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It pays to pay – Big Five personality influences on co-operative behaviour in an incentivized and hypothetical prisoner's dilemma game

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## Abstract

The authors investigated how the presence or absence of monetary incentives in a prisoner's dilemma game may influence research outcomes. Specifically, the predictive power of the Big Five personality traits on decisions in an incentivized ( $N = 60$ ) or hypothetical ( $N = 60$ ) prisoner's dilemma game was investigated. Participants were less generous in the incentivized game. More importantly, personality predicted decisions only in the incentivized game, with low Neuroticism and high Openness to Experience predicting more cooperative transfers. The influence of Neuroticism on behaviour in the incentivized game was mediated by risk attitude. The results are consistent with other results suggesting that the Big Five are relevant predictors of moral behaviour, and with results suggesting that the determinants of hypothetical decisions are different from the determinants of real decisions, with the latter being more revealing of one's true preferences. The authors argue that psychologists, contrary to prevailing praxis, should consider making their participants' decisions more real. This could allow psychologists to more convincingly generalize laboratory findings into contexts outside of the laboratory.

Keywords: Big Five, Prisoner's Dilemma, Social Dilemma, Moral Behaviour, Incentives, Stake size

It pays to pay – Big Five personality influences on cooperative behaviour in an incentivized and hypothetical social dilemma

## 1. Introduction

Half a century ago, early research in experimental economics predicted and confirmed that when people are asked to repeatedly guess whether a light will or will not appear after a signal stimulus, people behave differently depending on whether their only payoff is subjective satisfaction, or whether there is a monetary reward or risk involved (Siegel, 1959). Later experiments showed that markets behave varyingly depending on whether participants receive complete monetary rewards, random monetary rewards, or no rewards. Reviewing such findings and introducing induced value theory, Smith (1976) argued that laboratory experiments can be useful for the development and verification of theories, but only when the experimenter has control over the participants' preferences. In essence, participants have to prefer more of the reward medium to less of the reward medium, must not become satiated, and the reward must depend on the subject's actions. Such control can be achieved by using a reward structure that induces prescribed monetary values on actions and outcomes. The game value that individuals *may* attach to experimental outcomes not linked to the outside world is, according to Smith (1976, p. 277), "weak, erratic, (...) and subjects may be easily satiated with 'point' profits". Currently, monetary incentives are economists' most crucial argument for allowing generalizations from laboratory experiments to contexts outside of the laboratory: monetary incentives ensure that participants perceive their behaviour as relevant, experience real emotions, and take decisions with real economic consequences (e.g., Falk and Heckman, 2009). By contrast, psychologists, in general, do not tend to offer participants monetary incentives. The purpose of the present study was to empirically investigate how this

difference in research methods can affect research outcomes, by focusing on the Big Five (B5) personality determinants of incentivized or hypothetical behaviour in the Prisoner's Dilemma (PD) game.

Many of the experiments that economists and psychologists are most interested in are social dilemma games. These games, such as the PD, common pool resource game, trust game, and public goods game, all involve a decision in which the individual's decision to maximize personal earning leads to a suboptimal outcome for the collective, and the harm done to the collective by such a decision is greater than the profit of the individual (Dawes, 1980). In the PD game, players are assigned into dyads, and they make a simultaneous choice on whether to cooperate with or defect from the other player. Defecting always delivers the best personal payoff, regardless of what the other player does, but each player's personal payoff would be greater if they both played cooperatively rather than both of them defected.

The empirical evidence from social dilemma games has repeatedly refuted the conception of humans as rational and narrowly self-interested actors, instead showing large individual variation in behaviour. One of the most basic tasks in understanding or explaining these individual differences is relating them to broader dispositional variables. The majority of the research attempting to explain this variation has used the social value orientation scale (Van Lange et al., 1997) to examine whether differences in individual motives underlie choices in social dilemmas (for a meta-analysis, see Balliet, Parks, and Joireman, 2009). However, the social value orientation scale has, according to a recent review (Van Lange, Schippers, and Balliet, 2010), been related to almost no behaviour outside of the laboratory. There is thus a clear need to link behaviour in social dilemmas to broader personality concepts.

Although the PD is probably the most extensively studied and paradigmatic social dilemma game, and the B5 framework has a similar status in personality psychology, there are very few published studies that would have attempted to connect the two. Pothos et al. (2010) found no relation between the B5 factors and PD decisions, whereas Hirsh and Peterson (2009) found participants scoring high on Neuroticism to be less likely to defect (we focus only on the broad five dimensions; although the facets or aspects that define the B5 often provide important additional information, there is no consensus on the lower order structure of the B5). Both of the above studies were conducted with hypothetical stakes, and we know of no studies that would have used monetary stakes.

