



Limits to Rationality in Financial Markets

Workshop 2: Neuro-Economics

18-19th June 2009

Programme and Abstracts

	Thursday 18th	Friday 19th
10:00-10:30	Opening Remarks	Herrmann-Pillath (2)
10:30-11:30	Leuthold	Baddeley
<i>11:30-12:00</i>	<i>Coffee</i>	<i>Coffee</i>
12:00-13:00	Derbyshire (1)	Derbyshire (2)
<i>13:00-14:30</i>	<i>Lunch</i>	<i>Lunch</i>
14:30-15:30	Herrmann-Pillath (1)	Grinfeld
<i>15:30-16:30</i>	<i>Tea + discussion</i>	<i>Tea + discussion</i>
16:30-16:45		Closing

Abstracts

M. Baddeley (Cambridge), “Human herd behaviour reflected by ventral striatum activity”

Economic theories of herd behaviour suggest individuals are sensitive to the decisions and actions of other people, which can lead to undesirable outcomes such as stock market bubbles and bank runs. However, how the brain processes this socially derived influence is not understood. Using functional magnetic resonance imaging (fMRI), we scanned participants as they made decisions on whether to buy stocks after observing others' buying decisions. We demonstrate that activity in the ventral striatum, an area heavily implicated in reward processing, tracked the degree of social influence arising from the observation of other peoples' decisions. The signal did not track non-human, non-social control decisions. These findings lend weight to evidence that the ventral striatum is involved in the processing of complex social aspects of decision making and identify a possible neural basis for herd behaviour.

S. Derbyshire (Birmingham),

1) How has neuroimaging been applied to economics and politics? Why is association not cause?

A series of neuroimaging experiments have involved participants making risky monetary decisions, engaging in fair or unfair monetary exchanges, evaluating the statements of political candidates and so forth. Typically the investigators will report, for example, that the decision to accept or reject an unfair offer or the consideration of a preferred versus non- preferred candidate's statements activates different brain areas. These activations will then be linked into a body of neuropsychology to ascribe function. Rejecting an unfair offer, for example, activates the insula whereas accepting an unfair offer activates frontal cortex. The insula is associated with emotional responses whereas the frontal cortex is associated with rational decision making. The unfair offer is rejected when the participant has a "screw you buddy" reaction, associated with insula activity, whereas it is accepted when the participant has an "I'll take the money" reaction, associated with frontal activity. There are several problems with this line of argument. First, it tends to prematurely naturalise function. Human beings have spent centuries trying to get to grips with what is fair and what we consider to be fair is in a constant state of flux. The assumption of fairness and reciprocity amongst the largely white and middle class students that take part in psychology experiments is not necessarily going to be shared across cultures and history. Dropping fairness into a piece of neural tissue reifies fairness as a natural entity rather than something historical, contingent and negotiated. Second, given that the participants are doing different things there is nothing the slightest bit surprising about different brain activation. We may not fully understand the relationship between brain structure and function but it is widely accepted that some relationship exists. Describing function in terms of brain activity is merely another level of description, it is not an explanation. Third, imaging experts avoid explanation by using phrases such as "associated with" or "involved in". It is obvious that the brain is "associated with" or "involved in" emotional responses and reasoning. Heads full of sawdust do not feel or reason. The brain is a necessary part of the story, just as legs are necessary for walking, but brains do not explain emotion and reasoning any more than legs explain walking. We walk because

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we want to get somewhere not because we have legs and we get emotional or engage in reason because we have something to get emotional about or think about.

2. How do neuroeconomics, evolutionary psychology and the idea of massive modularity overlap? How does this lead to the assumption of 'irrationality'?

