



Smart or selfish – When smart guys finish nice

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ABSTRACT

This paper examines the relationship between public good game (PGG) contributions and cognitive abilities assessed by the Cognitive Reflection Test (CRT). Employing two additional treatment conditions, the paper explores (i) whether CRT-scores are linked to preferences for cooperation or to a better understanding of the incentive structure; and (ii) the association between CRT-scores and contributions, if choices are elicited under time pressure. A time limit should make it harder for participants to base their choices on cognitive reflection. I find a strong and positive relationship between CRT-scores and contributions in a standard one-shot PGG. This relationship is fully moderated by the presence of time pressure. Thus, features of the decision environment can affect the link between cognitive abilities and PGG contributions. Finally, there is only a weak relationship between CRT-scores and the ability to understand the incentive structure.

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1. Introduction

Recently, researchers have started exploring the role of cognitive abilities as one potentially important determinant of economic behavior (Rustichini, 2015). Since individuals differ in their cognitive abilities, a better understanding of the interplay between cognition, preferences, and behavior could shed light on the drivers of behavioral heterogeneity in economic experiments (Frederick, 2005; Benjamin et al., 2013; Deck and Jahedi, 2015) and, more generally, could illuminate the sources of differences in market outcomes (Heckman et al., 2006; Cunha and Heckman, 2009; Heineck and Anger, 2010; Christelis et al., 2010; Mazzonna and Peracchi, 2012).

Compared to non-strategic choices¹, less is known about the relationship between cognitive abilities and strategic choices. A large part of the evidence on this link comes from experiments on participants' levels of strategic sophistication (Stahl and Wilson, 1995; Nagel, 1995; Costa-Gomes et al., 2001). More recently, cognitive abilities have also started to attract attention as a predictor of strategic behavior in public good, trust, or ultimatum games. The present paper adds to this growing literature by providing experimental evidence on the relationship between contributions in a

public good game (PGG) and cognitive abilities assessed by the *Cognitive Reflection Test* (CRT) (Frederick, 2005). This short test of cognitive abilities has been designed to capture the propensity to override a first, intuitive response that quickly comes to mind with a more cognitively reflected and demanding one. Therefore, the contribution of this paper is twofold. First, it provides evidence for the presence and direction of a link between cognitive reflection and strategic choice in a one-shot PGG. Second, by examining two additional treatment conditions, it illuminates the nature of this link. The first condition assesses whether CRT-scores are linked to preferences for cooperation or rather to a better understanding of the incentive structure. The second condition explores the link between contributions and CRT-scores, if the choice setting is cognitively more demanding. In particular, in this more demanding setting, participants have to decide under time pressure, which should limit their ability to base their choices on cognitive reflection.

It is far from obvious whether a more reflective cognitive style should be associated with a higher or lower level of contributions in a one-shot PGG. In a variety of strategic decision tasks, individuals with higher cognitive abilities have been shown to be more likely to select strategies that are in line with game theoretic equilibrium predictions.² One-shot PGG have a dominant strategy

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¹ For instance, individuals with higher cognitive abilities have been found to display lower levels of small-stakes risk aversion, (e.g., Burks et al., 2009; Dohmen et al., 2010), to discount future payments at lower rates (e.g., Frederick, 2005; Benjamin et al., 2013), and to be less affected by biases in financial decision making (e.g., Oechssler et al., 2009; Hoppe and Kusterer, 2011; Kiss et al., 2015).

² Most of the findings on strategic sophistication have been observed in games of iterated dominance. For instance, participants with higher cognitive abilities have been found to submit lower entries in beauty contest games (e.g., Burnham et al., 2009; Rydval et al., 2009; Brañas-Garza et al., 2012; Carpenter et al., 2013; Gill and Prowse, 2015). Similarly, Grimm and Mengel (2012) find that subjects with higher CRT-scores are more likely to choose according to the Nash prediction in a series of 3×3 normal form games.

equilibrium in full free-riding, assuming that decision-makers hold purely selfish preferences. Hence, if the existing evidence on equilibrium selection also applied to one-shot PGGs and preferences for cooperation and CRT-scores were otherwise unrelated, subjects with higher CRT-scores should be observed to free-ride more often. This prediction is in line with previous findings in Kanazawa and Fontaine (2013), who observe more free-riding in a one-shot prisoner's dilemma (PD) among subjects with higher cognitive abilities. Similarly, when comparing the cognitive abilities of different cooperative types, Nielsen et al. (2014) find that strict free-riders have significantly higher CRT-scores than conditional or unconditional cooperators.