We investigated behaviour in two versions of a one-shot PD game with multiple choice. The incentivized version of the game was played with stake sizes characteristic of experimental economics, the hypothetical version of the game with hypothetical stakes. Previous results suggest people are less generous and risk-preferring when playing with higher stakes (Camerer and Hogarth, 1999; Levitt and List, 2007). However, such an effect on average decisions only shows that monetary stakes are more influential if they exist. More pertinent to the present research is whether the influence of other than monetary factors also depends on the existence of stakes. One could expect individualized determinants of decisions to become more important in the absence of monetary incentives, thus accentuating the influence of the B5 in the hypothetical game. Indeed, Mischel (1977), introducing the strong situation hypothesis, argued that strong situations, amongst other things, “provide adequate incentives” (p. 347), and that personality variables are not likely to be influential when situations are strong. However, Cooper and Withey (2009), reviewing the empirical evidence, found no support for the strong situation hypothesis.

We believe that the presence or absence of stakes may in part determine some of the associations between personality and PD behaviour. Individuals' decisions in the laboratory are determined both by monetary considerations and by other, often unobserved, preferences (representing all other motives, such as fairness, envy, boredom, experimenter demand effects, social preferences, risk attitudes). In economic models, monetary considerations are typically modeled as taking on increasing prominence as the stakes rise (for a model and review of the empirical evidence, see Levitt and List, 2007). In the complete absence of monetary stakes, other preferences determine the participants' decisions. However, it is crucial to note that monetary incentives influence not only wealth considerations, but also other preferences. For instance, if an action has a negative impact on others, the larger the stakes, the more negative the moral payoff (Levitt and List, 2007). The hypothetical PD game may thus lack some aspects that are present in the incentivized game (e.g., possibility of negative moral payoff, monetary risk). Therefore, although we did not expect the B5 to predict PD behaviour in the hypothetical game (Hirsh and Peterson, 2009; Pothos et al., 2010), we derived a different set of predictions for the incentivized game.

Relations between the B5 and PD behaviour appear not to have been previously investigated in a monetarily incentivized PD game. However, if, monetary incentives allow generalizations from laboratory experiments to contexts outside of the laboratory (Falk and Heckman, 2009), then behaviour outside of the laboratory should also be relevant for making predictions concerning monetarily incentivized PD behaviour. We thus turned to related fields of research in order to develop predictions for the incentivized game. First off, there is clearly a moral aspect both to behaviour in the PD and to the B5. Regarding the former, the decision to cooperate involves the constraint of self-interest in favor of the common good (although we refer to cooperation in the PD as moral behaviour, it could also be referred to as

prosocial, altruistic, or other-regarding behaviour). On the other hand, as famously noted by Hofstee “the science of individual differences is deeply rooted in morality” (Hofstee, 1990, p. 82), and personality has accordingly been related to a variety of moral behaviours outside of the laboratory (for a review, see Batson, 1998), and also to questionnaire measures of moral behaviours (Krueger, Hicks, and McGue, 2001). Therefore, we believe that personality will also be related to PD behaviour in the incentivized game.

Moral behaviour may in different contexts be motivated by different sources. In the rather impersonal context offered by the PD game, stoical sources of moral motivation may be more relevant than emotions or feelings, which could be expected to matter in more personal contexts. Impartiality (De Raad and Van Oudenhoven, 2010), moral exemplarity with regard to justice (Walker and Hennig, 2004), and degree of sophistication in understanding and applying abstract moral principles (Cawley, Martin, and Johnson, 2000), have all been related to high Openness to Experience, which could thus be expected to be related to more moral behaviour in the PD game.

As maximizing joint outcome in the PD game involves taking a risk, risk considerations may also be relevant in determining PD behaviour. People scoring high on Neuroticism are known to be more risk-averse (Lauriola and Levin, 2001). High Neuroticism could thus predict lower transfers in the incentivized PD game, and these effects could at least partly be mediated by attitude towards risk-taking.

In sum, we first expected participants to show higher levels of cooperation in the hypothetical than in the incentivized game (Camerer and Hogarth, 1999; Levitt and List, 2007). More importantly, based on previously reported weak and inconsistent relations (Hirsh and Peterson, 2009; Pothos et al., 2010), we did not expect the B5 to predict behaviour in the hypothetical PD game. By contrast, building on research on moral behaviour and risk



taking, we expected high Openness to Experience and low Neuroticism to predict larger transfer in the monetarily incentivized PD game.

