5.2. Risky Choice and the Construction of Preferences

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Imagine your doorbell rings. You open to find a young professional salesperson offering you a new type of electronic data loss insurance. You may wish to send him away immediately, but he talks so fast that you cannot help hearing the details of the deal. The contract will pay you a certain amount, if your electronic data storages are lost due to power blackouts or irregularities, due to fluid damages (water, coffee, soft drinks, etc.), or due to other unforeseen accidents or natural disasters. The insurance agent has a certified table listing the historic frequencies of all these events, i.e. you have reliable estimates of the event probabilities. The agent also quotes a price (or perhaps a number of prices for variants of the contract, insuring more or less of the data loss events). All you have to do now is to assess the value of your electronic data, match it up with your risk preferences, compare cost to benefit, relate the net benefit of the insurance contract to all other prospects that life offers, and you can immediately tell the friendly salesperson, whether the suggested insurance contract is a deal or is no deal. This should not be a big deal, right?

This paper is an attempt to answer the question above from three different perspectives: from the perspective of a classical economist, from the perspective of a decision behavior researcher, and from Reinhard Selten's perspective. As we move down that line, we find that the answer goes from a light-hearted response by the classical economist (something like: "Making that decision is a simple task and not a big deal at all.") to a contemplative and finger-waving reply by Reinhard Selten (something like: "How such decisions are made is a fundamental mystery of economic behavior!"). The reason for this disparity in responses lies in a subtle, but important detail of the way, we see our mission as economists. While classical economists – even those who resolutely refer to themselves as "behavioral economist" – are merely interested in the way choices are made *given* a complete and stable preference ordering, a behavioral decision researcher (usually a scholar in marketing or economic psychology) is also interested in the *construction of preferences* from the parameters of the decision environment (Cubitt, Starmer, and Sugden 2001). Reinhard Selten's scientific curiosity goes even one step further, not simply seeking the (statistically) best mapping from the decision environment parameters to the observed choice behavior, but trying to uncover the mental processes that govern decision making. Reinhard Selten believes that these *decision emergence* processes (Selten 1990 and 1991) are only partially non-routine choices that result from conscious deliberations. And even the deliberate choices, he believes, are not based on the optimization of an objective function, but on adaptation of aspirations to the perceived environment (Selten 1998a and 1998b).

After having discussed the intricate interplay between ideas of the “formula believers” (classical economists), the “psychological phenomenonists” (decision behavior researchers), and the “full-fledged constructionist” (Reinhard Selten), we will turn to some of methods that may be helpful tools for uncovering the mental processes that precede a risky choice decision. Our preliminary results seem to point in a direction that has hardly been explored in the past. We find decision-making to be highly heterogeneous. While some individuals seem to actually use simple optimization procedures, most others use simple non-optimization procedures, and some of the remaining engage in highly complicated non-optimal decision-making. We conclude that any empirically relevant model of risky-choice must allow for heterogeneity in decision procedures and not just in preferences.

What if you ask a classical economist?

If you ask a classical economist, whether the decision on buying the new insurance contract is a big deal, there is no doubt that the response will be negative. An insurance decision like the one above is a simple exercise in basic micro-economics (or decision science, if you prefer). In fact, the task is so simple that most economists would complicate it in several ways, before using it as an exercise in class or as a question in a mid-term exam. Since the students, who are trying to solve the exercise problem, cannot look into the decision-maker’s mind to observe his preferences, the economist provides them with a *preference function* that (so the economist claims) represents the decision-maker’s preferences in a beautifully simple way, fulfilling a number of consistency conditions.[1] Given the stable and consistent preferences that classical economists tend to postulate and given the simple rules of rational decision-making, solving this problem is in fact no big deal.

