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## **Social capital to induce a contribution to environmental collective action: results from a laboratory experiment in Indonesia**

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**Abstract:** This paper examines whether social capital increases individual contribution in an environmental collective action. Using a laboratory experiment, two games are played among participants in a sequential manner: a trust game to measure level of trust – as a proxy for social capital – and a public goods game to measure individual contribution to environmental collective action in the case of waste collection management. The results show that the level of social capital positively impacts individual contribution to environmental collective action. This study also finds that disclosing partial information on a group member's behaviour in the previous trust game has an impact on people's willingness to pay for a public good. However, having partial knowledge as to whether a trustworthy or generous person exists in the group does not make any difference.

**Keywords:** social capital; environment; collective action; trust game; public goods game; laboratory experiment; Indonesia.

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## **1 Introduction**

Social capital plays an important role in promoting collective action (Ostrom, 2000), including promoting resource sustainability and environmental protection (Basili et al., 2006; Gibson et al., 2005; Ishihara and Pascual, 2013; Meinzen-Dick and Di Gregorio, 2004; Pretty, 2003). Social capital functions to promote cooperation and to generate a flow of benefits through collective action by lowering transaction costs, reducing the free rider problem and increasing individual contribution (Collier, 2002; Ishihara and Pascual, 2013; Paavola and Adger, 2005; Pretty and Ward, 2001; Putnam, 1993; Ostrom, 2000; Ostrom and Ahn, 2003).

The concept of social capital has been developed by leading sociologists, economists and political scientists. Despite many definitions and interpretations, it is agreed that social capital is all about the connectedness of citizens to their community (Dasgupta and Serageldin, 1999). It has a multi-dimensional nature and no theory has fully captured all of its components (Kits, 2011). Ostrom and Ahn (2003) mentioned that three things form social capital i.e., trustworthiness, networks and institutions (formal and informal rules). However, several social capital studies emphasise trust as a key component (Bowles and Gintis, 2002; Putnam, 2000) and as central to the theory of social capital (Bouma et al., 2008; Fukuyama, 1995; Putnam, 1995).<sup>1</sup>

Studies measuring social capital and observing the links between social capital and environmental collective action exist in the literature. Among others are works by Rodriguez and Pascual (2004) on social capital and collective action in mountain agroecosystems in Peru, by Bouma et al. (2008) on community resources management in India, by Nath et al. (2010) on social capital and forest resource management in Bangladesh, and by Cardenas et al. (2011) on the collective action for watershed management in Columbia and Kenya. All these studies suggest the same finding that social capital promotes environmental collective action.

There has only been a very limited number of empirical works on observing the links between social capital and environmental collective action in Indonesia. Among the few is the work by Isham and Kähkönen (1999) on the issue of a community-based water project in Central Java. The empirical works by Beard (2005, 2007) have an Indonesian context, but do not involve the issue of environmental collective actions. More empirical works on social capital and environmental collective action in Indonesia are needed since Indonesia is the fourth largest country in terms of population, and it has serious environmental issues. Among these environmental issues are, first, Indonesia has the third largest area of tropical forest in the world and it has one of the fastest deforestation rates (Resosudarmo et al., 2012); second, Indonesia is among the top 5 CO<sub>2</sub> emitters in the world (Resosudarmo et al., 2013); third, pollution and waste management in the mega cities of Indonesia are an alarming issue (Amalia et al., 2014; Pasang et al., 2007). In an effort to fill this literature gap, this paper investigates the role of social capital, measured by the level of trust, in individual contributions to an environmental collective action in Indonesia.

To produce and analyse textual data about social capital, some studies have adopted qualitative methods such as focus group discussions, institutional mapping, and priority rankings, which allow for more in-depth analysis of social, political, and economic processes (Hentschel, 1999; Krishna and Shrader, 2000). However, Dudwick et al. (2006) highlighted some limitations of the qualitative method. Firstly, it is difficult to extrapolate

the qualitative finding for broader inference as the sample is not random and small. Secondly, it can also be difficult to replicate and therefore independently verify the results of qualitative research. Thirdly, interpretation of different researchers' qualitative data may lead to different conclusions.

On the quantitative side, most literature on social capital and collective action uses self-reporting information gathered using a set of questions to measure them (Beard, 2005, 2007; Isham and Kähkönen, 1999; Leonard et al., 2010). However, there are potential problems in measuring social capital that relate to vague interpretations regarding social capital, poor data sources, and the possibility of measurement error that could be brought into identification and endogeneity issues (Durlauf, 2002a). There is also concern that survey-based measures of social capital are not meaningful, particularly, since the concept of social capital is not easily understood by the general population (Anderson et al, 2004; Glaeser et al., 2000). The limitations of survey-based measuring of social capital give rise to the suggestion to use an experimental approach to measure social capital (Durlauf, 2002a, 2002b). Relatively few works in developing countries measure social capital in this way.