## 2. Method

*2.1 Participants and procedure.* Participants were invited to take part in a laboratory experiment via a University of Bonn Laboratory for Experimental Economics mailing list with around 3000 subscribers. The experimental sessions, run in six groups of 20 participants, were conducted with pen and paper and participants were seated in computer cubicles that secured anonymity. Three groups played the incentivized game ( $N = 60$ , 25 men; mean age 24.9,  $SD = 5.4$ ), and three groups the hypothetical game ( $N = 60$ , 34 men; mean age 25.4,  $SD = 4.0$ ). Participants first played either the incentivized or hypothetical PD. After this, a B5 personality questionnaire was announced and administered. Participants were paid whatever they earned in the incentivized PD plus 10 Euro for completing the B5 questionnaire. The latter reward was announced after the PD, so participants had no knowledge of it when making their PD decisions. The PD was always played first, as there is evidence that PD behaviour may be influenced by preceding measures (e.g., Knez, and Camerer, 2000), whereas no such evidence, to the best of our knowledge, exists for personality measures.

## *2.2 Measures*

### *2.2.1. Prisoner's dilemma*

Participants played a one-shot PD game with multiple choice (Goerg and Walkowitz, 2010; Lönnqvist et al., 2009). This is a PD game that allows participants to choose a cooperation level from a range of different options. Participants were anonymously and randomly matched with a second player. The currency applied in the experiment was 'Talers'.

Participants received an initial endowment of 10 Talers. They were then given the opportunity to transfer as many Talers (0–10; natural numbers) as they wished to the other

participant. The amount the participants transferred was doubled by the experimenters. At no stage was the identity of the randomly assigned other participant revealed. Moreover, participants did not learn of their partners' decisions until when they were paid at the very end of the session. In both games, 1 Taler was worth .50 Euro. In the hypothetical game, participants were at the outset told it was a hypothetical situation and that they would not be paid according to their decisions. For the exact instructions of the hypothetical game, see Appendix A. The incentivized game was otherwise similar, but the first paragraph, explaining the hypothetical nature of the game, was omitted, as well as was the word "hypothetical" from the sentence "Your personal hypothetical income can be calculated as follows".

### 2.2.2 Personality

Personality was measured with the Short Five (Konstabel, Lönnqvist, Walkowitz, Konstabel and Verkasalo, submitted for publication). This 60-item measure of the B5 factors closely mimics the facet system of the NEO PI-R (Costa and McCrae, 1992). Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C) are each measured with 12 items. The reliabilities were .87, .84, .79, .70, and .82, respectively.

### 2.2.3. Risk attitude

As a measure of risk attitude participants responded on an eleven point scale to the item "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" (see Dohmen et al., 2005). The anchors were '*unwilling to take risks*' and '*fully prepared to take risk*'. The mean score was 5.37 ( $SD = 2.14$ ).

## 3. Results

Neither sex nor age influenced decisions in either game, and were excluded from further analysis (in the incentivized game, transfer decisions correlated .03 and .08 with sex and age, respectively; the corresponding correlations in the hypothetical game were .05 and .01).

Comparing the incentivized game and hypothetical version of the game, a one-way ANOVA showed, as expected, that people tended to transfer about 25 % more in the hypothetical game (4.68 vs. 3.42,  $F(1, 118) = 4.26, p < .05$ ). More importantly, in the incentivized version of the game, a linear regression that predicted transferred amount with all B5 personality traits showed that personality predicted transferred amount ( $F(5, 54) = 2.86, R^2 = .21, p < .05$ ). However, in the hypothetical version of the game, a similar regression showed that personality did not predict transferred amount ( $F < 1, R^2 = .02$ ). The B5 predicted more variance in the incentivized than in the hypothetical game ( $R = .46$  vs.  $R = .13$ ; for the difference in coefficients of multiple correlation,  $z = 1.99, p < .05$ ). The unstandardized regression coefficients, along with the zero-order correlations, for all traits in both versions of the game are presented in Table 1. As expected, in the incentivized game, low N and high O predicted higher transfers, this was apparent both in the regression coefficients, and in the zero-order correlations between these two traits and transfer behaviour. High E also appeared to be related to higher transfers. However, this result showed only in the zero-order correlations, suggesting no independent predictive power for E. There was also a trend towards significance for high C to predict lower transfers. This relation did not show in the zero-order correlations, suggesting the possibility that C may act as a suppressor variable. Such a potential suppressor effect should be replicated before considered reliable (see Paulhus, Robins, Trzesniewski, and Tracy, 2004).

INSERT TABLE 1 AROUND HERE

We finally investigated whether risk attitude would mediate the relations between N and generosity in the incentivized game. To test for the significance of the mediation we used

Preacher and Hayes's (2004) method of calculating standard errors and 95% confidence intervals of the effect of N on behaviour through risk attitude. We used 10,000 bootstrapped samples to estimate the confidence intervals. Results of these analyses suggest that risk attitude partially mediated the relation between N and behaviour, Mediated Effect = .04, SE = .02, 95% CI = - .08 - .01. Because the confidence interval did not contain zero, there was a statistically significant mediation effect of N on behaviour through risk attitude. In contrast, risk attitude did not play a part in the decisions made in the hypothetical game, nor mediate the influence of any other personality traits on PD behaviour.