Neuroeconomics rests upon the assumption that the behaviour of consumers, financiers, capitalists and so forth can be explained by psychological predispositions dictated by neural circuitry. Writing in *Scientific American* last year, for example, Michael Shermer explained that we may reject an offer of free money if we see the offer as "unfair". This irrational rejection of free money is because the "moral sense of fairness is hardwired into our brains". Such explanations of human behaviour rest on the contentious idea that our brains evolved during the Stone Age to cope with Stone Age problems. According to Shermer, and others, Stone Age survival was dependent on co-operation and so a module to detect cheating evolved and has stayed with us. The existence of this module explains why people play the ultimatum game to maximise fairness rather than to maximise financial gain. Similar modular biases are also used to explain anchoring, loss aversion and the allure of free offers. These biases lead to consumers spending more money and chasing losses in an irrational fashion. The assumptions of massive modularity and irrationality should both be challenged as missing the unique feature of human beings as creatures capable of reason and transition. Evolutionary psychologists and neuroscientists miss the transformative potential of reason and the possibilities for transitions in thought. The ultimatum game, for example, can be played in a more altruistic fashion to ensure punishment is avoided and that is rational when there is a norm of reciprocity. At the same time, even if playing with someone "unfair", there is still the option to take any money offered and to walk away with something rather than nothing. Once the biases that might inform behaviour are understood they can be overcome. Consequently, the idea that we are being dictated to by modules programmed by evolution loses a lot of force.

M. Grinfeld (Strathclyde), "The language of neuroeconomics"

I will give examples of typical claims made by neuroeconomists and will analyse the reasons these are often misleading and obscure the true potential of the neuroeconomics project (seen as an instance of the cognitive neuroscience project).

C. Herrmann-Pillath (Frankfurt School of Finance and Management),

1. Adam Smith's Theory of Moral Sentiments in the light of modern neuroscience and neuroeconomics

Recently, neuroeconomists have realized the affinity between their research and the theory of human behaviour presented by Adam Smith in the *Theory of Moral Sentiments*. I review the diverse commonalities with the aim to reach conclusions for the foundations of economics as a science. The ToM suggests that the economic conception of the individual has to take account of two fundamental forces. One is the internal dynamics of the human brain, which is lacking a unifying systemic frame (passions, sentiments etc. struggling for dominance), and the other is the essential cognitive embeddedness of human beings into collective processes of sense-making, epitomized in

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Smith's notion of the impartial spectator. Thus, Smith presages modern neuroscientific conceptions of social cognition, mentalizing and other related notions. This has far-reaching implications for economics, as the economic agent needs to be modelled as an inherently trans-individual entity. A possible approach to model this fact is Sudge's proposal of team preferences.

2. Memetics and the incompleteness of neuroeconomics

Current practice in interpreting neuroeconomic results contradicts some fundamental tenets of the philosophy of mind in its naturalistic version. Neuronal facts cannot constitute mental content, but only in conjunction with external facts. That is, a neuronal process is meaningless, so that it cannot be directly used in explaining human behaviour. There are two options: One is to state that there is a special human capacity to generate meanings, such as human reason. But this contradicts a naturalistic concept of mind, which maximally can accept that mental processes supervene on neuronal processes. I favour the second option, which, however, is very challenging. This is to naturalize language in the sense of being a set of external artefacts that are causally related with neuronal facts (teleosemantics). A framework for this could be memetics, a now languishing extension of Darwinism. However, the version offered by Aunger in his book "The Electric Meme" seems promising in offering an overarching theoretical framework for neuroeconomics.

H. Leuthold (Glasgow), *Neuroeconomics: an introduction to its methods*

The rapidly growing field of neuroeconomics has been strongly related to developments in cognitive neuroimaging and cognitive neuroscience. In my presentation I will provide an introduction into the methods that neuroeconomists typically employ to studying economic cognition. In particular, I will focus on various techniques that neuroeconomists employ, including animal studies and studies in humans using brain stimulation (transcranial magnetic stimulation), functional magnetic resonance imaging (fMRI) and electroencephalography (EEG). I hope to illustrate how these brain measures help to advance our understanding of the neural basis of economic cognition while also pointing towards their possible limitations.

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