve their utility or profit by adjusting their behavior. Perception is the more likely, the less costly is a comparison with non-anomalous behavior. If everyone in one's environment falls prey to an anomaly, it is difficult or impossible to overcome it; some important anomalies, such as endowment or sunk cost effects, affect only the persons directly involved, while other persons are not affected. One force working against comparison is overoptimism or an 'ipsative' view of the

world (Frey, 1989), where individuals refuse to consider themselves as part of the total set to which they actually belong.¹⁴

Awareness of an anomaly also depends on the type of utility loss suffered. Out-of-pocket costs are well perceived, while monetary costs paid by check or credit card are less apparent. Individuals tend to be least aware of monetary cost when it takes the form of automatic bank charges or of opportunity cost (Thaler, 1980; Ausubel, 1991).

Formal education promotes perception. An abundance of experimental literature testifies that 'experts' (i.e. people especially educated to perform a given task) fall less prey to anomalies.¹⁵ Experiments with real-estate agents and professional buyers and sellers of consumption durables (Northcraft and Neale, 1987; Neale and Northcraft, 1986) showed, for example, that experts do better than non-experts (students) in the case of the anchoring effect, at least as long as general circumstances do not strongly change, but that the difference is not very large. In some cases (e.g. the sunk cost effect, see Arkes and Blumer, 1985) experts are as likely to fall prey to anomalies as other people.

Perception is also helped by experience. The more often individuals have been confronted with a situation, the closer their behavior corresponds to the rational choice model. This finding is supported by a large number of experiments which allow for learning through repetition. Examples are the narrowing down of the difference between the willingness to pay and the compensation demanded (Knetsch and Sinden, 1987; Brookshire and Coursey, 1987), or the reduced bias in probability estimates (Shanteau, 1989). Chu and Chu (1990) have experimentally shown that after a small number of arbitrage transactions (involving both incentive to act rationally and repetitions of the choice situation), all reversers converted to non-reversers after having experienced a money loss caused by the reversal. In a real-life setting, medical doctors committed less errors of diagnosis than inexperienced medical students (e.g. Schwartz and Griffin, 1986; Weinstein, 1986). Moreover, there is a stronger tendency to maximize objective expected utility when the subjects know that the game is repeated several times (Montgomery and Adelbratt, 1982; Keren, 1991).

¹⁴ A study of 1,088 managerial and professional employees found, for example, that 47 percent rated their own performance in the top 5 percent, 83 percent in the top 10 percent, and no-one rated his or her performance below the 75th percentile (Meyer, 1975, for further evidence). Similarly, a large majority of people believe that they are better-than-average drivers, and that their life expectancy is above average (Weinstein, 1980; Kirscht et al., 1966; Fischhoff et al., 1981; Akerlof and Dickens, 1982).

¹⁵ See e.g. Schoemaker (1982, p. 555), Machina (1987, p. 128). Slovic et al. (1977), who study bankers and stock market experts, and MacCrimmon and Larsson (1979), business executives and investment projects. The thrust of this research has, however, been to show that even experts act in an anomalous way, and that anomalies do not disappear.

However, in general, anomalies do not fully disappear with repetition. In experiments on preference reversals it was shown that the frequency of behaving in an inconsistent manner only falls from about 60 to 40 percent (Knez and Smith, 1987), and in another case is reduced by just half (MacDonald and Huth, 1989). Learning does not completely eliminate anomalies because there is considerable cost attached to learning in unstable environments (see Einhorn, 1980; Brehmer, 1980; or Hogarth et al. 1990; and from the point of view of economics Smith and Walker, 1990). In addition, under some conditions, anomalies such as the availability, the hindsight or the outcome bias may hinder the process of learning from experience.

4.2. Size of the utility gained by reducing anomalies

Some scholars claim that there is little evidence that anomalies are reduced when monetary rewards for acting rationally are introduced. Not surprisingly, this view tends to be held mainly by psychologists who concentrate on people's cognitive capacities (e.g. Tversky and Edwards 1966; Tversky and Kahneman, 1981, 1987), while some economists believe that only monetary incentives matter. There exists overwhelming evidence from laboratory studies that the incidence (frequency and size) of anomalous behavior is reduced when the utility losses thereby brought about increase. Smith and Walker (1990) discuss 17 studies, and provide new laboratory data, showing that individuals act more rationally when faced with increasing incentives to act consistently, for a variety of choice problems. Moreover, for almost any type of anomaly, the same effect has been found.¹⁶ Binswanger (1980, 1981) has raised the stakes by undertaking experiments in a poor country (India), where a given sum of money to be won is of higher value to the participants in the experiment. He found that the anomalies in question are smaller but are not completely eliminated. In real-life observations, Shefrin and Statman (1985) have shown that the sunk cost effect is smaller with increasing stakes involved.