In this paper, we utilise an experimental game to quantitatively measure trust as a proxy for social capital. It also compares trust measurements from the trust game and the questionnaire to ensure the robustness of the experiment result.

We conducted a series of classroom experiments among undergraduate students to test whether social capital induces individual contribution in a collective action problem, using both a trust and a public goods game in a sequential manner. The public goods game represents the case of waste collection management. We apply treatment to the group in the public goods game to look at whether partial disclosure of a group member's behaviour in the trust game affects individual contributions in the public goods game.

The following section describes the method utilised in this paper, including the experiment's mechanism. Section three delivers the laboratory-experiment results and deliberates deep analysis. The conclusion is presented in the last section.

## 2 Method

In this paper, we attempt to investigate the role of social capital, measured by the trust level, in making contributions to a collective action – which provides environmental public services in the case of waste collection management. Two games are conducted sequentially: a trust game and a public goods game with a threshold. The trust game measures the trust level and the public goods game measures individual contributions in public goods provision in the case of uncollected trash. In addition, for comparison purposes, the trust level is also measured by a questionnaire on social capital.

We used a computerised class experiment in which 462 undergraduate students voluntarily participated. The experiment was conducted in May 2013 in a computer laboratory at the Faculty of Economics in one of the main universities in Indonesia, using widely-used software, namely Zurich toolbox for readymade economic experiments (z-Tree) (Fischbacher, 1999). Each session had 16 participants and there were 29 sessions of the experiment in total. Each session took about one hour. All the sessions were completed within ten days.

The experiment was advertised through a mailing list and 838 applicants registered online and about 105 applicants registered on the spot. Those who registered online could

choose a timeslot/session. We selected participants randomly if more than 16 participants registered for any particular session. If there were applicants who registered online but did not arrive, we immediately replaced them with applicants who had registered on the spot. We invited 18–20 participants to each session in case there were no-show participants. If more than 16 participants arrived, we paid IDR 20,000 as a show-up fee to those who registered but could not become participants in the experiment.<sup>2</sup>

All participants were guaranteed a minimum payment of IDR 20,000. In this experiment, there was no communication between participants and their identities were confidential. Although participants played two sequential games – the trust game and then the public goods game, at the beginning of the experiment the participants were informed that the amount earned would be determined by lottery. Participants only received one payoff from either the trust game or the public game.

The lottery was conducted to ensure that the payoffs from both games were independent of each other. This is important because should a participant receive payoffs from both games, two problems arise: Firstly, if participants are guaranteed a payoff from the trust game, this payoff would be added to the endowment received from the public goods game. The endowment in the public goods game would no longer be equal among all participants, and this would complicate the analysis of the results. Secondly, an individual's decision as to the size of their contribution in the public goods game is dependent on their earnings in the trust game. As the social capital is represented by the trust game and collective action is represented by the public game, such dependency should remain and be observed to answer the research question.<sup>3</sup>

There are four activities in this experiment, conducted as follows: *First*, participants fill out a social capital questionnaire mostly adapted from Bullen and Onyx (1998). Table 1 shows the questions on trust. Table 2 shows the questions on civic engagement, which together with trust compose the social capital scores.<sup>4</sup>

**Table 1** Trust questions

| No | Trust question  | Minimum (1)    | Maximum (4)       |
|----|---|----------------|-------------------|
| 1  | Some say that by helping others you help yourself in the long run. Do you agree?          | No, not at all | Yes, very much so |
| 2  | Do you feel safe walking down your street after dark?                                     | No, not much   | Yes, very         |
| 3  | Do you agree that most people can be trusted?   | No, not much   | Yes, very much so |
| 4  | Can you get help from friends when you need it?   | No, not at all | Yes, definitely   |
| 5  | If you disagree with what everyone else agrees on, would you feel free to speak out?      | No, not at all | Yes, definitely   |
| 6  | If you have a dispute with your neighbours or friends, are you willing to seek mediation? | No, not at all | Yes, definitely   |
| 7  | Do you think that multiculturalism makes life in your area better?                        | No, not at all | Yes, definitely   |
| 8  | Do you enjoy living among people of different lifestyles?                                 | No, not at all | Yes, definitely   |
| 9  | How many best friends do you have right now?  | None           | 5 or more         |

Note: Answers are in a Likert scale from 1 to 4.