Note that the “modern” classical economists do not deny the evidence for decision behavior that does not conform to expected utility theory. They have accepted that – while being the

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[1] Typically preference functions represent preference orderings that are *complete*, *monotonic* (i.e. not contradicting stochastic dominance criteria), *transitive*. This is true for expected utility theory (von Neumann and Morgenstern 1949) and for most of the non-expected utility (or “generalized expected utility”) theories that provide a preference function (e.g. Machina 1982; Quiggin 1982; Tversky and Kahneman 1992). In expected utility theory preference orderings are also assumed to fulfill the *independence* axiom, which basically states that if one prospect is preferred to another, combining both with a third common prospect should lead to the same preference relation between the combined prospects as between the original prospects.

most beautifully rational theory – expected utility theory may have deficiencies in dealing with observed behavior. Admitting to these deficiencies has led to three general lines of defense, but to no retreat. The first line of defense (and probably the crudest) has been to deny the external validity of the experimental findings on the grounds that the decision-makers in the artificial situation were either not given a chance to "discover" their "real" underlying preferences (Plott 1996) or were not given enough training to understand the game (Binmore 1999). The obvious question to ask here is: How much "training" a decision-maker in reality has when choosing a new insurance contract as the one in our example above?

It seems straightforward to believe that experience with a decision situation will increase the stability of choices in that situation. However, in a recent line of research that they have dubbed "coherent arbitrariness," Ariely, Loewenstein, and Prelec (2003) show that repeated choices (and presumably the underlying preferences) do stabilize in a coherent manner, but they stabilize relative to an (almost) arbitrary first choice that can be easily influenced by random cues or by adding dominated (hence irrelevant) alternatives to the decision task (Ariely, Loewenstein, and Prelec 2006). These results make the case even worse for the discovery of preferences argument, because they indicate that with experience people may not be discovering their true underlying preferences, but simply learning to stick to an arbitrary first choice (Hoeffler, Ariely, and West 2006).

The second line of defense that is used by classical economists is based on a notion often referred to as *stochastic choice*. The idea is that individuals have well-defined preferences and do plan to maximize expected utility, but err when making decisions (Loomes and Sugden 1995 and 1998; Loomes, Moffatt, and Sugden 2002; Hey 2005). These models seem perfectly in line with the econometric tradition of economics, where "representative household" decisions are modeled stochastically to allow for idiosyncratic noise. In fact, if the goal is to measure the aggregate behavior (i.e. as in a macro-economic analysis) this approach may be a promising route to take. But, if the idea is to understand decision-making on a micro-level and to develop micro-founded economic models, this approach may be too imprecise, especially if the instable preference phenomena exhibit predictable biases in behavior (Tversky and Kahneman 1974; Selten 1998b; Ariely, Loewenstein, and Prelec 2006). Systematic and predictable biases in choice behavior cannot easily be explained using stochastic choice (or stochastic preference) models, because errors are usually thought to be non-systematic in their distribution, i.e. non-informative "white noise".

The third line of defense for "modern" classical economists is to integrate some of the findings of behavioral decision research into preference functions ("non-expected utility theory") has clearly been the most popular approach (Starmer 2000). In fact, non-expected utility was so fruitful as a new field of economic research that in 1988 the active researchers decided to establish a specialized field journal (*The Journal of Risk and Uncertainty*) that has been thriving ever since. As if to certify that the approach has "won over" the behavioral decision research, two of the staunchest adversaries of the classical economic approach, Amos Tversky and Daniel Kahneman, caved in and republished their highly successful behavioral model "Prospect Theory" (Kahneman and Tversky 1979) as pure generalization of expected utility theory in an early issue of the *Journal of Risk and Uncertainty* (Tversky and Kahneman 1992). The new version was deprived of the "editing phase," an originally central part of the model in which the decision-maker is believed to code, aggregate, or eliminate prospects (or consequences in prospects) in order to facilitate the task of choosing.

What if you ask a behavioral decision researcher?

