# Essays in Behavioral Economics

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## Motivation

- I am interested in **economic decision-making** — particularly in how individuals' *subjective assessment* of choice situations shapes their behavior.
- In **three projects**, I study how beliefs (Project 1), cognitive capabilities (Project 2) and contexts (Project 3) influence choices.
- Goal: *Extend* classical frameworks of choice (e.g., the "revealed-preferences paradigm" (Samuelson, 1938)).
- Timely discussion: Very recent applications of concepts from cognitive science and psychophysics to economic choice behavior (Enke & Graeber, 2020; Frydman & Jin, 2022; Gabaix, 2019; Khaw et al., 2021; Woodford, 2020).

## P1: Behavioral Time Allocation

*joint with Alexander Dzionara, JGU*

**Research Question:** How do people decide how much *time* to take for solving a problem? *Only poorly understood so far* (Oud et al., 2016).

- We link allocation decisions to *subjective* assessment of a decision problem (Gabaix, 2019). E.g., **Overoptimistic beliefs** in own ability leads agents to allocate less time in a given setting.
- Method: *visual search task* in pre-registered lab experiment ($n$ = 91): identify highest arabic numeral (see A in Fig. 1).

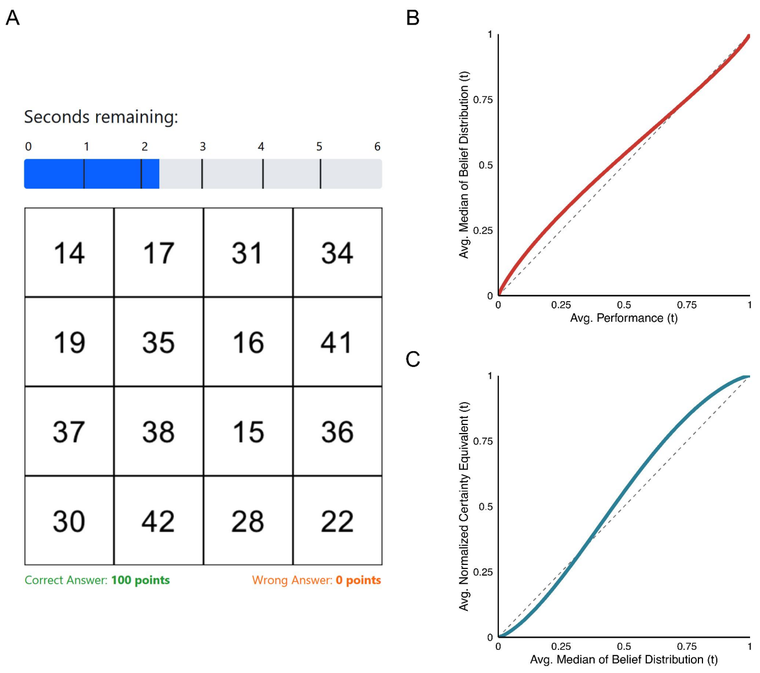


Figure 1: Visual search task and estimated average weighting functions

- We measure *time-dependent performance*, *uncertainty attitudes* and *beliefs* and estimate speed-accuracy (Dean et al., 2007) as well as belief and probability *weighting functions* (Gonzalez & Wu, 1999; Tversky & Kahneman, 1992); see B + C in Fig. 1.

→ Link individually estimated parameters to *endogenous time choice variant* of our task.

- **We find support for our hypotheses:** Over(under)-confident and over(under)-weighting individuals allocate more(less) time in our task, *conditional on their ability*.
- Behavioral assessments as drivers of time allocation decisions.
- *Increasingly relevant* for discussions about 4-day workweeks.

## P2: Cognitive Imprecision and Social Preferences

*single-authored*

**Research Question:** What role does the mental representation of arithmetic differences play for (measuring) *pro-social behavior*?

- Popular tool: (binary) *dictator game*. One person splits resources between herself and another (Bruhin et al., 2019; Charness & Rabin, 2002). See A Fig. 2.
- Assumption so far: People are perfectly able to process numerical quantities, *only social preferences matter* for choices. Empirically implausible (Dehaene, 2011).