**Table 2** Civic engagement questions

| <i>No</i> | <i>Civic engagement question</i>  | <i>Minimum (1)</i> | <i>Maximum (4)</i>                    |
|-----------|---|--------------------|---------------------------------------|
| 1         | Have you ever picked up other people's rubbish in a public place?   | No, never          | Yes, frequently                       |
| 2         | Do you help out a local group (in your campus or local community) as a volunteer?   | No, not at all     | Yes, often<br>(at least once a week)  |
| 3         | Are you an active member of an organisation or club such as in your campus or outside campus, sports club social organisation, or other kind of organisation? | No, not at all     | Yes, very active                      |
| 4         | Does your local community (in campus or your neighbourhood) feel like home?   | No, not at all     | Yes, definitely                       |
| 5         | In the past week, how many phone conversations have you had with friends?   | None               | Many (at least 6)                     |
| 6         | How many people did you talk to yesterday?  | None at all        | Many (at least 10)                    |
| 7         | When you go shopping in your local area are you likely to run into friends and acquaintances?   | No, not much       | Yes, nearly always                    |
| 8         | In the past 6 months, have you done a favour for a sick friend/neighbour?   | No, not at all     | Yes, frequently<br>(at least 5 times) |
| 9         | Are you on a management committee or organising committee for any local group or organisation?  | No, not at all     | Yes, several<br>(at least 3)          |
| 10        | In the past 3 years have you ever taken part in a local community project (in your campus or neighbourhood) or working bee?                                   | No, not at all     | Yes, many times                       |
| 11        | Have you ever been part of a project to organise a new service in your area (e.g. cleaning the neighbourhood together, social project, etc)                   | No, not at all     | Yes, several times<br>(at least 3)    |

Note: Answers are in a Likert scale from 1 to 4.

*Second*, they play the trust game. In this game, every participant is given IDR 50,000 and the computer assigns 16 participants randomly into two equal groups: group A and group B. Each participant in A is paired randomly with a participant from B. Each participant in A is asked to decide how much money, if any, is to be given to B. A has the option to give nothing, all of it, or some. The computer will triple the money A decides to send to B, and B receives all of it. After that, B is asked to decide how much money should be returned to A. B could give nothing, all of it, or some. B possesses three times the money A initially sent, plus an endowment of IDR 50,000. Both A and B know that the computer has tripled the money transferred by A. We adopted this game from an investment game by Berg et al. (1995) and modified it by allowing B to give money to A from his/her endowment, not only from the tripled money he/she received from A.

*Third* is a public goods game with a threshold. There were 116 groups of 4 assigned persons. These groups are categorised into three types: control, treatment 1 and treatment 2 groups. The control groups are those who are selected randomly: we assigned 2 A persons and 2 B persons to form a group, with no assurance that an A–B couple from the trust game would be in the same group. In the treatment 1 groups we deliberately put 2

A–B couples from the trust game into a group. The treatment 2 groups are those where no A–B couple from the trust game would be in the same group. Please note there are more than 30 groups formed using each method.

In this public goods game, each group faces the same problem, namely neighbourhood trash that has not been collected for about two weeks. The neighbourhood smells bad and residents find it uncomfortable to live there. There is a health risk of diarrhoea. Everyone gets IDR 50,000 as an endowment and each participant will be asked how much he/she wishes to contribute to resolving the problem – none of the IDR 50,000 received, all of it or some. A group will be able to solve this problem if the total contribution of the group reaches IDR 100,000.

If the threshold is met, the computer will double the total contribution of the group and distribute it – defined as the benefit of collection action – equally among group members who are successful in reaching the threshold. This benefit will be added to the money they already have at hand. It can be seen that the higher the total contribution of a group, the higher the returns for its members. But if the threshold is not met, group members will have their contribution returned.

*Fourth*, at the end of the game, the participants are asked to fill in the socio-economic questionnaire and redeem the money they have earned based on the lottery results.

### **3 Results and analysis**

As many as 40 experimental sessions of the trust game were planned. The first 10 trial sessions were designed to test and improve the game procedures and computer program. Due to time constraints it was not possible to implement the last session, so a total of 462 observations or 231 pairs was produced from the 29 sessions.

68% of the samples are female. About 74% are social science students; and 39% are from the Faculty of Economics. Most participants are 19–20, with the youngest participant aged 17 and the oldest 24. 70% of the participants are in their 1st and 2nd years of study. About 73% of participants come from urban areas and the rest from rural areas. Most participants have a family member (including the member) with a bachelor's degree as the highest educational attainment level (80%). About 62% of participants' families have migrated from their hometown. For 88% of participants, this is the first time they have participated in an experiment. Almost 74% of participants have friends or know of other participants in the same session of the experiment.

Table 3 gives statistics that illustrate the results of the two games. In the trust game, on average trustor A sent IDR 17,118 while trustee B sent back IDR 24,522. Some As and Bs sent no money to their partner while some As sent all. The maximum value B sent to A is IDR 190,000 which means that this person not only sent to A the money received from A (after it had tripled), but also some of his endowment. In the public goods game, the average contribution is IDR 31,906, with some participants contributing nothing and some all of their endowment. The range of group contribution in the public goods game is between IDR 37,500 and IDR 190,000.