If you ask a behavioral decision researcher (or a consumers' choice psychologist), whether the decision on buying the new insurance contract is a big deal, you will realize that the answer may be much more involved than the classical economist had indicated. Behavioral decision research (Payne, Bettman, and Johnson 1992) identifies two important issues in the decision situation above that the classical economist ignores. For one thing, every deliberation is costly in terms of cognitive effort. Hence, creating a complete preference ordering that includes all options, including those that are not in the immediate choice set, is much too costly for most individuals. If contemplating about the benefits of alternatives is costly, then it may "pay" to construct preferences on-the-fly, at least to some extent. Hence, when faced with a new type of insurance, an individual most probably will not have evaluated and ranked this new prospect within his preference ordering yet. Instead, the individual may start contemplating on the prospect ex-post, i.e. after the prospect has (involuntarily) entered his consciousness. Note, that this decision-maker is a different creature than the one the classical economist has in mind, because there is no pre-specified preference ordering that can be simply "looked up" without incurring an effort cost. This creature exerts cognitive effort to *construct* his preferences (Bettman, Luce, and Payne 1998).

The second line of reasoning is based on the observation that perception generally is imperfect and prone to misperception biases (Tversky and Kahneman 1974). Obviously, if stochastic events, statistical measures, and even own future satisfaction are systematically misperceived, then preferences are no longer invariant to the problem frame, but are constructed depending on when, where, and how the choice arises and the information about the decision is accumulated. Note that the "when, where, and how" mentioned here are akin to the "place" and "promotion" in marketing's 4 P's paradigm (the other 2 P's are "product" and "price", which may correspond to the outcome and risk attributes of the prospect). If preferences were completely invariant to the decision frame, many marketing activities would be futile.

While behavioral decision researchers clearly complicate things by introducing a growing set of framing issues (Griffin et al. 2005) and by more-or-less invalidating all three rationality provisions of classical economics,[2] they do believe that their predictions of the observed choices are actually enhanced using the more elaborate models (Bettman, Luce, and Payne 1998). This assessment, however, is challenged by classical economists on the account of the loss of parsimony (e.g. Hey 2005). The argument is based on an idea that is similar to the econometric trade-off between the increasing the number of exogenous parameters in a regression model (i.e. decreasing parsimony) and increasing the degree of variance in the data that is explained by the regression (i.e. increasing R^2). Obviously, in both cases the model complication and ex-post explanatory power are positively correlated, justifying some degree of scientific suspicion to increased model complication. It, however, remains unclear, why model parsimony in itself is of value, if the predictive power of models can be increased by increasing their complexity. Just imagine an astrophysicist or a meteorologist saying: "We know that our forecast for some phenomena would be enhanced with a more complicated model, but we prefer parsimony, because it keeps things simple."

What if you ask Reinhard Selten?

If you ask Reinhard Selten, whether the decision on buying the new insurance contract is a big deal, you may be surprised to find that he is even less inclined to believe in a simple, comprehensive catch-all rule than most behavioral decision researchers are. In a response to Kahneman's (1994) overview of "new challenges" to rationality (Kahneman 1994), Reinhard

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[2] McFadden (1999, p.75) sums up the classical economic model as follows: "The *standard model* in economics is that consumers behave *as if* information is processed to form perceptions and beliefs using strict Bayesian statistical principles (*perception-rationality*), preferences are primitive, consistent and immutable (*preference-rationality*), and the cognitive process is simply preference maximization, given market constraints (*process-rationality*)."

Selten points out that his “own view is more radically constructivist” than Kahneman’s (Selten 1994). This statement perhaps conveys the disappointment that Reinhard Selten felt with the work of Kahneman and Tversky, after they had published the revised version of Prospect Theory (Tversky and Kahneman 1992), in which the constructive model elements were purged and the probability weighting function was specified as in Quiggin (1982), in order to guarantee monotonicity and transitivity of predicted choice behavior. While these features made the model more viable for classical economists, in Reinhard Selten’s view, they also substantially reduced the behavioral validity of new Prospect Theory, reducing it to “just another” generalization of expected utility theory with all the same weaknesses.