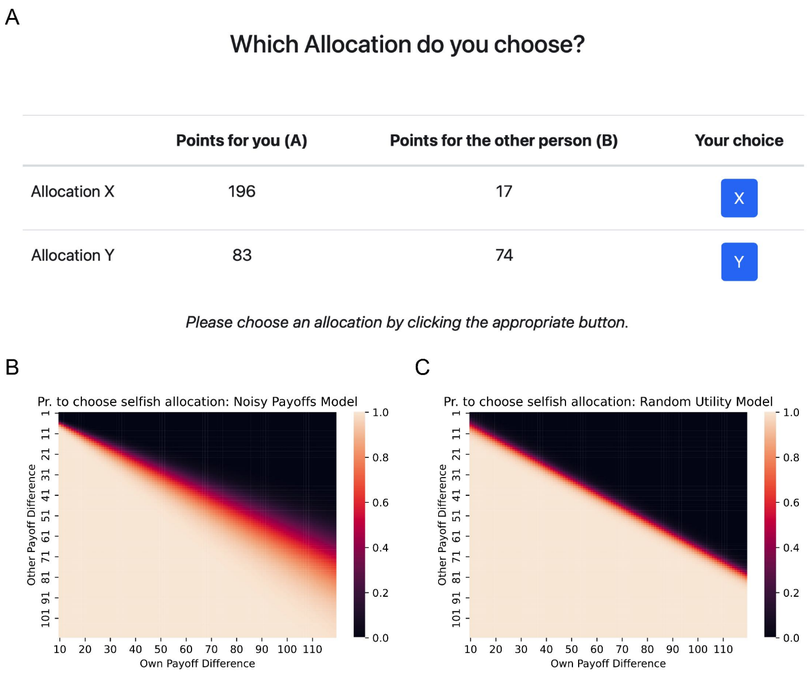


Figure 2: Binary dictator game and model simulations

- I propose a **simple model of choice behavior** in binary dictator games featuring *cognitive noise* in estimating payoff differences based on Khaw et al. (2021).

Model and simulations imply:

- Random Utility Model (standard approach) implausible. In Noisy Payoffs Model, stochasticity of choices *depends on quantities involved* (see B + C in Fig. 2).
- Cognitive load (higher imprecision) **increases selfish choices**.
- Correlation between arithmetic ability and behavior should manifest.

*Lab experiment to be conducted*

## P3: Strategic Uncertainty and Time Pressure in Professional Chess

*joint with Johannes Carow, JGU + MWVLW RLP*

**Research Question:** How does time pressure affect choices in the presence of *strategic uncertainty*?

- We investigate this in *professional chess*, which is highly strategic + players possess great skill.
- **Two innovations**:
  1. We propose a source of *exogenous variation* in available thinking time of chess players (due to a specific feature of FIDE World Cups)
  2. A novel measure for the *degree of strategic uncertainty* of a single chess move.

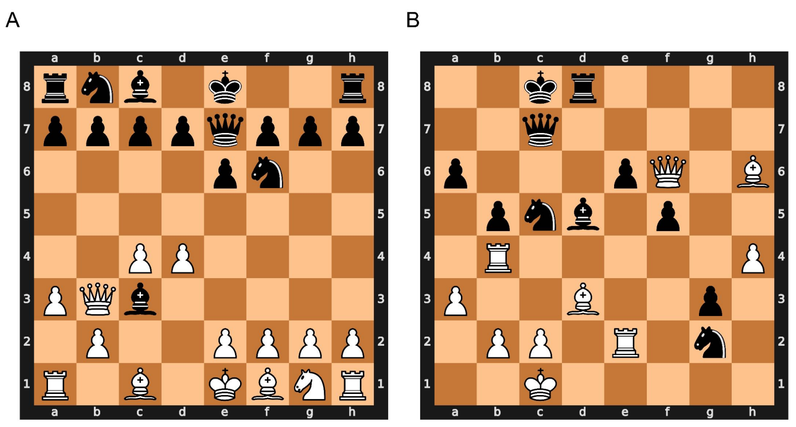


Figure 3: Predicted difficulty for White: low and high example

- Key in (human) chess is the (strategic interaction with the) *difficulty* of a position.
- Think difficulty as $Q = f(p)$, i.e., the quality of a move $Q$ being (partly) dependent on piece positions $p$.
- We approximate $f(p)$ using a *residual convolutional neural network* (RCNN) (McIlroy-Young et al., 2020) trained on > 80 mio. human chess moves.
- RCNN correctly identifies unseen positions of low (A) and high (B) difficulty (see Fig. 3).
- *Variability of emerging difficulties* across responses by opponent is related to strategic uncertainty of a chess move.
- In FIDE Chess World Cups, we find *causal* evidence that chess players play **uncertainty-averse strategies** under time pressure.
- *Implies that contextual factors matter even with very high proficiency.*

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