Reasoning in Economics and Psychology: Why Social Context Matters

by

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1. Introduction

Both psychology and economics have been shaped by two competing programs. One program has postulated the existence of norms of optimal reasoning, and that humans actually conform to these norms. In both disciplines this program has been challenged by a competing one that, while maintaining the same traditional norms of sound reasoning, has argued that human beings fail miserably at both.

We first discuss traditional programs of thinking about reasoning in psychology, and their problems. Next we identify a set of parallel programs and problems in economics. In the fourth section we present new models of thinking about reasoning in psychology. In the last section, we discuss the implications of these new models for experimental economics.

2. Traditional Models of Reasoning in Psychology

Two Programs. Research on human reasoning, judgement, and decision-making has been shaped by two major programs. The first assumed that the laws of logic and probability theory represent the laws of rational reasoning, and that humans actually follow these laws. GIGERENZER et al. [1989] document that variants of this view, which traces its origin to the Enlightenment, can be found from Jean Piaget's formal operations to Bayesian models of reasoning. While the first program thus emphasizes human rationality, the second program – now known as heuristics-and-biases program – emphasizes human irrationality. Like the Enlightenment program, it assumes that rational judgement and behavior can be reduced to the laws of logic and probability, but proponents of the heuristics-and-biases program, such as KAHNEMAN and TVERSKY [1996], claim that human cognition systematically deviates from these norms.

Two Problems. The problem with these two programs is that (a) rationality is reduced to mere syntactical relations, to the exclusion of the semantic, pragmatic, ecological, and social;[1] and (b) for any real-world situation of some complexity, the human mind is assumed to be a supercomputer like a Laplacean demon, with almost unlimited knowledge, time, and computational capacity.

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An Outstanding Example: Wason Selection Task. WASON [1966], [1968] designed what has become "the most intensively researched single problem in the history of the psychology of reasoning" (EVANS, NEWSTEAD and BYRNE [1993, 99]). The Wason selection task arguably raised more doubts about human reasoning than any other toy problem with which many psychologists play. In the Wason selection task, an experimenter presents subjects with a conditional statement of the following form: *If p, then q.* One such conditional statement is the following letters-and-numbers rule: *If there is an "A" on one side (p), then there is a "2" on the other side (q).* Subjects are shown four cards, each with a number on one side and a letter on the other. The cards are face down, and the top sides show "A," "K," "2," and "7." Subjects are then asked to select those cards, and only those, that allow them to determine whether the rule is violated. (See figure 1.)

Figure 1

Letters-and-numbers rule:

If there is an "A" on one side (p), then there is a "2" on the other side (q).

Each of the following cards has a letter on one side and a number on the other. Indicate only the card(s) you definitely need to turn over to see if the rule has been violated.

The Wason selection task has been interpreted as a laboratory test of Popper's falsificationist strategy of testing hypotheses. This strategy suggests that in order to evaluate the conditional statement (*If p, then q.*) one ought to look

[1] "Pragmatic" relates the semantic (i.e. the meaning of a proposition) to the goals of an individual, "ecological" describes decision-theoretic situations (games against nature), and "social" describes game-theoretic situations (games against other players).

for cards with p on one side and *not-q* on the other.[2] For the letters-and-numbers example of figure 1, subjects should choose to turn over the A-card and the 7-card.

Experimental Tests of the Wason Selection Task. Wason found that only about 10% of the subjects made this selection in his toy problem. This result lead to an avalanche of studies that confirmed Wason's result under numerous slight changes in the protocol. Specifically, it was found that most people select the p-card and the q-card, or only the p-card. MANKTELOW and EVANS [1979], POLLARD [1982], COSMIDES [1989], and GIGERENZER and HUG [1992] soon found, however, that the selections were highly dependent on the content of the conditional statement. These results – a low overall proportion of p & *not-q* answers and the content effect – contradicted the model of human reasoning provided by propositional logic. While propositional logic was subsequently abandoned as a *descriptive* model, many researchers retained it as the *normative* model of reasoning. Human reasoning was blamed as irrational.

