

# Behavioral Economics

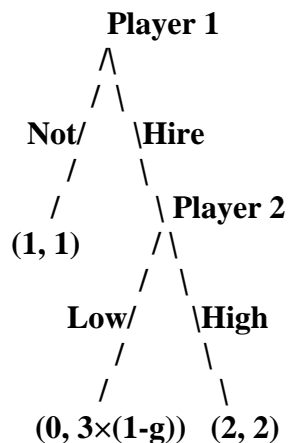
Martin Dufwenberg\*

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Economics has traditionally relied on sophisticated mathematical methods as exemplified for example by general equilibrium theory, price theory, or game theory. However, the traditional approach has largely made relatively simple assumptions about human nature such as that each individual only cares about his own consumption. Research in neighboring social sciences, by contrast, usually relies on mathematical methods to a lesser extent while entertaining a richer description of man that may take into account for example how social relations or emotions influence people.

Behavioral economics (BE) combines the strengths of both approaches, incorporating psychological insights into economic analysis typically with continued use of sophisticated analytical tools. BE has recently become the fastest growing field in economics and in my view the most exciting. The background is a wealth of evidence, often experimental, identifying empirical phenomena that are not well explained by traditional analysis. BE develops new models that incorporate emotions, fairness, reciprocity, social norms, bounded rationality, myopia, etc. BE is developed hand-in-hand by theorists and experimentalists, with many scholars having a foot in each camp. By its nature, BE is cross-disciplinary. Behavioral economists are often inspired by researchers in fields such as psychology, sociology, philosophy, and the neurosciences. In return, BE offers analytical tools and modes of thinking that can inspire scholars outside economics.

To illustrate a particular BE exercise, consider the “trust game” described in the following figure:



The figure depicts a “game tree” which describes a situation where an employer (player 1) and an employee (player 2) interact. Think of the tree as growing upside down, with its branches corresponding to choices. The interaction starts with player 1 who decides whether to

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\* Department of Economics, University of Arizona, Tucson, AZ 85721-0108; martind@eller.arizona.edu

Hire or Not player 2, as indicated via the labeling of branches. The game ends if player 1 chooses Not (to hire). If player 1 chooses Hire, however, then player 2 must choose to exert Low or High effort; again these choices correspond to branches in the game tree, as indicated. The expressions (1, 1), (0,  $3 \times (1-g)$ ), and (2, 2), finally, specify the players payoffs (or how much they like the corresponding outcomes) associated with the indicated sequence of choices involved. Player 1's payoff is given first in each pair. These payoffs should be interpreted as money payoffs, with the exceptions of player 2's payoff  $3 \times (1-g)$  following choices Hire and Low which should be thought of as a money payoff (=3) tempered by 2's feelings of guilt. Player 2 feels guilt because he hurts player 1 by choosing Low. This feeling is as captured through  $g$  which is a number between 0 and 1; the higher is  $g$  the lower is  $3 \times (1-g)$  so the more player 2's enjoyment of money is reduced if he exerts Low effort. I will consider how these guilt feelings of 2's, as captured through  $g$ , may influence the interaction between the players. Below an assumption will be made such that  $g$  depends on the players' beliefs, in a particular way, but we start with a much simpler benchmark case:

Assume that  $g = 0$ . That case corresponds to a traditional economic analysis where feelings of guilt are not accounted for. In this case, player 2 would choose High, since  $3 \times (1-g) = 3 \times (1-0) = 3 > 2$ . If player 1 anticipates this she would choose Not (to hire), since  $1 > 0$ . The outcome is inefficient in the sense that each player gets a payoff of only 1, whereas each player would have gotten 2 had they instead chosen Hire and High.

Now assume instead that 2 is prone to suffer from guilt, captured via the possibility that  $g > 0$ . To be specific, assume (in line with some experimental as well as survey evidence) that  $g$  depends on 2's beliefs about the probability with which 1 believes 2 will choose High. Specifically, assume that player 1 assigns probability  $p$  to player 2 choosing High. The number  $g$ , then, is player 2's best guess about  $p$  (or more precisely, for the mathematically inclined, assume that 2 has a probability measure describing her beliefs about  $p$ ;  $g$  is the mean of that probability measure). The psychological sentiment modeled here is that the stronger 2 believes that 1 trusts him to choose High, the more guilty 2 will feel by choosing Low.

What will happen in this situation? Since  $g$  may take any value between 0 and 1 it may seem that we can't tell. However, I will now argue that it is plausible that the players will choose Hire and High and thus manage to get two money units each. The reason is as follows: If 1 chooses Hire he must hold belief  $p \geq 1/2$ ; if he didn't he would be better off choosing Not. Player 2 should be able to figure that out. Hence when 2 faces the choice between Low and High she 2 should realize that  $p$  is at least  $1/2$ , which means that her guess  $g$  should be at least  $1/2$ . It follows that  $3 \times (1-g) < 2$  (since  $g \geq 1/2$ ), so 2 should thus choose High. Player 1 should figure all of this out, and so chose Hire to start with. The illustrated phenomenon – how 1's choice of Hire forces 2 to impute certain beliefs to 1 such that 2 will act in a way favorable to 1 – has been labeled psychological forward induction. I find it an intriguing illustration of an insight that BE may offer. Incorporate a little bit of guilt and there will be no need to worry about an inefficient outcome anymore (and no one suffers from guilt)!

Why has BE recently become such a popular field? I asked that question to my students in an experimental economics class I teach. They came up with four answers: (i) BE has been inspired by the turmoil on financial markets in recent years. (ii) The interest in BE derives from economists increased use of experimental methods. (iii) Economists already did all they could using traditional approaches. (iv) Economists at last realized that traditional theories do not work well.

While each of these answers may make some sense, I was actually after a completely different one. It explains the increased recent interest in BE as a side effect of a parallel development the cause of which itself had little connection to BE. My answer puts the field of game theory at center stage. Game theory is a mathematical toolbox which allows for analysis of strategic interaction, meaning situations in which multiple decision makers influence each other. One example would be the above trust game, where the payoffs to 1 may depend on what 2 does and the payoffs to 2 depend on what 1 does. Looking at the history of game theory one sees that the 60s and early 70s was largely a slow period for the subject; during this time most economists did not pay much attention to game theory and were often not trained in the relevant techniques. In the mid-70s and increasingly onwards this started to change. For example, the game-theory based study of economic situations with asymmetric information (which is relevant, for example, in auctions) took off in the 70s. Bargaining theory and industrial organization are two other game theory-based field which became popular. New exciting game-theoretic results were derived concerning for example interactive epistemology (when players reason about each others' reasoning), repeated games (where players interact over and over again), and the impact of communication in games. Alongside with these contributions, interest in game theory grew and students were increasingly taught game theory. This happened because people were excited about asymmetric information, bargaining, industrial organization, and foundational topics in game theory. It did not originally happen because people wanted to enrich economics psychologically. However, it just so happens that game theory also furnishes the right tools for conducting exercises of that sort. The above analysis of guilt in employer-employee relationship, which is game-theoretic in nature, can exemplify. So when it happened that a new younger generation of economist was brought up on game theory, at some point people in this generation realized that they were well positioned to explore topics in behavioral economics. Eventually this lead to a boom in experimental and theoretical research addressing psychological aspects of game play and, more generally, to a boost of interest in behavioral economics.