The more important a decision is, the more utility is gained by reducing anomalies. Especially in financial markets there is likely to be a larger effect on one's wealth if one succumbs to an anomaly, for instance, if there is a sunk cost effect. Indeed, analyses of such markets show that while anomalies exist, they are of relatively small size (see Thaler, 1987b, 1987c). On the other

¹⁶ To cite just a few: preference reversals (Chu and Chu, 1990); Allais paradox (Conlisk, 1989); certainty effect (Shogren, 1990, p. 199); aversion to ambiguity (see the survey by Camerer and Kunreuther, 1989); disparity between willingness to pay and compensation demanded (Harless, 1989); base rate fallacy (Grether, 1980); overoptimism (Camerer, 1987); anchoring (Wright and Anderson, 1989); hindsight bias (Hell et al., 1988); temporal inconsistency (Loewenstein and Thaler, 1989); framing (Levin et al. (1988).

hand, when individuals fall prey to anomalies and experience only a small reduction in their utility, they do little about it. An example is the effect of framing on individual voting decisions (for experimental evidence see Quattrone and Tversky, 1988). As an individual's vote has only a minute effect on the collective outcome, the utility loss suffered by being influenced by the frame is negligible. Suppliers of goods and services (producers) experience lower profit when they act in an anomalous manner. This loss is relatively easy to observe, as it is formulated in monetary units. Survival in a competitive environment (market) is threatened if the losses in profit are sizeable and happen over an extended period of time (Alchian, 1950; Friedman, 1953). In consumption activities, on the other hand, falling prey to an anomaly means that utility is lower than it would otherwise be, but the respective individual's survival is unlikely to be threatened. The incentive to reduce consumption anomalies is therefore smaller than in the case for production anomalies.

Finally, the stronger the competition, the greater are the incentives to reduce anomalies. This has been clearly shown in a great number of market experiments, for instance on preference reversals (MacDonald and Huth, 1989; Knez and Smith, 1987), on the certainty effect (Shogren, 1990), as well as in other areas (Weber, 1990). In real-life financial markets participants who consistently fall prey to an anomaly lose financial weight and tend to disappear. Under competitive conditions there is therefore a stronger demand to reduce anomalies, e.g. by turning to experts, by seeking more information, or by using appropriate rules.

4.3. Cost of changing behavior

The marginal cost of acting differently in order to reduce anomalies is higher when complex tasks are involved. Under these circumstances, individuals tend to resort to rule-guided behavior (Heiner, 1983; Day, 1984, 1991). These routines under certain circumstances lead to anomalies such as the representativeness bias (on this point see Tversky and Kahneman, 1974). The same applies when behavior leading to anomalies is guided and sanctioned by tradition and norms.

4.4. Institutions and free-riding

Institutions are behavioral regularities which can be employed to reduce the frequency and size of anomalies (see Frey and Eichenberger, 1989b). Individual institutions exist with whose help anomalies can be reduced. An (already mentioned) important instance is self-commitment, which can be

organized by oneself and where no agreement with others is necessary. To establish collectively agreed institutions (e.g. a law or a constitutional provision) to reduce anomalies is more costly in anonymous situations compared with situations of face-to-face interaction (e.g. within a small family firm). In an anonymous situation the transaction cost of reaching an agreement is higher, partly owing to a stronger incentive to act strategically and to free ride.

5. Policy issues

Should the government intervene to reduce anomalies? From the welfare point of view, the issue is open: a reduction in the number of traps set (and the resources thereby expended) also reduces the incentives to avoid them (and thereby reduces the resources expended by the potential victims); however, such an efficiency-enhancing move also has distributional consequences, the potential victims gaining and the potential exploiters losing. The outcome will be determined by the political process in which the ability of the two groups to organize and to put pressure on the government is crucial.

To influence the extent of anomalies exploited, the exploiters' and the exploitees' incentives and possibilities can be changed. The options are discussed in turn, with real-life examples provided for the purpose of illustration.