In contrast, the original version of Prospect Theory (Kahneman and Tversky 1979) is well in line with Reinhard Selten’s (1990) and Herbert Simon (1957) picture of boundedly rational decision making.[3] The common element in the original Prospect Theory model and the work of the Reinhard Selten and Herbert Simon is that individuals facing a choice task first try to solve the problem using procedures that incur low cognitive cost and only move on to cognitively more costly procedures, if a simple solution cannot be found. This notion of stepwise increased cognitive effort has an intuitively “rational” appeal, because it avoids wasting cognitive effort on easy problems. But, note that these procedures are not rational, because instead of optimizing a net benefit function, categorical heuristics are employed.

Reinhard Selten’s earliest model of boundedly rational decision making appears in the “legendary” section 3 of his paper on the Chain-Store-Paradox (Selten 1978).[4] In that section, he introduces a three-level model of decision making. In later publications this model is sometimes referred to as *decision emergence* (Selten 1990). The three levels of the process consist of (1) the *level of routine*, (2) the *level of imagination*, and (3) the *level of reasoning*. Cognitive effort increases going from one level to the next. In the level of routine decisions are based on past experience with similar situations and “are made without any conscious effort.” (Selten 1978, p. 147) The level of imagination is creative in that the decision maker “imagines” the outcomes of several new scenarios, using the routine knowledge to make

[3] Herbert Simon’s work on boundely rational decision making was an important early influence for Reinhard Selten, who says that in the late 1905s he was “converted to Simon’s views.” (Selten 1993, p.117)

[4] The “legend” of section 3 is that the paper had be accepted for publication in *Econometrica* under the provision that some minor revisions are made and that the paper’s section 3 is removed. Instead of revising and resubmitting the paper, however, Reinhard Selten withdrew the paper from *Econometrica* and submitted it to *Theory & Decision* insisting that it is either rejected or taken as it is. The paper was published in *Theory & Decision* without major revisions and turned out to be one of the most frequently cited papers in game theory.

guesses. On the level of reasoning, the decision maker consciously uses all current and past information and draws conclusions using logical reasoning.

For any given decision situation the decision maker first uses a routine level decision process to decide on how to decide, i.e. to decide which level of reasoning to employ. This *predecision* is the most critical element of the model, because it is this meta-decision that specifies the degree of rationality and the level of cognitive cost that is incurred for each decision. It is crucial that the predecision in this model is set on the level of routine decisions. There is no doubt that this assumption is to some extent *ad hoc*, but it does help to avoid the problem of introducing higher degree complexities and cognitive cost that rational models specifying decision complexity and cost often encounter (e.g. Kalai and Stanford 1988, Wilcox 1993).

If the predecision has selected a higher level of decision making, the *final decision* requires a meta-decision to select from the suggested choices on the different levels. The crucial element here is that the model does not assume that the solution offered by the highest level is generally followed. Hence, decision makers may actually know the rational (or optimal) decision, but still decide to follow the suggestion of a lower level. The possibility that rational reasoning may be overruled by a lower level decision is essential to Reinhard Selten's view of boundedly rational decision making, not only because there is abundant experimental evidence that subjects systematically deviate from rational choice, even after being trained explicitly (Grether and Plott 1979), but also because of the introspective assessment of the conflict between rational and intuitive choice in the Chain-Store-Paradox that he describes in the introduction of the paper (Selten 1978).

Both the predecision and the final decision are made on the routine level, i.e. intuitively without a conscious deliberation. To be successful these decisions must be based on past experience and adapted through a learning process. The idea that routine decision behavior is adapted to an ex-post assessment of short-run success and failure later enters into the widely cited learning direction theory (Selten, Abbink, and Cox 2005) and the related impulse balance theory (Ockenfels and Selten 2005).

