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Personality, personal values and cooperation preferences in public goods games: A longitudinal study

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ABSTRACT

Recent research on behavioral heterogeneity in social dilemma situations has increasingly focused on exploring the predictive value of individual difference variables. This paper contributes to this line of research by examining how cooperation preferences in a series of three public goods games conducted over the course of five months are related to personality traits and personal values. A variant of the four player one-shot public goods game was administered to classify participants' cooperation preferences, along with measures of the Big-Five personality dimensions and Rokeach's terminal values. Results revealed that, when considered independently, Agreeableness and prosocial values were indicative of individual preferences for cooperation. However, when considered simultaneously, only Agreeableness emerged as a significant predictor of cooperation preferences. The findings are interpreted in terms of how personality and personal values jointly impact economic behavior.

1. Introduction

The public goods game (PGG) and the prisoner's dilemma game (PDG) represent social dilemma situations in which a group or team of subjects is interdependent for obtaining outcomes. Subjects can achieve the highest possible outcome for the collective by cooperating, but each individual has an incentive to free ride on the cooperation of the others. A number of recent studies have examined the effects of individual difference variables on contribution decisions in PGGs (e.g., Fleming & Zizzo, in press) and cooperative choices in PDGs (e.g., Hirsh & Peterson, 2009).

Our research takes this analysis one step further by assessing the relationship between individual difference variables and cooperation preferences that form the basis of individual choices in PGGs and PDGs. We use a variant of the PGG developed by Fischbacher, Gächter, and Fehr (2001) in which participants, instead of making one contribution, submit a contribution schedule as a function of others' contributions. Unlike a single contribution decision, this schedule is a direct measure of individual cooperation preferences, allowing the classification of participants as either free riders or cooperators.

In the present longitudinal study, we examine how cooperation preferences in a series of three PGGs conducted over the course of five months are related to the constructs of personality and personal values. Specifically, we investigate whether the Big-Five personality dimensions and Rokeach's (1973) terminal values are indicative of individual preferences for either cooperation or free riding. The Big-Five model is the standard trait framework for research in personality and specifies that five overarching dimensions (Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness to Experience) account for the biggest part of between-subject variation in stable personality traits. Rokeach's value survey is a measure of the importance of two lists of terminal (end-states of existence) and instrumental (modes of conduct) values within a person's total belief system. We focus on the set of terminal values, because they are considered more fundamental than instrumental values, which are thought merely to refer to preferred modes of conduct that help achieve the desired end states of existence (Rokeach, 1973).

Olver and Mooradian (2003) and Parks and Guay (2009) provided excellent discussions of the relationship between personality and values. According to these authors, personality traits can be described as innate characteristics representing the nature of an individual, while personal values are socially learned beliefs about acceptable behavior and actions resulting from the interaction of nature and nurture. Parks and Guay (2009, p. 675) pointed out that

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"both are expected to influence a variety of behavioral outcomes, and so it seems evident that we should consider both in examining the impact of individual differences on behavior. Yet this practice is so infrequent, there is little understanding of how personality and values are related to one another, much less how they might jointly impact behavior".

The present paper contributes to this line of research by exploring how personality traits and personal values are separately and jointly related to individual preferences for cooperation in social dilemma situations.

2. Methods

The study was conducted three times over the course of five months and involved 72 students majoring in business administration. Four of these did not return for the third study leaving us with 68 participants with complete information at all three times (mean age 25.6, SD = 3.2, 49 male). At time 1, students completed Gosling, Rentfrow and Swann's (2003) Ten-Item Personality Inventory (TIPI) and Rokeach's (1973) terminal value survey. Students also participated in a PGG, which was repeated after 2.5 months (time 2) and again after 5 months (time 3).

2.1. Ten-Item Personality Inventory (TIPI)

The TIPI includes two items for each of the Big-Five personality dimensions. Each item contains a pair of two trait descriptors and participants have to rate on a 7-point scale ranging from 1:'disagree strongly' up to 7:'agree strongly' the extent to which the pair of traits applies to them (see Gosling et al., 2003). We chose to adopt the TIPI rather than a longer personality measure to reduce transient measurement errors resulting from participant fatigue, frustration and boredom associated with completing several survey instruments in combination with a lengthy experimental session.