#### 4. Discussion

The results confirmed that people behaved less generously when monetary stakes were involved. More importantly, the results also showed that personality predicted behaviour only in the incentivized game. As expected, high O and low N predicted higher transfers in the incentivized game.

Our results from the hypothetical game – i.e., that personality is not related to hypothetical PD decisions – replicate almost perfectly those reported by Pothos et al. (in press) and Hirsh and Peterson (2009). However, with regard to N, Hirsh and Peterson (2009) reported a positive relation between high N and cooperative PD behaviour. As this is the opposite of what we found in the incentivized game, it is reassuring that we also identified a mechanisms that may cause these differences. N is an important trait in the prediction of risk-taking (Lauriola and Levin, 2001), and risk attitude mediated the influence of N on incentivized PD behaviour. As this did not happen in the hypothetical game, it seems that participants were not afraid of losing points that were not worth anything. This interpretation would be consistent with participants' more generous behaviour in the hypothetical game. N has also been studied in conjunction with the Trust game (Lönqvist, Walkowitz, Wichardt,

and Verkasalo, 2010). In this game, the Trustee (the person to whom money is transferred and who decides on how much to transfer back), makes a somewhat similar decision as do the players in a PD game. Here, Trustees having the combination of high N and low A ruin cooperation. Together, these laboratory results, as well as result relating high N to questionnaire measures of antisocial behaviour (Krueger, Hicks, and McGue, 2001), suggest that high N is more likely to be related to low than high levels of cooperation.

Our results are in line with some recent research in economics suggesting that monetary incentives are truth-revealing. For instance, people act more consistently when choosing among different lotteries when there are monetary stakes involved, suggesting that their true preferences are more influential under such conditions (Berg, Dickhaut, and Rietz, 2010). Within economics there is mounting evidence that people judge hypothetical and actual scenarios differently (Camerer and Hogarth, 1999). This is a genuine problem for some fields, such as environmental valuation, where there is intrinsically an element of uncertainty involved (e.g., Harrison, 2006). However, such an element of uncertainty or make believe need not necessarily enter into the social dilemma games that psychologists conduct. This would be especially appropriate for studies involving personality, as personality psychology has been accused of having accumulated a vast amount of research on personality, but much less relating personality to actual behaviour (Baumeister, Vohs, and Funder, 2007).

The effect sizes we found for the B5 were similar to those reported in a recent meta-analysis on social value orientation and cooperation in social dilemmas (Balliet, Parks, and Joireman, 2009). However, contrary to our results, that study also showed that the effect size for the social value orientation scale is smaller when participants are paid than when they are not paid. But this is perhaps not that surprising, the social value orientation scale classifies people into competitors, cooperators, and individualists based on their preferences in

hypothetical scenarios in which participants are required to allocate points to themselves and an imaginary other person. Preferences in hypothetical scenarios and decisions in hypothetical social dilemmas may share method variance that is not present in incentivized decisions (see Podsakoff, MacKenzie, Lee, and Podsakoff, 2003), and this shared variance might explain why the social value orientation scale performs better in hypothetical scenarios.

Our results are not entirely without precedent. Lönnqvist et al., (2009) conducted two studies in which they investigated how personal values (trans-situational goals that serve as guiding principles in the life of a person; Schwartz, 1992) predicted behaviour in the same PD game that was used in the present study. In the laboratory study (Lönnqvist et al., 2009; Study 2), in which all participants were paid according to their decisions, personal values predicted 15% of the variance of decisions. However, in a nearly identical follow-up conducted over the internet, and in which only some participants – to be determined by lottery – were paid, personal values predicted only 2% of the variance of the PD decisions (Lönnqvist et al., 2009; Study 3). Personal values, like the B5, are measured with questionnaires that ask how the respondent typically behaves, thinks, and feels; that is, what the respondent is like outside of the laboratory. Thus, a connection to real life, brought about by real payment, may be useful for personality questionnaires to better predict laboratory behaviour. However, as these results are contrary to those reported for the social value orientation scale (Balliet, Parks, and Joireman, 2009), and the sample sizes of the present study were rather small, some caution in interpreting the present results is advisable until the results can be replicated.

In future work, it would be important to investigate how the presence or absence of monetary incentives influences behaviour in other types of social dilemma games. A systematic investigation of how the size of the stakes influences the predictive power of

individual differences variables would also be valuable. It is quite conceivable that large enough stake sizes would mitigate the predictive power of individual difference variables, leading to a curvilinear relation between the predictive power of such variables and stake size. Another highly important topic for future research would be to connect behaviour in both hypothetical and incentivized social dilemma games to relevant behaviours outside of the laboratory. But one conclusion that the present study does offer is that psychologists should at least consider making their participants' decisions matter by means of monetary incentives. This would reduce bias caused by the hypothetical nature of the situation, and arguably connect the decisions more strongly to real life.

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