3. Traditional Models of Reasoning in Economics

Two Programs. Research on human rationality in economics has likewise been shaped by two major programs. The first program is the neo-classical paradigm. Following SMITH [1776/1937, 26f.], it builds on the assumption that people are self-interested. As illustrated by BARRO [1990] and KREPS [1990], its modern expression is the eductive (deductive) approach to non-cooperative game theory of which the neo-classical paradigm has become a special case. The eductive approach to game theory is based on strong rationality and knowledge assumptions. The second program emphasizes human irrationality by identifying ever new anomalies, or systematic deviations from predictions of standard game-theoretic models. Like the eductive approach to game theory, it assumes that rational decision-making and behavior can be reduced to norms of reasoning such as avoidance of dominated strategies, use of backward induction, etc., but claims that human decision-making and behavior deviates from these norms. As illustrated by CAMERER [1997] and RABIN [1996], this program – now becoming known as behavioral economics – draws heavily on the heuristics-and-biases program.

Two Problems. The problem with these two programs is that they, like their counterparts in psychology, ignore the semantic, pragmatic, ecological, and

[2] Obviously, this is true only for the deterministic case. The argument does not apply for the probabilistic case, and hence situations of risk and uncertainty. OAKSFORD and CHATER [1994], [1996] take the probabilistic case as point of departure and argue the selection task ought to be understood as decision-making rather than a deductive reasoning task.

social – this being most dramatically illustrated by the abstract settings which experimental economists use as testbeds. Furthermore, for any real-world situation of some complexity, the normative models assume that the human mind is a supercomputer like a Laplacean demon, with almost unlimited knowledge, time, and computational capacity.

An Outstanding Example: Principal-Agent Games. Principal-agent games are arguably the most important class of toy problems in economics. As illustrated in KLEIN and LEFFLER [1981], ORTMANN [1996], [1997], and TIROLE [1988], [1994], principal-agent games derive their importance from their role as building blocks in the analysis of markets involving adjustable quality, the internal organization of for-profit and non-profit firms, and so on.

Assume that you are about to start working for a small company, and are told that the company has the following day-off rule: *If an employee works on the weekend, then that person gets a day off during the week.* You understand that the employer faces a moral hazard problem: Why give you a day off during the week if you have worked on the weekend? You also understand that the answer to the problem depends on whether the situation is a repeated game, and how well information travels within the company. A typical parameterization of the normal form of this principal-agent game is shown in figure 2.[3]

Figure 2

		Prospective employee: Trust	Prospective employee: Don't
Employer	Adhere to rule	1, 1	0, 0
	Don't	2, −1	0, 0

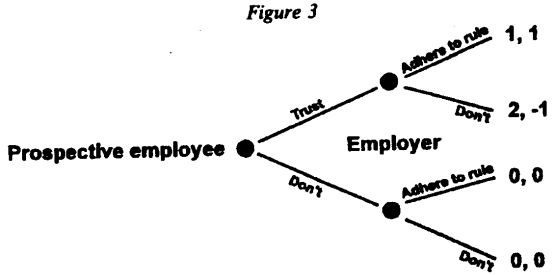
Will you trust what you have been told about the day-off rule? If this game were a one-shot game, then the game-theoretic prediction (and implicit norm of reasoning) would be for you to reason through the employer's incentives and, upon realizing that the employer has a (weakly) dominant strategy, not to trust him or her.[4] A prospective employee is thus assumed to "solve" this game by putting himself in the employer's shoes, meaning that he is assumed to

[3] Each pair of numbers represents the payoffs of the employer and the prospective employee. The first number denotes the payoff of the employer, the second denotes the payoff of the prospective employee. For a more detailled justification of the payoffs chosen here see ORTMANN and COLANDER [1997].

[4] In other words, (weak) dominance and common knowledge induce a Nash equilibrium.

compare the employer's payoffs under the different scenarios, to anticipate the likely choices of the employer, and then to make the decision whether the employer can be trusted or not. The resulting outcome (Don't, Don't) would be socially suboptimal. The mode of reasoning employed by the prospective employee – analyzing the smallest subgames at the end of the decision tree first, and thus "folding" the tree back to the initial node – represents the essence of backward induction and can be illustrated in one of the extensive forms associated with the normal form (see figure 3).