Summarizing, we find that Reinhard Selten's view on how risky choice decisions are made fundamentally differs from the formula optimization (be it expected utility, generalized expected utility, stochastic expected utility, or any other value function) approach of the classical economists. It also differs in many ways from the diverse and dispersed behavioral decision research models that describe the construction of preferences based on numerous (partially unrelated) parameters of the decision environment. Instead, Reinhard Selten suggests taking all elements of human decision making (including routine decisions, emotional and intuitive decisions, and rational decisions) together and creating a joint framework, in which individuals learn to use different decision types in different situations. Learning will certainly be guided by the cost of cognition and the payoff obtained through the decisions. However, the learning procedure is not an optimization process, but an adaptive and satisficing process as suggested by Herbert Simon (1957).

Using the strategy method to uncover decision processes

One of the first methods that Reinhard Selten devised to gain a better understanding of decision behavior is the *strategy method* (Selten 1967). The strategy method – as Reinhard Selten defined it – is a rather complicated procedure including an initial *spontaneous play* phase, a *strategy elicitation* phase, and at least one round of *strategy evaluation and enhancement*. The only group of researchers, who have used the entire complicated procedure in all details, are Reinhard Selten and his students (e.g. Selten 1967; Selten, Mitzkewitz, Uhlich 1997; Selten, Abbink, Buchta, Sadrieh 2003; Keser and Gardner 1999; Rockenbach and Wolff 2009).

Most experimental economists, however, do not relate the term "strategy method" to the elaborate procedure Reinhard Selten has in mind, but only to the strategy elicitation phase.[5] Hundreds of studies now exist that make use of the strategy elicitation phase of the strategy method.[6] Furthermore, there is some research on tournaments amongst software agents (human strategies) that combine the strategy elicitation and the strategy evaluation and enhancement phase.[7] In any of these formats, the strategy method has the advantage of revealing the subjects' entire strategy and, thus, giving the researcher an insight into the counterfactuals of the game. There has been some debate on whether eliciting complete strategies, forces subjects to think differently – or more thoroughly – about the problem (Brands and Charness 2009). The argument, however, seems peculiar, because hindering

[5] While the distorted usage of the term used to infuriate Reinhard Selten early on, he has now accepted it as the result of an evolutionary process (personal communication).

[6] See Brandts and Charness (2009) for a survey comparing the strategy elicitation method to spontaneous play.

[7] Amongst these the most notable are the *strategy tournaments* that ask subjects (often self-selected subjects) to send in a full strategy that can be run in a tournament against others. See e.g. Axelrod (1984), Friedman and Rust (1993), and Erev, Ert, and Roth (2010).

subjects to think about the game more deeply is almost like giving them instructions that are too complicated or misleading. Hence, if it is true that the strategy elicitation makes subjects think about the situation more thoroughly, then all economic experiments should use strategy elicitation.

While the strategy elicitation reveals a subject's complete strategy, it does not reveal the reasoning that led to the chosen strategy. However, to be able to create a behavioral model of (perhaps non-optimizing) decision-making, it would be helpful to gain insight into the mental deliberations of a decision-maker. To do so, psychologists sometimes use think-aloud studies. In these studies, the decision-maker is asked to communicate his deliberations out loud, so that a monitor can record the on-going thought process. The procedure obviously has the disadvantage that the subjects cannot be incentivized to reveal their thought process completely or truthfully. Early in his experimental research (Sauerman and Selten 1959), Reinhard Selten realized that the incentive problem may be solved, if not one subject decides, but a team. Since each team member has an incentive to convince the others of his most favored strategy, Reinhard Selten asserted that the protocol of the team discussion should contain most (if not all) relevant arguments. The team protocol method was later improved by videotaping the team discussion, instead of letting one of the subjects write a protocol of the team discussion. This then resulted in the video-taped team decision method (often abbreviated as "video experiment") that is the topic of one of the chapters of this book.