The analysis of the experiment results is divided into three parts, namely, an analysis of trust behaviour from the trust games; an analysis of trust measurement from the experiment and whether this correlates and is consistent with the trust measurement from

the social capital questionnaire; and the main analysis of this paper, discussing whether trust influences the contribution to solving the collective problem.

**Table 3** Statistics descriptive of the games results

| <i>Parameter</i> | <i>Trust game</i>      |                            | <i>Public goods game</i>       |                           |
|------------------|------------------------|----------------------------|--------------------------------|---------------------------|
|                  | <i>Money sent by A</i> | <i>Money returned by B</i> | <i>Individual contribution</i> | <i>Group contribution</i> |
| Mean             | 17,118                 | 24,522                     | 31,906                         | 128,244                   |
| Std dev          | 14,229                 | 27,916                     | 12,898                         | 28,532                    |
| Min              | 0                      | 0                          | 0                              | 37,500                    |
| Max              | 50,000                 | 190,000                    | 50,000                         | 190,000                   |
| Observations     | 231                    | 231                        | 231                            | 231                       |

### 3.1 Trust behaviour

The results of the trust game show that on average, A sent IDR 17,118 or 34% of her/his endowment to B (Table 3). On average, trustor A who sent appropriate sums of money to trustee B received IDR 24,522 or 39% more than she/he had invested in B. Therefore, on average, trust was marginally honoured.

Table 4 describes in detail how B and A behaved in the trust game. Ten participants (4.3%) in Group A gave nothing to B and 11 participants (4.8%) from Group B gave nothing to A. Seven Group B participants sent money to A, even though A sent nothing to them. Fifteen Group A participants gave all their money to Group B. However, 50% of participants belong to a pair where A gives something to B and B gives A more than A gave to B. From this figure it can be concluded that trust exists.

**Table 4** Distribution of decision type in the trust game

| <i>Decision</i> | <i>Frequency</i> | <i>Percentage</i> |
|-----------------|------------------|-------------------|
| A > 0           | 221              | 95.67             |
| B > 0           | 220              | 95.24             |
| A > 0; B > A    | 116              | 50.22             |
| A > 0; B = A    | 27               | 11.69             |
| A > 0; B < A    | 78               | 33.77             |
| A = 0; B > A    | 7                | 3.03              |
| A = 0; B = 0    | 3                | 1.30              |

Note: Number of pairs = 231.

Acting as the second mover, trustee B's decision as to how much money she/he is willing to give to A could vary. Trustees B can then be decomposed into four types based on how they reciprocate A's gift. A ratio is used between the money sent back by trustee B over money sent by trustor A as an indicator for categorising trustee reciprocal behaviour (Ahmed, 2011). Trustee reciprocal behaviour is the departure point from which to examine the level of trustworthiness<sup>5</sup> of B.

First is the *exploitative trustee*. About 34% of trustees B had a ratio of less than 1 between the amount received by trustee B and that sent by trustor A. This trustee B type



can be classified as purely selfish individuals who exploited the trust shown by trustor A because they sent back less money than trustor A had sent them. In this case, trustor A is worse off. Of the 11 trustees B who sent no money to trustor A, about 8 of them had been sent a positive amount of money by A. Therefore, trustor A lost their entire investment to B.

The second type is the *egoistic trustee*. About 27 trustees B (12%) had a ratio equal to 1 between the amount they received and that sent by trustor A. This trustee B type can be classified as egoistic reciprocators because they sent back the same positive amount of money they had received from trustor A. In this case, trustee B only cares about how to maximise their welfare without sharing the benefit with trustor A or worsening their condition. Therefore, A's trust is not honoured.

The third type is the *generous trustee*. This type covers the majority of trustees B where 116 or approximately 50% of trustees B had a ratio of more than 1 between the amount they received and the amount sent by trustor A. In this case, both trustor A and trustee B gain by trusting each other. Trustor A received more than they invested. Therefore, trust from trustor A is honoured.

The last type is the *altruistic trustee*. Seven trustees B (3%) can be categorised as altruists because although their partner trustor A did not give them anything (any trust), trustee B is still willing to make A better off by sending back a positive amount of money.