Figure 3



Do People Backward Induct?[5] *Experimental Evidence.* The evidence is rather mixed. The experimental result of the guessing game discussed in NAGEL [1995] and STAHL [1996], [1997], or the alternating offer games discussed in CAMERER et al. [1993] and JOHNSON et al. [1996], confirm the earlier assessment that "despite the theoretical elegance of backward-induction rationality, it often fails to predict the behavior of subjects." (DAVIS and HOLT [1993, 109]). However, JOHNSON et al. [1996] have shown that people can be taught to apply backward induction and find the equilibrium for the alternating offer game studied in CAMERER et al. [1993].

4. New Models of Reasoning in Psychology[6]

The Role of Content and Context in Reasoning. In the wake of Wason's result, CHENG and HOLYOAK [1985], COSMIDES [1989], COSMIDES and TOOBY [1992], and GIGERENZER and HUG [1992] introduced the content of the *p*'s and *q*'s into

[5] An answer to this question is complicated by severe theoretical problems involving the status of common knowledge. BINMORE and SAMUELSON [1996] provide an excellent discussion of the problems. Roughly, the issue is to rationalize backward induction when one knows that another player has not acted "rationally" previously or when one has reason to believe that the player one is matched with may not act "rationally."

[6] This section draws heavily on GIGERENZER [1996b].

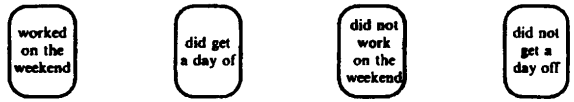
their theories and put the traditional letters-and-numbers selection tasks into thematic garb. Subjects would now be tested on thematic rules such as the following day-off rule: *If an employee works on the weekend, then that person gets a day off during the week.* (See figure 4.)

Figure 4

Day-off rule:

If an employee works on the weekend, then that person gets a day off during the week.

The cards below have information about four employees. Each card represents one person. One side of the card tells whether the person worked on the weekend, and the other side tells whether the person got a day off during the week. Indicate only the card(s) you definitely need to turn over to see if the rule has been violated.



It turned out that the number of "logical" answers increased dramatically. GIGERENZER and HUG [1992], for example, report that typically 70–90% of subjects chose the *p*- and *not-q*-cards in the day-off problem. Some interpreted this and similar results as meaning that social contracts such as the day-off rule somehow improve logical reasoning. This was not GIGERENZER and HUG's [1992] interpretation. Drawing on COSMIDES [1989], they connected information search with pragmatic goals such as cheater detection, with cost-benefit analyses, and the broader evolutionary theory of reciprocal altruism. Cosmides' central point is that humans are one of the very few species that practice cooperation between unrelated conspecifics ("reciprocal altruism"), and that selective cooperation demands the ability to detect cheaters. Selective cooperation would not work without a cognitive program for detecting cheaters – or, more precisely, a program for directing an organism's attention to information that could reveal that it (or its group) is being cheated: Whether this happens automatically through some module specifically designed for social contracts, or as the domain-general reasoning process modeled by game theory, is at the heart of the debate over the domain specificity of reasoning.

Specifically, Cosmides' and Gigerenzer's thesis is that a "cheating detection mechanism" (which alternatively may be interpreted as a convenient descriptor for a, possibly quick-and-dirty, game-theoretic analysis) guides reasoning in the

following type of selection task: *If the conditional statement is coded as a social contract, and the subject is cued into the perspective of one party in the contract, then attention is directed to information that can reveal being cheated.*

Being cheated in a social contract means that someone takes the benefit, but does not pay the cost.[7] In other words, a subject should select those cards that correspond to "benefit taken" and "cost not paid," whatever the cards' logical status is. For the day-off rule (figure 4), the employer takes the benefit of the employee working on the weekend, without paying the cost of giving the employee the promised day off.