As a measure of the Big-Five dimensions of personality, the TIPI has been validated against standard Big-Five instruments. Gosling et al. (2003), for example, showed high convergent validity and discriminant validity of the TIPI with Costa and McCrae's (1992) 240-item NEO-PI-R. Furnham (2008) evaluated the TIPI relative to Costa and McCrae's (1992) 60-item NEO-FFI and found generally positive results in terms of validity. In a similar vein, Donnellan, Oswald, Baird, and Lucas (2006) and Ehrhart et al. (2009) demonstrated convergent validity of the TIPI with a number of longer five-factor model measures, including Goldberg's (1999) 50-item IPIP. All these extensive validation studies have shown that the TIPI has acceptable psychometric properties.

The Cronbach's alphas for the five TIPI scales in our study were very similar to the findings by Donnellan et al. (2006), Ehrhart et al. (2009) and Gosling et al. (2003), i.e.: Extraversion ($\alpha = 0.73$), Agreeableness ($\alpha = 0.32$), Conscientiousness ($\alpha = 0.49$), Emotional Stability ($\alpha = 0.53$) and Openness ($\alpha = 0.46$). With only two items per dimension, the relatively low alphas are to be expected as the computation of Cronbach's alpha is a function of the number of scale items. Test–retest reliability is therefore a more appropriate reliability measure for such brief scales. Gosling et al. (2003) reported test–retest reliability for the five TIPI scales over a period of six weeks. They were 0.77 for Extraversion, 0.71 for Agreeableness, 0.76 for Conscientiousness, 0.70 for Emotional Stability and 0.62 for Openness, indicating that the scale provides a stable measure of personality over time.

2.2. Rokeach's terminal value survey

Value priorities were assessed with Rokeach's terminal value list (see second column of Table 1) using a rating scale adopted from Feather (1991). Participants rated the importance of each of the 18 terminal values on a scale ranging from 1 (not at all important to me) to 7 (extremely important to me). A rating response format was adopted because it allows for a more detailed analysis of value priorities than the traditional ranking method.

Table 1
Value domains from principal components factor analysis*.

Value domains for terminal values	Marker values in order of the level of the factor loadings
Prosocial ($\alpha = 0.78$, $M = 5.60$, $SD = 0.87$)	A World at Peace (free of war and conflict) Inner Harmony (freedom from inner conflict) A World of Beauty (beauty of nature and the arts) Equality (brotherhood and equal opportunity for all) National Security (protection from attack) Happiness (contentedness) Freedom (independence and free choice) Salvation (saved, eternal life)
Maturity ($\alpha = 0.71$, $M = 6.15$, $SD = 0.72$)	Wisdom (a mature understanding of life) Self-Respect (self-esteem) True Friendship (close companionship) An Exciting Life (a stimulating, active life) Social Recognition (respect and admiration)
Enjoyment ($\alpha = 0.67$, $M = 6.01$, $SD = 0.71$)	Mature Love (sexual and spiritual intimacy) A Comfortable Life (a prosperous life) Pleasure (an enjoyable, leisurely life) A Sense of Accomplishment (a lasting contribution) Family Security (taking care of loved ones)

* The table shows value domains obtained from principal components factor analysis with promax rotation. Cronbach's alphas (α), mean scores (M) and standard deviations (SD) in parentheses.

The intercorrelations between ratings for the 18 terminal values were factor analyzed using principal components analysis with promax rotation. Preliminary tests confirmed the suitability of our sample for factor analysis. Three factor extraction methods, Scree Test, Parallel Analysis and Velicer's MAP test all suggested a three-factor solution that explained 49% of the variance. Three subscales were constructed based on the values that had loadings greater than 0.40 on the relevant factor. The first subscale is largely consistent with the "Universal prosocial" domain specified by Feather (1991). While the majority of Rokeach's terminal values serve individualistic interests, most of the values included in this domain serve collectivistic interests and reflect therefore Schwartz and Bilsky's (1990, p. 879) definition of prosocial values, i.e. "Active protection or enhancement of the welfare of others." The second subscale mirrors Feather's (1991) "Mature accomplishment" domain and is related to Schwartz and Bilsky's (1990, p. 880), definition of maturity values, i.e. "Appreciation, understanding, and acceptance of oneself, others, and the surrounding world." The third subscale includes values related to Feather's (1991) "Comfort/Stimulation" and "Positive affiliation" domains and corresponds to Schwartz and Bilsky's (1990, p. 879), definition of enjoyment values, i.e. "Pleasure, sensuous and emotional gratification." Each participant's mean score on each subscale was taken as his or her score on the respective value domain. Table 1 summarizes the three value domains.

2.3. Public goods game (PGG)

Participants' cooperation preferences were assessed by a variant of the PGG developed by Fischbacher et al. (2001). In order to maximize comparability with the original experiment by Fischbacher et al. (2001), we replicated the same protocol and used the same parameters.