**Table 5** Trust and social capital level from trust game and questionnaire

| Trust game                         |                             | Questionnaire          |                      |      |
|------------------------------------|-----------------------------|------------------------|----------------------|------|
| Category/decision                  | Trust score                 | Civic engagement score | Social capital score |      |
| Trustor A                          | A1 ( $A > 0$ ; $B > A$ )    | 3.15                   | 2.92                 | 3.02 |
|                                    | A2 ( $A > 0$ ; $B \leq A$ ) | 3.13                   | 2.98                 | 3.05 |
|                                    | A3 ( $A = 0$ ; $B = 0$ )    | 3.07                   | 2.79                 | 2.92 |
|                                    | A4 ( $A = 0$ ; $B > 0$ )    | 3.32                   | 2.88                 | 3.08 |
| Trustee B                          | B1 ( $B > A$ ; $A > 0$ )    | 3.16                   | 2.93                 | 3.03 |
|                                    | B2 ( $B < A$ ; $A > 0$ )    | 3.12                   | 2.98                 | 3.04 |
|                                    | B3 ( $B = 0$ ; $A = 0$ )    | 2.93                   | 2.97                 | 2.95 |
|                                    | B4 ( $B > 0$ ; $A = 0$ )    | 3.06                   | 2.60                 | 2.81 |
| Trust pair ( $A > 0$ and $B > A$ ) |                             | 3.15                   | 2.91                 | 3.02 |
| Mistrust pair (others)             |                             | 3.12                   | 2.98                 | 3.04 |
| All                                |                             | 3.14                   | 2.94                 | 3.03 |

Notes: All values are an average score. From a total of 20 questions on social capital, eleven questions are about civic engagement, nine questions are about trust.

### 3.2 Trust measurement: experiment vs. questionnaire results

We aim to compare the measurement of trust from the trust game with that of the social capital questionnaire. Table 5 presents trust scores from the trust game and the questionnaire as well as the social capital score. The trust scores of A and B are divided according to their decision in the trust game. A4, namely trustor A who gives nothing to

B, would be expected to have the lowest score. On the contrary, A4 has the highest trust and social capital scores. It was also observed that in the case of B4, who is supposed to have a high trust and social capital score since he is an altruist, the figure shows that to the contrary, B4 did not receive the highest trust score, and furthermore his social capital score is the lowest due to a low score for civic engagement. These results suggest that, if it is to be believed that the game could extract a better true value of trust than the self-reporting questionnaire, the latter does produce a serious measurement error regarding trust and therefore social capital variables. Observing this table, it can be concluded that there is no consistency between trust (and social capital) measurements in the survey and trust measurements in the experiment.<sup>6</sup>

### 3.3 Trust and its contribution to collective action

Two models are used to determine whether trust can affect individual contribution to a collective action. The models use the amount of money sent to the partner as a proxy of trust (Bouma et al., 2008; Karlan, 2005). Model A represents A's behaviour and model B represents B's. The models for A as trustor and B as trustee are separated because of their different role in the trust game. For A, this money sent represents the level of trust that A gave to her/his partner B. For B, this money sent represents the level of trustworthiness of B or how B wants to reciprocate the trust from A. It is important to note that the amount of money B gives back is suspected to be important for A's decision about how much to contribute in the public goods game. So, a variable is placed on the relative amount of money sent by B and A which is represented by the second explanatory variable i.e., the ratio of money sent. The higher the ratio, the higher the trustworthiness of B will be.

Table 6 presents the definition and summary statistics of the variables utilised in the analysis and Table 7 shows how the explanatory variables affect contributions made by A and B in a public goods game. The results show that for both A and B, the amount contributed in the public goods game is positively dependent on the amount of money contributed to their partner in the trust game.

In the trust game, money sent by A to B measures how much A trusts B, and for B, money sent back by B to A measures how trustworthy B is with regard to A. Comparing the coefficient, additional money contributed in the public goods game as a proportion of additional money sent in the trust game is much less for B than A (*ceteris paribus*). For each additional IDR 1,000 that A gives to B, A's contribution to the public good game would significantly increase by IDR 286. For B, the coefficient is much lower: she/he only wants to contribute IDR 71 for each additional IDR 1,000 that he/she gives back to A. Trustor A is sensitive to the ratio of money sent back by B over what she/he has received from A; as B generously sending more money to A is relative to what A has sent to her/him, A will contribute more in the public goods game.<sup>7</sup>

For both A and B, the amount of money contributed in the public goods game also depends on obedience to their religiosity. As the religious rate (scale 0–10) increases by 1, the amount of money contributed increases by about IDR 985 for A and IDR 1,301 for B. This fact concurs with some studies which found that trusting increases with an increase in religiosity (Tan and Vogel, 2008); although this claim is still inconclusive as another other study found religiosity has a negative effect (Berggren and Bjørnskov, 2009) and only plays a minor role (Leon and Pfeifer, 2013).