Experimental Results. COSMIDES' [1989] experimental results as well as earlier studies corroborated her thesis. If the conditional statement expressed a social contract, then the percentage of "benefit taken" *and* "cost not paid" selections was very high (see also GIGERENZER and HUG [1992]).

These results, however, are consistent with competing accounts that do not relate to cheating detection. For example, it had been suggested that social contracts somehow elicit logical thinking, while letters-and-numbers problems do not. Although nebulous, this explanation deserves attention; in her tests, COSMIDES [1989] did not distinguish between social contracts and cheating detection.

GIGERENZER and HUG [1992] disentangled social contracts from cheating detection. For each of four social contract problems they constructed two context stories. One of the stories (the cheating version) put the participants into the perspective of an interested party to a social contract (that can be cheated); the other story (the no-cheating version) did not. Across their four social contract problems, Gigerenzer and Hug found that 83% of the subjects selected "benefit taken" and "cost not paid" when cheating was at stake, compared with 45% in the no-cheating version. This suggests that being a party to a social contract (that can be cheated) affects reasoning.

These results notwithstanding, researchers proved to be resistant to the idea that social contracts might shape reasoning rather than logic; they suggested that cheating detection may somehow facilitate logical reasoning. The objection had to be addressed, since in most of Cosmides' tests the predicted "benefit taken" and "cost not paid" selections corresponded to the truth conditions of conditionals in propositional logic. GIGERENZER and HUG [1992] tested this conjecture by deducing predictions from the cheating-detection hypothesis that contradicted propositional logic. The key to these tests is that cheating detection is pragmatic and perspectival, whereas logic is aperspectival. For example, in the day-off problem, subjects were originally cued to the perspective of an employee, in which case cheating detection and propositonal logic indeed predict the same cards. Gigerenzer and Hug switched the perspective from employee to employer but held everything else constant (the conditional statement, the four cards, and the instructions). For the employer, being cheated meant that the employee "did not work on the weekend and did get a day off;" that is, in this perspective, subjects should select the cards "did not work on the weekend" and "did not get a day off," which correspond to the *not-p*- and *q*-cards. (Note that *not-p & q* selections have rarely been observed in selection tasks.)

[7] COSMIDES and TOOBY [1992] make it clear that this idea was informed by simple game-theoretic toy games of the (one- and two-sided) prisoners' dilemma variety.

Thus, perspective change can play cheating detection against propositional logic. The two competing predictions are: If the cognitive system attempts to detect instances of "benefit taken and cost not paid" in the other party's behavior, then a perspective switch implies switching card selections; if the cognitive system reasons according to propositional logic, however, pragmatic perspectives are irrelevant, people should reason "logically," and there should be no switch in card selections.

The results showed that when the perspective was changed, the cards selected also changed in the predicted direction. The effects were strong and robust across problems. For instance, GIGERENZER and HUG [1992] report that in the employee perspective of the day-off problem, 75% of the subjects had selected "worked on the weekend" and "did not get a day off," but only 2% had selected the other pair of cards. In the employer perspective, this 2% (who had selected "did not work on the weekend" and "did get a day off") rose to 61%.

Thus, social contracts do not simply facilitate logical reasoning. Choices in the selection task are a systematic function of perspective (e.g. employer versus employee) and guided by the goal of detecting cases of "benefit taken" and "cost not paid." Thus, reasoning is functional rather than logical.

We propose that the program of reducing context to an instrument for "facilitating" logical reasoning is misguided. Reasoning consistent with propositional logic is entailed by some perspectives (e.g. the employee's), but is not entailed by other perspectives (e.g. the employer's).

5. *New Models of Reasoning in Economics?*

GIGERENZER and HUG's [1992] discovery of perspective effects – "one of the most interesting findings in the recent literature on the selection task" (GIROTTO [1995, 333]) – has ambiguous implications especially for experimental economics, the main provider of the anomalies on which behavioral economics is built.

