

# Summary of project results

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Attention is a scarce cognitive resource. Humans do not have the cognitive capacities to pay attention to all potentially relevant information and can only analyze those aspects on which they focus their attention. How economic agents direct their attention has profound implications for economic policy. The project LIMITED ATTENTION (PCIG11-GA-2012-322253) sought to better understand this subject. The project had two main parts: 1) Evolutionary foundations of limited attention. 2) Social and strategic aspects of allocating limited attention and implications for political economics and public policy.

## **Part 1: Evolutionary foundations of limited attention.**

One key question for the investigation of limited attention is how agents allocate these bounded cognitive resources. A typical hypothesis by economist is an optimal allocation of (in)attention under the given constraints. The implicit hope is that, for sufficiently stable environments, people will learn to adapt their allocation of attention optimally. The project investigated in how far mathematical tools from evolutionary game theory can be used to model and analyze the implications of cognitive constraints on decision making.

One interesting evolutionary aspect is the relation between limited cognition and the foundations of prospect theory. Prospect Theory (Kahneman-Tversky 1973, 1992) provides a framework for a positive description of empirically observed choice behavior under uncertainty. The key elements are an S-shaped value-function with loss aversion relative to a reference point and an inversely S-shaped weighting of probabilities. Nick Netzer from the University of Zurich and Florian Herold from the University of Bamberg demonstrate in their paper “Probability weighting as evolutionary second best” that if one takes a S-shaped value function as given, probability weighting consistent with prospect theory may arise as a natural second-best solution to minimize the evolutionary fitness-loss. This paper provides a framework that allows us to understand different components of prospect theory as evolution’s second best response to certain cognitive limitations.

A further research direction of part 1 of the project focused on the evolution of paying attention to different characteristics and, correspondingly, the evolution of taking roles. In their joint research Florian Herold from the University of Bamberg and Christoph Kuzmics from the University of Graz consider a certain class of symmetric two-strategy two-player games with asymmetric equilibria in which the single and multiple population approaches lead to radically different evolutionary stable equilibria (hawk-dove like games). They investigate what happens if the role a player assumes and the resulting social structure evolve endogenously. More precisely, they consider a single population model in which players have payoff-irrelevant, but observable, labels and their strategies can be contingent on these labels. Then, in any neutrally stable strategy, players with different labels manage to anti-coordinate. However, the emerging probability distribution over labels may not be efficient. Furthermore, from the evolutionary analysis a key distinction between two types of games arises: Conflict games (in which players would always prefer their opponent to play ‘dove’ independently of their own choice) and anti-coordination games (in which players always prefer their opponent to mismatch their own action). Depending on this distinction, different social structures (e.g., hierarchical and egalitarian) can or cannot arise in a stable equilibrium. One interesting consequence is that in this setting the payoffs under an (sta-

ble) egalitarian social structure Pareto-dominate the payoffs under a hierarchical social structure: Intuitively, under a hierarchical structure too many players want to take the highly ranked roles.

## **Part 2: Social and strategic aspects of allocating limited attention and implications for political economics and public policy.**

Part 2 focused on social and strategic aspects of allocating limited attention and the implications for political economics and public policy. In “Economic Models of Limited Attention - a Survey”, Stefanie Schmitt and Florian Herold from the research group at the University of Bamberg survey different approaches of modeling limited attention and limited cognitive resources and discuss some potential implications for economic theory.

In “Rational Allocation of Attention in Decision-Making”, Stefanie Schmitt from the research group at the University of Bamberg sets up a model of rational attention allocation. Attention has very different definitions across the economic and the psychological literature. In this model, attention is understood as selecting information for costly processing. The paper analyzes how a decision-maker rationally allocates attention to pieces of information that are significant for a decision. Specifically, the model investigates how processing costs influence attention allocation. Results indicate that the processing costs influence attention allocation and, consequently, also choice quality. Furthermore, in addition to complete inattention, the decision-maker draws on two strategies to allocate attention. These two strategies share characteristics with two psychological concepts of attention: Top-down and bottom-up attention. Top-down attention refers to an effortful, endogenous selection of information, whereas bottom-up attention refers to a faster, exogenous selection of information. In a second step, taking this attention allocation as a premise of how consumers allocate attention, the paper investigates how firms respond to those consumers. In particular, the paper explores whether firms strategically exploit consumers’ attention allocation. Results show that a fraction of firms can profit from producing an inferior good and, by shrouding the quality, sell the good to inattentive consumers.

In “Strategic Sequential Voting” Julio González-Díaz from the University of Santiago de Compostela, Florian Herold from the University of Bamberg, and Diego Domínguez from Instituto Tecnológico Autónomo de México suggest and theoretically analyze a novel, yet natural, voting system. Each voter has one vote and can choose when to cast his vote. After each voting period, the current count of votes is publicized, enabling subsequent voters to use this information. In elections with three or more candidates, a majority may dislike one of the candidates (a Condorcet loser), but voters who are not sure or do not pay sufficient attention to which other candidate is the most viable candidate may mis-coordinate under plurality rule. Strategic sequential voting may help voters to better coordinate their choices, mitigating the problem of a Condorcet loser winning an election due to mis-coordination. Furthermore, a (relatively) strong preference for one candidate can be expressed by voting early, possibly swaying the choice of remaining voters.

Working papers and further information can be found on the website of the project:

<http://www.uni-bamberg.de/vwl-fiwi/forschung/mariecurieciq-limited-attention/>