**Table 6** Definition of explanatory variables and their means

| <i>Variable</i>                       | <i>Definition</i>  | <i>Mean for A</i> | <i>Mean for B</i> |
|---------------------------------------|--|-------------------|-------------------|
| Contribution to public good           | Amount of money contributed to the public good in the public good game (in Rp thousand)                        | 31.91             | 31.74             |
| Money sent to partner                 | Amount of money sent to partner in the trust game (in Rp thousand)   | 17.12             | 24.52             |
| Ratio of money sent B/A               | Ratio of money sent back by B to money sent by A   | 4.47              |                   |
| Ratio earning B/A                     | Ratio of B's payoff to A's payoff  |                   | 2.58              |
| Treatment 1                           | 1 if couple A and B from the trust game is put in the same group during the public goods game, or otherwise 0  | 0.31              | 0.31              |
| Treatment 2                           | 1 if couple A and B from the trust game is put in separate groups during the public goods game, or otherwise 0 | 0.34              | 0.34              |
| Gender                                | 1 if male and 0 if female  | 0.32              | 0.32              |
| Type of region during childhood       | 1 if grew up in urban areas, or otherwise 0  | 0.74              | 0.71              |
| Using ethnic language                 | 1 if using an ethnic language at home, or otherwise 0  | 0.64              | 0.62              |
| Has mother and father                 | 1 if still having both mother and father, or otherwise 0   | 0.90              | 0.89              |
| Migrant                               | 1 if have migrated from homeland, or otherwise 0   | 0.60              | 0.64              |
| Pocket money                          | Monthly pocket money (in Rp/1000)  | 1,011.97          | 855.84            |
| Environmental concern                 | Rating of concern to environment (0 = lowest; 10 = highest)  | 9.37              | 9.39              |
| Religious practitioners               | Rating of obedience to religious rule (0 = lowest; 10 = highest)   | 7.44              | 7.80              |
| Participate in other experiments      | Has ever participated in similar experiment (1 = yes; 0 = no)  | 0.10              | 0.13              |
| Number of friends in the same session | Number of friends in the same session (in person)  | 1.97              | 2.04              |
| Economics                             | 1 if taking an major in economics, or otherwise 0  | 0.43              | 0.35              |

**Table 7** Model estimation of contribution in public goods game

| <i>Independent variables</i>          | <i>Model for A</i> |     |                  | <i>Model for B</i> |     |                  |
|---------------------------------------|--------------------|-----|------------------|--------------------|-----|------------------|
|                                       | <i>Coefficient</i> |     | <i>Std error</i> | <i>Coefficient</i> |     | <i>Std error</i> |
| Money sent to partner                 | 0.286              | *** | 0.061            | 0.071              | **  | 0.029            |
| Ratio of money sent B/A               | 0.321              | **  | 0.131            |                    |     |                  |
| Ratio earning B/A                     |                    |     |                  | -0.122             |     | 0.205            |
| Treatment 1                           | 4.828              | *   | 2.160            | 3.997              | *   | 2.151            |
| Treatment 2                           | 5.220              | *   | 2.119            | 5.315              | **  | 2.447            |
| Treatment 1 * ratio of money sent B/A | -0.331             |     | 0.160            |                    |     |                  |
| Treatment 2 * ratio of money sent B/A | -0.037             |     | 0.213            |                    |     |                  |
| Treatment 1 * ratio earning B/A       |                    |     |                  | 0.069              |     | 0.270            |
| Treatment 2 * ratio earning B/A       |                    |     |                  | -0.589             |     | 0.805            |
| Gender                                | 2.086              |     | 1.888            | 3.308              | *   | 1.749            |
| Type of region during childhood       | 0.563              |     | 2.044            | 0.478              |     | 2.145            |
| Using ethnic language                 | 0.576              |     | 1.795            | -1.888             |     | 1.894            |
| Has mother and father                 | -0.172             |     | 2.739            | -1.173             |     | 2.499            |
| Migrant                               | -0.608             |     | 1.760            | 2.782              |     | 1.839            |
| Pocket money                          | 0.000              |     | 0.001            | 0.003              |     | 0.002            |
| Environmental concern                 | 0.410              |     | 0.823            | 1.529              | *   | 0.791            |
| Religious practitioners               | 0.985              | **  | 0.465            | 1.301              | *** | 0.480            |
| Participate in other experiments      | -6.297             | **  | 2.873            | 2.784              |     | 2.382            |
| Number of friends in the same session | 0.152              |     | 0.432            | 0.696              | *   | 0.413            |
| Economics                             | -0.622             |     | 1.828            | -5.651             | *** | 1.823            |
| Constant                              | 11.951             |     | 9.046            | -0.042             |     | 8.561            |
| Adj-R-squared                         | 0.1227             |     |                  | 0.1228             |     |                  |
| R-squared                             | 0.1876             |     |                  | 0.1877             |     |                  |
| F                                     | 2.89               |     |                  | 2.89               |     |                  |
| Prob >  F                             | 0.0002             |     |                  | 0.0002             |     |                  |
| Observations                          | 231                |     |                  | 231                |     |                  |

Notes: The coefficients are reported for an OLS. All variables in money terms counted in thousand rupiahs.

\*statistical significance at 10% level, \*\*statistical significance at 5% level,

\*\*\*statistical significance at 1% level.