Thus, if cognitive abilities and social preferences were uncorrelated, a negative relationship between CRT-scores and contributions would seem plausible. However, there is experimental evidence that points towards a positive relationship between social preference and cognitive abilities. Burks et al. (2009) report that participants with higher scores in the Raven's IQ Test cooperate more frequently in a sequential PD as first-movers and retaliate more against defection as second-movers. Similarly, a meta-study by Jones (2008) finds that students from schools with higher SAT and ACT entry scores are significantly more likely to cooperate in repeated PD games.³ In repeated or sequential settings, a positive link between cognitive abilities and contributions could be due to long-term strategic considerations rather than social preferences (Keser and Winden, 2000).⁴ Yet, evidence from simple allocation tasks, in which such strategic considerations are typically not present, also suggest that cognitive abilities and social preferences could be related. Chen et al. (2013) find a positive correlation between SAT scores and dictator game giving. For CRT-scores the evidence is somewhat mixed and depends on the specifics of the decision task. Ponti and Rodriguez-Lara (2015) and Corgnet et al. (2015) both find that more reflective dictators are less generous in standard dictator games, but more generous when the price of giving is low (or zero).

In sum, cognitive abilities could be related to behavior in one-shot PGGs through two different channels: subjects with higher CRT-scores could be less (or more) cooperative and it could be easier for them to identify their dominant strategy. In a standard PGG, as used in the baseline of this study, it is not always possible to tease these two distinct channels apart. For instance, a negative correlation between CRT-scores and contributions (Nielsen et al., 2014) could indicate that reflection is required to find the dominant strategy or that more reflective decision-makers hold less cooperative preferences. Therefore, I employ an additional treatment condition that helps to distinguish between both explanations. This condition (Variant 1: *Computer Condition* (CC)) retains all structural features of a one-shot linear PGG, apart from one difference: Instead of interacting with human partners, subjects interact with a computer algorithm that mechanically contributes a predetermined amount to the public account (Houser and Kurzban, 2002; Ferraro and Vossler, 2010). Therefore, contributing zero is a dominant strategy that is independent from cooperative preferences towards other participants.

Finally, several papers have pointed out that choices in PGG might depend on the cognitive resources available to an individual at the moment of decision making (Rand et al., 2012; 2014). In the context of PGG, this literature on the effects of time pressure

has ignored interaction effects with individual cognitive abilities. However, such effects plausibly exist, either because subjects with higher CRT-scores are more able to cope with having to decide under a time limit, or conversely because their better reasoning capacities are less useful when having to decide quickly.⁵ Employing time pressure as a second between-subjects treatment (Variant 2: *Time Pressure Condition* (TP)), I test for the presences of an interaction effect of this kind.

My results show that subjects with higher CRT-scores tend to contribute significantly more in a one-shot PGG. This result is surprising in light of a large literature, which finds that higher cognitive abilities typically enable decision makers to identify their dominant strategy more easily. To some degree, it can be explained by observations from the CC. Here, subjects across all CRT-score categories display similar contribution levels. This suggests that identifying the dominant strategy in a PGG might depend less on cognitive reflection than in other, more complex decision tasks (Benito-Ostolaza et al., 2016). Finally, behavior in the TP condition demonstrates that specific features of the decision environment can strongly influence the relationship between CRT-scores and contribution behavior. When subjects have to decide under time pressure and it is hence harder to engage in cognitive reflection, there is no significant correlation between PGG contributions and CRT-scores.

The remainder of this paper is structured in the following way: Section 2 outlines the experimental design and procedures. Section 3 contains results and robustness checks. Section 4 closes with a short discussion of the main findings.

2. Methods and procedures

2.1. Measuring cognitive abilities

In order to measure cognitive abilities, the *Cognitive Reflection Test* (CRT) was administered in its original version (Frederick, 2005). This simple test assesses participants' predisposition to base their decisions on cognitive reflection rather than intuition. The test consists of the following three items:

- A tennis racket and a ball cost €1.10 in total. The bat costs €1.00 more than the ball. How much does the ball cost?
- If it takes 5 machines 5 minutes to make 5 widgets, how long will it take 100 machines to make 100 widgets?
- In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

Each question has an intuitive but incorrect answer (10 cents, 100 min, 24 days). The correct answer (5 cents, 5 min, 47 days) can be found upon sufficient reflection and is easy in the sense that the solution is "easily understood when explained" (Frederick, 2005, p.27). Following Frederick (2005), I count the number of correct answers and construct an overall CRT-score ranging from 0 (lowest reflection abilities) to 3 (highest reflection abilities). This score is used to classify subjects in the results section.

Clearly, the ability to base choices on cognitive reflection rather than on a first impulsive thought is not a measure of general intelligence. It only represents one specific subcategory of a broader set of cognitive abilities that could affect economic choices. The CRT could also be seen as too short and narrow to reliably capture such abilities. In spite of these objections, the CRT is

³ Further evidence on a positive relationship between cognitive abilities and cooperation in repeated or sequential tasks is found in Terhune (1974), Segal and Hersberger (1999), Cappelletti et al. (2011), Jones (2014), and Al-Ubaydli et al. (2016).

⁴ In line with this interpretation, Milinski and Wedekind (1998) and Duffy and Smith (2014) find that imposing cognitive load on subjects through a memory task reduces their ability to condition their strategies on previous rounds in repeated PDs.

⁵ For instance, Jones (2014) finds a positive relationship between ACT-scores and cooperation in a repeated PD. However, this relationship is only observed when the implementation complexity of cooperative strategies is low, but not when the complexity is high.

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