In mid 1990s, the team at the laboratory of experimental economics of the University of Bonn was heavily involved in video experimentation. The method proved to be very informative in bargaining (e.g. Hennig-Schmidt 1999) and in trust settings (Jacobsen and Sadrieh 1996). In lottery choice tasks, however, we encountered an unexpected problem with the method. In many cases, no significant discussion came up in the team. If, for example, the team was to choose between the lottery A and the lottery B, we frequently observed a discussion of the following type:

> Team member 1: "Let's take A."
>
> Team member 2: "Good choice."
>
> Team member 3: "OK."

Obviously, there is little to learn about the thought processes in such a discussion. It seems that the limited number of alternatives (just two) often leads to an immediate and implicit agreement with no need for further discussions. But, increasing the number of choice alternatives is not an option in these experiments, because the behavioral regularities that we want to learn more about are generally parameterized in simple lottery choices of the type described. To overcome the problems with the standard think-aloud studies and video-taped team decisions, we devised a new experimental design.

Introducing the verbal strategy elicitation method

In Sadrieh, Hassels, Ridder (2010), we introduce the *verbal strategy elicitation method,* a new incentive compatible method to uncover the heuristics that subjects use to make their risky choices. To be able to uncover more than just a simple choice for a specific task (i.e. more than just "In this pair, I choose A."), the verbal strategy elicitation uses a "veil of uncertainty" trick. The subjects know what "type" of lotteries will be coming up in the next lottery choice task, but they do not know exactly which payoffs and probabilities are assigned to the outcome states of the two lotteries A and B. Each lottery has two possible prizes, a_1 and a_2 for lottery A and b_1 and b_2 for lottery B. Each prize is drawn randomly from a uniform distribution of values, where each distribution has a potentially different support. The high prize a_1 of lottery A is drawn from [600, 650, 700, 750], while the low prize a_2 is draw from [0, 50, 100, 150]. Both of the prizes of lottery B, b_1 and b_2, are drawn from the interval [200, 250, 300, 350, 400, 450, 500, 550]. Hence, it is always the case that the lottery A is the lottery with the "extreme" outcomes, i.e. it has one prize that is greater than and one prize that is smaller than the prizes in lottery B.

Not only the lottery outcomes are randomly drawn, but also the probabilities of winning, where p denotes the probability of winning the high prize in lottery A and q denotes the probability of winning the high prize in B. Hence, the two lotteries are specified as follows: lottery A = $[(a_1, p),(a_2, 1 - p)]$ and lottery B = $[(b_1, q),(b_2, 1 - q)]$. Both p and q are randomly drawn from the interval [0.1, 0.2, …, 0.9] with equal probabilities.

After making 20 spontaneous decisions on randomly generated tasks, subjects are asked to report the decision rules that they intend to use in the next five choice tasks. The experimenter records the verbally reported decision rules and double checks with the subject that the rules are correctly understood. There is no limit to the number and the complexity of the rules, as long as the subject can precisely demonstrate that each rule can be executed in no more than a minute and using a simple pocket calculator at most. After the rules are fixed, the experimenter goes through a set of five decision tasks together with the subject, making choices according to the reported decision rules.[8] The subject monitors this process.[9] The subject is then given the opportunity to revise the rules. Once the revised rules are set, they are applied to the next five choice tasks. The process of rule revision and application is repeated three times, before the subjects are asked to report their final decision rules that are applied to the final set of 20 choice tasks. Subjects receive financial rewards based on the decisions made by their decision rules. Hence, unlike other self-reporting procedures, the verbal strategy elicitation method entails salient incentives for the truthful revelation of subjects' decision heuristics.