### 3.4 Treatment effect

Group treatment is conducted to answer the research question about whether particular disclosure in a group could affect individual contributions to solving a collective problem. Treatment 1 is represented by a couple A and B from the trust game being in the same group during the public goods game. In this case, what happens in the trust game may affect the public goods game or influence the contribution in a public goods game.

Treatment 2 is where it is certain a couple A and B from the trust game is not in the same group during the public goods game. Given this kind of treatment, the decision of each participant in the public goods game could be independent of that in the trust game. The control/reference groups are groups consisting of randomly chosen As and Bs. Those receiving the first or second treatments are controlled using a dummy variable.

From the estimation result (Table 7) it can be seen that the treatments affect both trustor A and trustee B. It was observed that disclosing partial information on who is in the group; partial information on a group member's behaviour in the previous trust game, has an impact on people willingness to pay for a public good. And when the coefficients of treatment 1 and treatment 2 are compared, they are not significantly different.

It is also to be expected that if A or B have partial knowledge that there is or there is not a trustworthy or generous person her/his group, this information would affect her/his contribution to the public good. Hence, it is to be expected that the coefficients of interaction between treatment 1 or treatment 2 and the ratio of money sent B/A variables in model A and those of treatment 1 or treatment 2 and the ratio earning B/A variables in model B would be significant. The results in Table 7, however, show that this is not the case; i.e. whether or not one has partial knowledge that there is or there is no a trustworthy or generous person in the group does not make any difference.

To further understand the impact of group treatment in our experiment, a more detailed descriptive analysis is conducted as follows. Table 8 describes the average contribution in the public goods game based on a pair's decision in the trust game and their group treatment. The first four rows are the average contribution of A in the public goods game in each treatment, and the second four rows show the average contribution of B. A and B are also decomposed into four categories based on their decision in the trust game. On average, the average contribution of the control group gives the lowest figure. The feature of the control group is a random selection of participants or high uncertainty as to what type of person belongs to this group. On the other hand, treatment 2 group gives the highest average contribution in the public goods game. Both treatment 1 and 2 reveal several pieces of information to the participant, which reduces the uncertainty. But how can treatment 2 group give the highest figure? The answer is that in treatment 1 group, the condition of past relations is different for every pair, with some participants being part of a generous pair, some not, and some even having been in an exploitative pair. This pair condition is suggested to have an impact on their contribution in the public goods game. In this sense, the average contribution in treatment 1 group logically may be lower than in treatment 2 group according to the previous argument.

B3's contribution in the public goods game was as expected. B3 is the one who does not receive anything from A3. For all treatments, B3 makes the lowest contribution. However, the figure is only arrived at from one sample each, so validation of this value has to be confirmed by another study with larger data on this pair type.

An altruistic person, B4, makes the highest contribution in treatment 2 group, where she/he is sure that she/he is not in the same group as her/his partner A. Her/his partner does not give any money to her/him and when she/he is not in the same group as A, she/he can reveal her/his altruistic behaviour by giving all her/his money to public goods.

One would expect that for the trust-game pair (A1 and B1), the average contribution in treatment 1 would be higher than other group types (control group and treatment 2). But this table shows that neither A nor B belonging to the trust-game pair has the highest average contribution in the treatment 1 group, where they are in the same group in the

public goods game. The highest average contribution by A1 is when she/he is not in the same group as her/his partner B1 (treatment 2 group) and for B1, the highest average contribution is when she/he is in a random grouping type (control group). Another paradox is evident with A3, where she/he makes a large contribution to the public goods game after having sent nothing to her/his partner B.

For A1, the explanation could be similar to what Oliver (1984) found. Being in the same group as her/his generous partner B1 (treatment 1) does not motivate her/him to contribute more since she/he is sure that her/his partner is a generous person. In this case, A1 acts to maximise her/his payoff with this information about her/his type of partner.

An ANOVA test has been conducted to look at whether there are mean differences between each treatment, each pair type or interaction between the treatment and pair type. The result shows there is a significant difference between pair types (4 pair types) at a significance level of 5% (Prob > F = 0.0202). For difference in treatments, the result is not significant at 5% (Prob > F = 0.1024). The Interaction between treatment and type is also shown not to be significant at 5% (Prob > F = 0.1029).

