

Summaries

From Psycho-Economics to Neuro-Economics

Bernard Walliser

In economics, three nested organizational levels, namely behavioural, mental and neural, can be distinguished. They introduce specific theoretical or observable concepts and suggest their own models for choice making. If psycho-economics relates implemented actions to declared mental states, neuro-economics relates mental states to brain areas. Bridge principles can be defined which link concepts with similar interpretations at two successive levels. Thanks to these principles, relations or even models independently suggested at two successive levels may well be associated. Some prescriptive applications of these principles were more recently proposed, but they remain grounded on a too fragile basis.

Keywords: brain areas, bridge principle, decision process, mental states, neuro-economics, organizational levels, psycho-economics.

JEL Classification: A12, B41, D87.

In Search of Lost Time

Antoine Billot

The model of memory process we propose is based on two assumptions. First, spatial or addresses network models in economics can be easily adapted to describe a significative part of the episodic memory mechanism as defined by Tulving (1983). Second, brain viewed as a network behaves as a decision-maker who arbitrates between two economic dimensions of recollection: the reward—i.e., the satisfaction for recovering old informations located in mnesic traces—and the cost—i.e., the price for stimulating the traces network. Indeed, the two results exhibited in the paper—and devoted to a formal and appealing characterization of true and false recollections—are directly derived from the idea of a rational brain. Finally, this paper aims at showing that it could be relevant to model memory processes in a pure symbolic way—contrary to most of the neuroeconomics contributions which are generally experimental—and also that such an attempt for an abstract and analogical representation of the episodic memory process based on a spatial microeconomics methodology seems to be specially effi-

cient and illustrative of Hintzman (1986) and recent Doeller et al. (2010) intuitions and features.

Keywords: neuroeconomics, memory process, spatial network.

JEL Classification: C91, D81.

Learning in Games: Neural Computations underlying Strategic Learning

Ming Hsu, Lusha Zhu

The past decade has witnessed an unprecedented growth in our understanding of the brain basis of economic decision-making. In particular, research is uncovering not only the location of brain regions where certain processes are taking place, but also the nature of the (economically meaningful) latent variables that are represented, as well as how they relate to behavior. This transition from understanding where to how economic decisions are being made in the brain has been integral to relating neural processes to economic models of behavior. This progress, however, has been notably uneven. Neuroeconomic studies of individual decision-making, such as those involve risk and time preferences, have the benefit of drawing on decades of work from neuroscientific studies of animal behavior. Critically, many of these findings are based on quantitative, computational approach that lends well to economic experimentation. In contrast, our understanding of the neural systems underlying social behavior is much less specific. A large measure of the current challenge in fact arises from the empirical shortcomings of standard game theoretic predictions of behavior, which are largely equilibrium-based. Using our own study as an example, we show how one can directly search for the latent variables implied by current economic models of strategic learning, and attempt to localize them in the brain. Specifically, we show that the neural systems underlying strategic learning build directly on top of those involved in simple trial-and-error learning, but incorporate additional computations that capture belief-based learning. Finally, we discuss how our approach can be extended to address fundamental problems in economics.

Keywords: strategic learning, game theory, neuroeconomics.

JEL Classification: C92, D83.

Ready to Face the Future: Brain Mechanisms for Cognitive Flexibility and Exploration

Sylvain Charron, Sven Collette

Solving the exploration/exploitation trade-off is a fundamental issue for an organism living in an uncertain and changing environment. This review describes how a stream of cognitive neuroscience studies linked exploratory behaviour to structures in the human prefrontal cortex, then identified the brain mechanisms involved in the online adaptation of behaviour relatively

to reward changes, and finally revealed fundamental limitations in the processing of information at the prefrontal level. The experiments and the results we present could particularly be of interest to economists who want to understand how cognitive neuroscience identify key processes in the human brain and shapes our understanding of decision-making.

Keywords: neuroeconomics, exploration, prefrontal cortex.

JEL Classification: D87, D81, D83, C91.

Seeking Ambiguity: a Review on Neuroimaging Studies on Decision Making under Ambiguity

Fumihiko Taya

Recent developments of neuroimaging technology enable us to investigate the brain network implicated in economical decision making (Glimcher et al. 2004; Camerer 2008). One of the fascinating topic is “ambiguity aversion” where people tend to avoid unknown options as demonstrated by Ellsberg paradox. Although “ambiguity aversion” has been consistently observed in a variety of situations, uncertainty due to incomplete knowledge can be resolved by obtaining missing information, and people explore the ambiguous options as well.

Here, we review a number of neuroimaging studies on “ambiguity aversion” and associated works. It has been shown that the affective OFC and the cognitive prefrontal cortex play a crucial role in decision making under uncertainty. We discuss what kinds of cognitive function are involved in the decision making process by overviewing neuroimaging studies on higher cognitive processes in general including exploratory behavior.

Keywords: ambiguity aversion, exploration, fMRI.

JEL Classification: D87.

Is it Betrayal Aversion or Regret Aversion?

Itzhak Aharon

Social and economic exchanges often occur between strangers who cannot rely on past behavior or the prospect of future interactions to establish mutual trust. Game theorists formalize this problem in several “one-shot” game – such as the trust game - predicting noncooperation – since the investor is not expecting trustee to reciprocate it is not rationally to invest. Bohnet and Zeckhauser (2004) suggest that, due to betrayal aversion, people seek to avoid situation in which one could be betrayed. We argue that this behavior could emerge also due to regret aversion.

Keywords : trust, game theory, betrayal aversion, regret aversion, decision making, risk, gambling.

JEL Classification: A12, A13, D81.

Aversions to Trust

Anne Corcos, François Pannequin, Sacha Bourgeois-Gironde

In this article, we focus on two types of “aversion” which we deem essential aspects of the notion of trust: betrayal aversion (social) and ambiguity aversion (a special case of aversion to uncertainty). Based on trust-games studies in experimental economics and neuroeconomics, our main goal is to assess the conceptual, behavioral and neurobiological connections between betrayal and ambiguity aversions.

From a social and individual psychological point of view the bottom line of our trusting behavior could be our general aversion to ambiguous signals. We approach social trust in the terms of a phenomenon based on uncertainty aversion. Specifically, a reduction of the perceived uncertainty of a social interaction tends to build up a trusting climate conducive to trade by decreasing betrayal aversion. We hypothesize that betrayal aversion and ambiguity aversion bear such a negative correlation.

Focusing on this potential negative correlation our approach clearly differs from more positive accounts of trust centred on altruism.

Keywords : trust game, betrayal aversion, ambiguity aversion, neuroeconomics.

JEL Classification: C72; C91; D03 ; D87.