Our experiment includes two treatments. In the treatment *Stats*, the subjects are provided with the expected value (EV) and the mean absolute deviation from the expected value (MAD) of every lottery under consideration.[10] In the treatment *NoStats*, statistical measures are not provided. Obviously, any type of optimization-based choice theory (including expected utility theory, cumulative prospect theory, and all other non-expected utility theories that ignore framing) predicts no difference between the decision rules that subjects report in the two treatments, since the set of lotteries to be chosen from and the information set are identical across the two treatments. Adding the measures simply provides a predefined aggregation of information that was already available. An earlier study, however, shows that providing the measures may significantly affect lottery choice behavior (Selten, Sadrieh, and Abbink 1999). Given that evidence, we conjectured that most of the subjects in the *Stats* treatment will not simply ignore the statistical measures, just as most of the subjects in the *Nostats* treatment will not readily specify rules that contain the measures.

The main results of our verbal strategy elicitation experiment are summarized in table 5.2.1. About two-thirds of all subjects use production systems instead of optimization procedures in their final decision rules. A production system consists of a series of conditional clauses (e.g. "If $a_1 > 650$ and $p > 0.3$, then choose A.") Moreover, most of these production systems begin with a clause conditioned on the highest possible prize a_1. The only statistical measure that is used by subjects in the *NoStats* treatment is the EV, while subjects in the *Stats* treatment also

[8] If the decision rules do not specify a unique choice, the task is skipped and the subject receives no payment for the specific choice task. Note, however, that subjects are allowed to include a random draw rule (e.g. "flip a coin") to make a decision when indifferent.

[9] Many subjects take notes that are later used to update their set of decision rules.

[10] We use MAD instead of SD or VAR, because MAD is much simpler to explain than the other measures of dispersion. It is also easier to calculate MAD without a calculator, because there are no exponents involved.

included the MAD in their final decision rules. Quite a number of subjects, who use EV and/or MAD in their final decision rules, include these measures in a complex production system. A few subjects use unusual functions to combine the measures. Finally, we observe an enormous amount of heterogeneity in the final decision rules both amongst the production systems and amongst those that use a numerical decision function. The only decision function that we observe more than once is the EV maximization rule. Amongst the observed production systems, basically no two systems are identical.

Table 5.2.1 – Frequency of final decision rules

treatment	production system	not production system	use EV(A)	use EV(B)	use MAD(A)	use MAD(B)
NoStats	19 (76%)	6 (24%)	7 (28%)	7 (28%)	0 (0%)	0 (0%)
Stats	12 (55%)	10 (45%)	11 (50%)	11 (50%)	9 (40%)	8 (36%)

Conclusions

While we are still far away from fully understanding choice processes and the emergence of preferences, some of the ideas that Reinhard Selten has promoted and – perhaps even more so – some of the research methods that he has introduced have gradually proliferated. Especially in consumer research, the notion that preferences are constructed and not merely discovered is a widely spread paradigm that is mainly based on the observation that many decision are not framing invariant.[11] But, significant attempts to compile the boundedly rational phenomena into a model of non-optimizing decision-making have not been made in consumer research either. It seems that Selten's aspiration adaptation model (Selten 1998a), which is inspired by Simon's approach (Simon 1957), remains unrivaled as a non-optimizing model of decision-making. The model, however, must first be supplemented to provide a satisfactory representation of the emergence or the construction of preferences.

To achieve progress in this area, we have suggested a novel experimental method, the *verbal strategy elicitation method* (Sadrieh, Hassels, Ridder 2010). The method provides information on the process of decision-making and, thus, allows us to enhance the procedural models of risky choice. The new method certainly will need some time before finding a general

[11] See e.g. Ariely, Loewenstein, and Prelec (2006) and the references therein. Amir and Levav (2008) study the stability of preferences that have been constructed in different framing tasks.

acceptance in academics. But, it seems worthwhile to go down that dusty road. Paraphrasing one of Reinhard Selten's favorite lines: You cannot discover new plants without going out to hike. You cannot discover new chemicals without experimenting in the lab. Why should you expect to discover anything about human behavior, while sitting comfortably and reasoning in your armchair?

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