**Table 8** Treatment and contribution in public goods game

| Category/decision | Obs | Control group      |       | Treatment 1        |       | Treatment 2        |       |
|-------------------|-----|--------------------|-------|--------------------|-------|--------------------|-------|
|                   |     | Contribution (IDR) | n (%) | Contribution (IDR) | n (%) | Contribution (IDR) | n (%) |
| A1 (A > 0; B > A) | 116 | 29,918             | 32    | 31,216             | 32    | 34,995             | 36    |
| A2 (A > 0; B ≤ A) | 105 | 27,075             | 38    | 34,200             | 29    | 32,272             | 33    |
| A3 (A = 0; B = 0) | 3   | 30,000             | 33    | 50,000             | 33    | 50,000             | 33    |
| A4 (A = 0; B > 0) | 7   | 50,000             | 29    | 30,000             | 57    | 50,000             | 14    |
| B1 (A > 0; B > A) | 116 | 35,000             | 32    | 32,756             | 32    | 34,309             | 36    |
| B2 (A > 0; B ≤ A) | 105 | 25,112             | 38    | 31,183             | 29    | 32,842             | 33    |
| B3 (A = 0; B = 0) | 3   | 15,000             | 33    | 10,000             | 33    | 25,000             | 33    |
| B4 (A = 0; B > 0) | 7   | 30,000             | 29    | 33,441             | 57    | 50,000             | 14    |
| Total             | 462 | 29,340             |       | 32,238             |       | 33,954             |       |

Notes: Contribution is an average. Treatment is how we group participants in the public goods game based on their role in the trust game (as trustor A or trustee B).

Control group: random grouping; treatment 1: A and B are in the same group; treatment 2: A and B are not in the same group.

#### 4 Conclusions

The main goal of this paper is to investigate the role of trust, as a measure of social capital, in individual contributions to an environmental collective action, namely the garbage collection management issue, in Indonesia. It is understood that trust is not the only component forming social capital, although several studies argue that it is a key component and central to the theory of social capital (Bouma et al., 2008; Bowles and Gintis, 2002; Fukuyama, 1995; Putnam, 1995, 2000). This study conducted a series of experiments among undergraduate students at one of the main universities in Indonesia to measure these factors: a trust game to measure the trust level and a public goods game to

measure contribution to environmental collective action. As an additional analysis, a questionnaire was conducted on social capital to compare the trust level from the questionnaire with that of the experiment. Several conclusions can be drawn from this study, as follows.

First, it was found that trust measured using a questionnaire does not correlate with that gathered from an experiment. Hence, in the case of Indonesia, if an experiment is a better way to extract information regarding trust, then trust extracted from a self-reporting question could contain a serious measurement error. Second, it was found that the trust level, measured by the amount of money sent to a partner, significantly influences contribution to environmental public goods, both for the trustor and the trustee. It then can be concluded that individual social capital is an important factor in determining individual contributions to an environmental collective action in Indonesia. Third, this experiment also shows that the trustor's contribution is also sensitive to the trustee's payback. The more money returned by the trustee relative to the initial money sent by the trustor (ratio of money returned by B over money sent by A), the greater the contribution by the trustor in the public goods game. This could be a sign that a trustor's behaviour depends on past experience with his partner in the trust game. This result is consistent with Leonard et al. (2010). Fourth, in regard to the treatment applied in this experiment; i.e. the impact of information disclosure of (some of) the group members' trust level regarding the contribution to public goods, it is shown that disclosing information on who is in the group has an impact on people willingness to pay for a public good. However, having only partial knowledge as to the existence or non-existence of a trustworthy or generous person in the group does not make any difference. Finally, willingness to contribute to a public good seems also to significantly correlate with a respondent's characteristics. For example, in both models A and B, the level of religious practice is a significant variable. More religious respondents tend to be willing to contribute more.

Results from the experiments among students conducted for this paper indicate that, in the case of Indonesia, the level of individual social capital positively impacts individual contribution to environmental collective action. Strengthening individual social capital might be the most effective policy to solve several environmental collective action problems in Indonesia; such as protecting the forests and fisheries, maintaining urban air quality and collecting garbage. How to actually strengthen social capital in a community, however, is not within the scope of this paper. Further studies are needed to understand the most effective policies to strengthen individual social capital.

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## Notes

- 1 This paper uses trust as a measure of social capital in line with the emphasis several academics have placed on trust as a key component of social capital, and as central to the theory of social capital.
- 2 IDR 10,000 was roughly equal to USD 1 during the period of the experiments.
- 3 However, it is worth noting that even if the payoffs from both games end up being independent of each other through a lottery, the experience that a participant undergoes in the trust game could influence their actions in the public goods game. In other words, even if we can ensure that what is decided by the individual is not influenced through their earnings in the trust game, they will still remember how they and their partner acted in the trust game. Hence, their decisions on the trust and public games could still be correlated.
- 4 Please note that not all questions developed by Bullen and Onyx (1998) are used. Those which are relevant to the Indonesian context and student living environment were selected. Therefore, there are 11 questions on civic engagement and 9 questions on trust.
- 5 A trustworthy person is the one who gives back the trust given to him/her.
- 6 We also tested for a correlation between each of the trust questions from the questionnaire with the contribution to collective action in our public goods game. For individuals in group B, it was found some trust questions are a significant determinant for collective action. But none are so for individuals in group A. In general, it can be concluded that the survey measurements hardly represent observed behaviour.
- 7 This variable is not included in the model for B since it is strongly correlated to the amount of money sent back by B to A.