

# Mind Games

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Recent advances in brain-imaging technology have affected the way economists examine decision-making. Tools such as functional magnetic resonance imaging (fMRI), which make possible real-time imaging of brain activity, have opened the door for economists to seek a neural basis for economic action. In a new paper published in the *Journal of Economic Literature*, economists Colin Camerer, George Loewenstein, and Drazen Prelec outline their hope that these new tools can be used to create psychologically realistic models that modify some assumptions underlying economic theory.

Economic accounts of human action usually neglect emotions such as disgust, fear, and empathy. Such omissions were made initially out of necessity; until the advent of fMRI, it was impossible for researchers to objectively measure these motivations. Restricting themselves to what was measurable, economists created a powerful theory of economic behavior based on revealed preference; people's actions are assumed to maximize their wishes, which cannot be seen directly.

Many traditional models assume a "deliberative equilibrium" in which no party would change their actions if given more time to think. But given the complexity involved in many economic situations, it's unrealistic to assume that all agents will quickly find the optimal strategy. Furthermore, studies of saving and consumption behavior have shown that people often engage in "time inconsistent" behavior, meaning their actions and goals in one time period are not consistent with those in future periods. Finally, interactive games show what appear to be ingrained tendencies toward either revenge or altruism that are not well accounted for in traditional economic models.

In the face of such inconsistencies, "behavioral economists" created alternative models that had considerable success in accounting for some of these empirical anomalies. But those models lacked a unifying framework. Many appeared to be ad hoc mathematical constructions designed to fit the data. For example, behavioral economists created a "hyperbolic discounting" model which predicts that people will overvalue the present and act impatiently, but they could not provide a compelling justification for why people behave this way.

Meanwhile, cognitive scientists were able to demonstrate multiple levels of cognition. Rational, deductive thinking

takes place in the frontal cortex of the brain; activity in this area correlates with our conscious, deliberative thought. The frontal cortex operates quite slowly and is particularly active when a person is completing a difficult task for the first time. In contrast, the limbic system and other parts of the brain process information very rapidly to produce split-second judgments about danger and to complete familiar tasks. These preconscious processing centers help us to spend time thinking only about things that warrant attention; we would be paralyzed with inaction if we had to consciously deliberate over every decision.

Economists have found direct support for theoretical constructs like hyperbolic discounting using brain imaging studies of activity in the frontal cortex and limbic system.

In an ingenious study, researchers found that the level of activity in the frontal cortex was a good predictor of whether or not subjects would act impatiently and opt for immediate rewards rather than for delayed gratification. Other fMRI studies have found that heightened activity in a region of the brain associated with the disgust reaction is linked with a person's tendency to engage in revenge, while increased levels of a hormone associated with feelings of trust are present during the playing of competitive games. Researchers hope that by creating theoretical frameworks in which multiple, functionally distinct, competing cognition systems interact to produce decisions, economists will be able to gain further understanding into several noted behavioral anomalies in neoclassical economics.

The emerging field of neuroeconomics is not without its critics, however. Some economists question the *economic* value of brain imaging work; after all, we already knew that our behavior is controlled by activity in the brain, so it is not at all surprising that specific aspects of decisionmaking seem to correlate with activity in particular areas of the brain. Neuroeconomists respond that peering into the "black box" of the human mind and examining the mental basis for decisionmaking will help us refine mathematical models to better reflect reality. Although these issues are far from resolved, neuroscience has assumed a growing — but still niche — role in economic research. Whether it can establish a presence in the mainstream of the profession remains to be seen.

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"Neuroeconomics: How Neuroscience  
Can Inform Economics" by  
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