Cognitive Imprecision and Social Preferences

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Recently, economists started to incorporate insights from cognitive science and psychophysics into modeling and explaining economic choice behavior. One key advancement is to incorporate *imprecisions* in decision making, e.g., in the mental representation of numerical quantities or in the selection among different actions. For example, existing work connects cognitive imprecisions with long--known "anomalia" in human choice behavior and thereby offers novel explanations for phenomena like (small-stake) risk aversion, biased beliefs, departures from bayesian belief updating among others (Enke and Graeber, 2020; Frydman and Jin, 2022; Graeber, 2020; Khaw et al., 2021; Polanía et al., 2019; Woodford, 2020).

One key area of behavioral economics research, in which the role of cognitive imprecision has not been studied so far, is the domain of *social preferences*. A popular tool to measure social preferences is the (binary) dictator game, which has been applied in various different forms, inter alia to obtain precise preferences measures (Bruhin et al., 2019; Charness and Rabin, 2002; Dana et al., 2007; Saucet and Villeval, 2019). A key aspect of the decision in this game is to compute *payoff differences* and to decide e.g., whether to sacrifice 110 experimental currency units to increase the other person's payoff by 65 units. Such arithmetics are likely to be *imprecise* and people frequently judge numerical quantities not by their precise value, but more by an approximate semantic representation (Dehaene, 2011; Dehaene et al., 2003; Izard and Dehaene, 2008). Here, I conjecture that individual differences in the mental representation of such arithmetic differences should impact choices in binary dictator games.

To formalize this notion, I introduce a simple model of binary dictator game choice behavior which combines the model by Khaw et al. (2021) with workhorse frameworks of social preferences, e.g., as proposed in Fehr and Schmidt (1999) and Charness and Rabin (2002). This combined model allows for (individual-specific) cognitive noise in estimating payoff differences between two allocations in binary dictator games. Multiple implications emerge from this model (and simulations based on it):

First, an increase in cognitive noise increases selfish choices.[1] Second, choices are stochastic, as it is usually observed in such experiments. Importantly, the stochasticity of choices is a result of the imprecise mental representation of payoff differences and thus *depends on the numerical quantities involved*. In contrast, random utility models (need to) rely on idiosyncratic effects on utility to explain stochastic choices. Furthermore, a correlation between people's arithmetic ability and their binary dictator game behavior should emerge. In addition, any type-based classification of individuals, as e.g., carried out by Bruhin et al. (2019), could in principle also be influenced by individual heterogeneity in computing payoff differences.

Experiment to be conducted

[1]Technically, this is only true for subjects who care more about their payoff than about the other person's payoff. However, even the strong altruistic types in Bruhin et al. (2019) had α, $\beta < 0.5$ such that the direction of this effect should be true for most subjects empirically.

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