5.1. *Influencing resistance to anomalies*

The marginal benefits of avoiding traps are determined by the factors discussed in the previous section. Taking the example of books and newspapers sent to consumers without having been requested, the perception of succumbing to the endowment effect may be raised by facilitating comparison. For this purpose, comparative advertising by competing suppliers (which would point out the higher price charged) or by consumer agencies, may be encouraged or mandated. Detection of the endowment effect may be facilitated by improving consumer education. The advantage of suppliers (who are experienced in setting up the traps) over consumers (who, in the case of some goods and services, are only rare buyers) might be reduced e.g. by requiring the consent of both adult members of a household by law for striking deals. The marginal cost to individuals of resisting an anomaly can, for instance, be lowered by facilitating self-commitment: if desired, one should have the right to have all unasked for goods and services automatically returned to the sender (at the sender's expense). In some cases, one should have the right to exclude oneself from being able to do

business.¹⁷ The cost of resisting anomalies may also be lowered by admitting class action against suppliers who infringe on laws while exploiting anomalies. A further possibility is to make the right to withdraw from contracts mandatory for consumers.

5.2. *Influencing the rate of elimination*

In today's welfare-oriented societies, both the existing law as well as government in pursuit of votes tend to work against the economic elimination of actors falling prey to anomalies. Actors, whether individuals or firms, who behave 'irrationally' are prevented from bankruptcy or even major losses, while 'rational' actors evading anomalies are 'punished' by being taxed. As a result, anomalous actions and actors increase in weight at the aggregate level (relative to no interaction), i.e. public interference raises the number of anomalies.

5.3. *Influencing exploitation*

The production function of setting traps, and therewith the return of using resources to exploit anomalies, can be affected in many different ways. In the example of books and journals used above, the marginal cost of trapping consumers by the endowment effect can be raised by restricting the frequency with which unsolicited goods may be sent, by barring these firms from using the public mail service or by forcing them to compensate consumers for the total transaction cost (including time) expended when returning the goods. The incentives of firms to exploit voters may also be reduced by taking the returns from exploitation.

To reduce the consequences of fiscal illusion, institutional provisions may be taken forbidding governments to increase indirect taxes, making automatic deductions from income, or including taxes in end prices. Without referring to anomalies, one of the main thrusts of 'constitutional economics' (Buchanan, 1977; Frey, 1983), is to decrease fiscal illusion by making sure that taxes of all kinds are equally visible to citizens. It has been empirically shown (Pommerehne and Schneider, 1978) that these measures reduce the tax burden imposed on citizens which may be interpreted as a decrease of 'exploitation' of the population by the governments. Facilitating the formation of new parties and the competition between established ones is an

¹⁷ In some casinos in Germany and in gambling halls in the Canton of Zurich, Switzerland, one can officially request that one be denied access to these places.

important institutional mechanism to prevent the domination of 'official' frames of defining political issues, thus increasing the cost of setting up traps.

5.4. Influencing competition

A monopolistic firm engaged in exploiting anomalies does not set enough traps to exploit all anomalies. This restrictive behavior is due to the fact that the firm is careful not to set so many traps that the potential victims are either eliminated or are induced to muster sufficient resources to avoid the anomaly traps.¹⁸ If, on the other hand, many firms strongly compete, the pool of potential victims becomes a public good which no firm has an incentive to preserve. Free-riding behavior leads to a rush for exploitation. With perfect competition all anomalies would be eliminated.¹⁹

Competition can be restricted by granting a license to only one supplier, by forming a government-supported cartel (an approach regularly used in the case of casinos and gambling halls), or by prohibiting activities which are most likely to lead to anomalies (banks may, for example, be prevented giving full checking facilities to minors).

6. Concluding remarks

Anomalies lead to incentives for the different actors to adjust their behavior. People acting in an anomalous way can do better by reducing their anomalies, and clever people can profit by exploiting the anomalies of others. Due to these reactions, anomalies and their frequency are not exogenously given, but are endogenous and influenced by social processes. The here proposed 'incentive' approach differs basically from the up until now prevalent 'psychological' and 'axiomatic' approaches. The new approach focuses on new questions, in particular under which conditions are the incentives and the possibilities large to exploit the anomalies of other people and when are anomaly-prone people able to protect themselves against their own paradoxical behavior?

Attention is directed towards the resources expended in handling/exploiting anomalies rather than on the anomalies per se. In the paper we have discussed different anomalies with examples from real life, and have shown that the conditions prevailing in the social environment (the institu-

¹⁸ The same restriction has been discussed for cartelized crime (Buchanan, 1973) and for the exploitation of natural resources, such as fish or oil fields (see e.g. Fisher and Peterson, 1977).

¹⁹ As has been pointed out, in real-life transaction costs prevent anomalies from disappearing completely even in markets nearest to the ideal of perfect competition (stock market).

tions) determine which kinds of anomalies are observable and what their consequences are. Much of the behavior in every day behavior of individuals and firms (and even of politicians) can be interpreted as attempts to exploit (set traps) or reduce (avoid traps) anomalies. The insights gained by our analysis is utilized to propose different measures so that fewer resources are expended on anomalies.

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