On the one hand, Gigerenzer and Hug's results are a ringing endorsement of experimental economists' practice of not only cueing subjects in, but letting them enact the roles of employees and employers, agents and principals. On the other hand, their results erect important warning signs regarding experimental economists' practice of putting their subjects into settings that are as abstract (content-free) as possible. We believe that this practice, in light of the content effects documented above, warrants re-examination. To extrapolate from the

new models of reasoning in psychology, and the experimental support in their favor, there is abundant evidence that people do not fail as miserably in their decision-making and judgement abilities as has been suggested by the heuristics-and-biases program or behavioral economics. Rather, people seem to bring a sound social intelligence into the laboratory that often seems to serve them well in their "natural" environment, though it may fail them in the artificial world of the laboratory. When experimental economists elicit subjects' responses in the laboratory, and when they do so in a content-free way, it is not always clear how subjects' social intelligence affects the results.

As regards the day-off rule and the associated principal-agent game, subjects might interpret the situation with which they are confronted as that of an indefinitely repeated game that indeed makes backward induction unnecessary. That subjects, acting as intuitive statisticians, do not apply backward induction is thus not indicative of their inabillity to reason properly, but of the experimenter's failure to create the laboratory situation that he or she is allegedly investigating.

We believe that there are two important avenues to pursue: First, exploration of experimental practices in economics as reflected in the important work of HARRISON [1992] and HOFFMAN, MCCABE and SMITH [1996]. Second, an exploration of the impact of content in economics experiments. That such content effects matter has been recently suggested by CAMERER [1997], DYER and KAGEL [1996], and HARRISON [1996].[8] However, experimental economics has some way to go toward an understanding of issues of content and context. We propose that in light of the content effects documented by psychologists, experimental economists' practice of putting their subjects into settings that are as abstract (content-free) as possible warrants careful re-examination.

[8] DYER and KAGEL [1996] address the issue why "sophisticated bidders," executives drawn from the commerical construction industry, suffer, like other subjects, from winner's curse in common value auctions. Simple survivorship arguments suggest that that should not be so. The authors identify a number of differences between theoretical and experimental treatments of one-shot common value auctions and practices in the commercial construction industry. One of the important differences is that there are repeated play elements to the commercial contracting game. For example, there are certain ways out – "arithmetic errors" – that often allow low bidders to withdraw bids without penalty. The results then suggest that experimenters may not have managed to cue their sophisticated subjects successfully into what they mean the experimental situation to represent. HARRISON [1996] addresses a similar problem in the context of contingent valuation and suggests that more attention be paid to explicit linguistic representations in experiments. He identifies the avoidance of ambiguity as a key problem and proposes "to regain control over the linguistic representations that subjects might entertain by use of a 'little language' that is specific to the experiments." (p. 48).

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Rent Leaving

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1. Introduction

Economic rents are the driving force of market economies. Resource owners constantly look for opportunities to create and exploit economic rents which, however, in the dynamics of the market process dissipate as new entrants seek to appropriate the profits. In equilibrium, economic rents are eliminated. Not so in different institutional settings. While rents in the market endogenously come and go, they are artificially created and sustained in political and bureaucratic decision-making. In analogy to individuals' behavior in the market, it is assumed that politicians, bureaucrats, pressure groups, voters and taxpayers strive for political rents. Rent seeking in the political arena may also increase an individual's income but, in contrast to the market, is not socially beneficial.

We argue that institutional settings are not only apt to encourage *rent seeking* but allow for *rent leaving* as well. While the market mechanism induces the profit-seeking butcher and baker to produce collectively beneficial results, in non-market decision-making, individual profit maximization has to be traded off against socially productive investments. We speak of rent leaving when subjects do not invest in something that is unproductive for others but that would increase their own income. Rent leaving thus encompasses all forms of other-regarding behavior such as charitable giving or contributions to public goods, independent of whether pro-social behavior is Pareto-improving in pay-offs as the pie gets bigger. In all cases, individuals have to decide whether they want to maximize their personal income – which is the dominant strategy – or whether they prefer to take into account somebody else's well-being as well, i.e. to leave rents.

Rent leaving exists as long as individuals derive intrinsic benefits from other-regarding behavior. Such behavior need not be irrational. The formation of such preferences may be the result of selfish parents trying to rig their children's

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