

NEUROECONOMICS: HOW NEUROSCIENCE CAN INFORM ECONOMICS

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Jan 25, 2024

RESEARCH QUESTIONS

- What neuroscientists do and how their discoveries and views of human behavior might inform economic analysis?
 - Diversity of tools that neuroscientists use
 - Cognition VS. Automation
 - General implication for economics
 - ★ Intertemporal Choice
 - ★ Decision making under risk
 - ★ Game theory
 - ★ Labor-market discrimination
 - Macro implications

NEUROSCIENCE METHODS AND LESSONS

"New tools define new scientific fields and erase old boundaries"

- Brain Imaging
 - Electro-Encephalogram (EEG): uses electrodes attached to the scalp to measure electrical activity synchronized to stimulus events or behavioral responses (directly monitors neural activity, but only limited to the outer part of brain)
 - Positron Emission Topography (PET): measures blood flow in brain (proxy for neural activity)
 - Functional Magnetic Resonance Imaging (fMRI): tracks blood flow in the brain using changes in magnetic properties due to blood oxygenation. (inner part of brain)
- Single-Neuron Measurement; Electrical Brain Stimulation (EBS)

NEUROSCIENCE METHODS AND LESSONS

Knowing more about functional specialization, and how regions collaborate in different tasks, could substitute familiar distinctions between categories of economic behavior with new ones grounded in neural detail

TABLE 1
TWO DIMENSIONS OF NEURAL FUNCTIONING

	Cognitive	Affective
Controlled Processes		
<ul style="list-style-type: none">■ serial■ effortful■ evoked deliberately■ good introspective access	I	II
Automatic Processes		
<ul style="list-style-type: none">■ parallel■ effortless■ reflexive■ no introspective access	III	IV

IMPLICATIONS FOR ECONOMICS

- **Common economics constructs:** how people differ from each other
- **Mentalizing module (theory of mind):** controls a person's inferences about what other people believe (the equilibrium requires agents correctly anticipate what others will do)
- **Utility for Money:** economic models assume it is indirect; while money provides direct reinforcement (i.g. paying is painful)
- **Wanting vs. Liking:** related to standard welfare economics; economics proceeds on the assumption that satisfying people's wants is a good thing → *wanting* = *liking*
- **Cognitive inaccessibility:** unconscious bias; self-deception and self-manipulation (inaccessibility of automatic brain processes, controls attention); one's own motives

SPECIFIC ECONOMIC APPLICATIONS

- **Intertemporal choice:** quasi-hyperbolic time discounting provides a mathematical representation of a splicing of two processes: impulsively vs. far-sighted
- **Decision making under risk and uncertainty:** collaboration and competition between systems; risk seeking vs. risk aversion (i.g. quadrant III preference between 10-90 and 1-9); conjunction fallacy and incoherent probabilities
- **Game theory:** theory of mind; hormone and biological factors affect the social preferences; Camerer-Ho theory shows both processes are at work but the faster, emotional process is stronger
- **Labor market discrimination:** automatic affective reactions contribute to cognitive judgements; implicit attitudes

CONCLUSION

Rational Choice Economics VS. Behavioral Economics

Application of neuroscience to economics VS. "Economic model of the brain"

APPENDIX

1. Single-Neuron Measurement: inserts tiny electrodes into the brain, each measuring a single neuron's firing (limited to animals as it causes damages to neurons) ; implication on basic emotional and motivational processes
2. Electrical Brain Stimulation (EBS): rats will learn and execute novel behaviors if rewarded by brief pulses of electrical brain stimulation to certain sites in the brain