

Mind games: Can studying the human brain revolutionise economics?

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ALTHOUGH Plato compared the human soul to a chariot pulled by the two horses of reason and emotion, modern economics has mostly been a one-horse show. It has been obsessed with reason. In decisions from how much to produce to whether to save and invest, humans have been assumed to be coolly rational calculators of their own self-interest. Over the past few years, however, evidence from psychology has persuaded many economists that reason does not always have its way. Now, judging from a series of presentations at the American Economic Association meetings in Philadelphia last weekend, a burgeoning new field dubbed “neuroeconomics” seems poised to provide fresh insights on how the two horses together produce economic behaviour.

The current bout of research is made possible by the arrival of new technologies such as functional magnetic-resonance imaging, which allows second-by-second observation of brain activity. At several American universities, economists and their collaborators in the neurosciences have been placing human subjects in such brain scanners and asking them to perform a variety of economic tasks and games.

For example, the idea that humans compute the “expected value” of future events is central to many economic models. Whether people will invest in shares or buy insurance depends on how they estimate the odds of future events weighted by the gains and losses in each case. Your pension, for example, might have a very low expected value if there is a large probability that bonds and shares will plunge just before you retire.

Brian Knutson, of Stanford University, carried out one recent brain-scan experiment to understand how humans compute such things. Subjects were asked to perform a task, in this case pressing a button during a short interval in which a certain shape was flashed on to a screen. In some trials, the subjects could win up to \$5 if successful, while in others they would have to defend against a \$5 loss. Before presenting the target, the researchers signalled to subjects which kind of trial they were in.

Brain activity in certain neural systems seemed to reveal a strong correlation with the amount of money at stake. Moreover, the prospects of gains and losses activated different parts of the brain. Traditional economists had long thought—or assumed—that the prospect of a \$1,000 gain could compensate you for an equally likely loss of the same size. In subsequent trials, subjects were given another signal: one that provided an estimate of the odds of success. That allowed the researchers to identify the regions of the brain used for recognising an amount of money and for estimating the probability of winning (or losing) it. Having identified these regions, the hope is that future work can measure how the brain performs in situations such as share selection, gambling or deciding to participate in a pension scheme.

David Laibson, an economist at Harvard University, thinks that such experiments underscore the big role that expectations play in a person's well-being. Economists have usually assumed that people's well-being, or “utility”, depends on their level of consumption, but it might be that changes in consumption, especially unexpected downward ones, as in these experiments, can be especially unpleasant.

Mr Laibson's own work tries to solve a different riddle: why people seem to apply vastly different discount rates to immediate and short-term rewards compared with

rewards occurring well into the future. People tend much to prefer, say, \$100 now to \$115 next week, but they are indifferent between \$100 a year from now and \$115 in a year and a week. In one recent experiment, noted in our science section on October 30th, Mr Laibson and others found that the brain's response to short-term riches (in this case, gift certificates of \$15 or \$20) occurs largely in the limbic system, a region that governs emotion. By contrast, the prospect of rewards farther into the future triggers the prefrontal cortex, which is often associated with reason and calculation. Thus, choosing immediate economic gratification, by spending excessively on credit cards or not saving enough even though you “know better”, could be a sign that the limbic system is in charge. Government policies, such as forced savings or “cooling off” periods for buying property or cars, may be one remedy.

And then there is trust and deception. Colin Camerer, of the California Institute of Technology, has conducted experiments in which brain-scanned participants play strategic games with anonymous partners. In these, a subject chooses his own actions and also tries to anticipate the choices of the other player. When players are doing the best that they can to “win” the game by anticipating their opponents' moves, their brains tend to show a high degree of co-ordination between the “thinking” and the “feeling” regions. Economic equilibrium, by this measure, is an identifiable “state of mind”.

Don't let it go to your head

Some neuroeconomists claim that such brain-scanning experiments are the start of a revolution in economics. No longer will economists rely on crude statistical models of how people behave in response to a policy change, such as an interest-rate rise or a tax increase. Instead, they will be able to peer directly into the brain to predict behaviour.

One day, perhaps; but much work remains. Identifying the parts of the brain that control economic actions is one thing. Harder tasks include determining how neural systems work together to create behaviour, and how wide is the variation in brain patterns between different people. Then there are age-old questions of free will: is your failure to save for old age simply a lifestyle choice, or is it down to faulty brain circuits? Neuroeconomics is already providing fascinating conclusions. But Plato's chariot will remain an alluring explanation for a while yet.