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Explaining large-*N* cooperation: Generalized social trust and the social exchange heuristic

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Abstract

This paper presents a new argument that links generalized social trust and collective action in situations with a large number of actors who do not have specific information on each other. Generalized social trust enhances large-*N* cooperation through the social exchange heuristic, which stimulates conditional cooperation in social dilemmas. Using data from a survey in four countries and recycling behavior as an indicator of collective action, this explanation is tested with individual-level data. While the relationship between generalized social trust and large-*N* collective action is often hypothesized, there is scant micro-level evidence as it has mainly been tested at the macro level. The results show that people holding generalized social trust cooperate more readily in large-*N* dilemmas, and that they most likely do so because of the social exchange heuristic.

Keywords

collective action, generalized social trust, pro-environmental behavior, social exchange heuristic

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1 Introduction

Generalized social trust, the belief that people in general are trustworthy, is often assumed to enhance collective action. Specifically, generalized social trust has been offered as an explanation for cooperation in social dilemmas characterized by a large number of actors, anonymity, and no repeated interaction (e.g. Knack, 2002; La Porta *et al.*, 1997; Putnam, 2000, page 288; Uslaner, 2002, page 49). If this effect is real, generalized social trust can help explain why some actors cooperate more readily in large-*N* social dilemmas than predicted by standard rational-choice theory and Nash behavior; and if real, generalized social trust plays an essential role in modern societies, which abound with large-*N* social dilemmas. So if it is real, high density of generalized social trust is a vital resource that every state should consider investing in.

Several studies have found that societies with high densities of generalized social trust indeed perform better in a wide range of areas like economic growth, policy performance, public good provision, and functioning of democracy, and that they are characterized by a vibrant civic culture (e.g. Almond and Verba, 1963; Inglehart and Welzel, 2005; Knack, 2002; Knack and Keefer, 1997; La Porta *et al.*, 1997; Sønderskov, 2008a). Most of these studies point to the collective action enhancing effect of trust as the cause of these effects. Thus, at first glance there is every reason to invest in generalized social trust. However, most studies rely on aggregated measures of generalized social trust, which implies that we cannot be sure that generalized social trust is in fact the driving force behind the relationship. We cannot be sure that people with high levels of generalized social trust actually engage more readily in collective action (cf. Robinson, 1950; Seligson, 2002).[1] Unfortunately, only scant evidence linking generalized social trust and large-*N* collective action exists at the individual level (e.g. Gächter *et al.*, 2004; Holm and Danielson, 2005; Sønderskov, forthcoming).

The purpose of this paper is to fill that gap. Using individual level data, it is investigated whether people holding generalized social trust cooperate more readily in large-*N* collective action dilemmas than low trusters. Furthermore, the paper offers a novel explanation for the possible relationship. Section 2 argues that existing accounts are unable to explain how generalized social trust enhances large-*N* cooperation. The explanation offered below posits that generalized social trust enhances cooperation because humans tend to cooperate in social dilemmas when others are expected to cooperate. To test if trusting individuals contribute more readily to the provision of collective goods, I analyze the effect of generalized social trust on recycling behavior. To recycle or not is an ideal typical collective action dilemma; it reduces resource consumption and thus helps improve the

environment. A cleaner environment is a common good that can be enjoyed by anyone whether he or she recycles or not. Furthermore, the private benefits of recycling, that is, the benefits that can be enjoyed only by people who recycle, are minimal (cf. Porter, 2002, page 122, although I will relax this assumption below). Finally, recycling is voluntary, not mandatory (in the countries analyzed here). Citizens' recycling behavior is thus an excellent indicator of behavior in collective action dilemmas. To explore the role of generalized social trust on recycling behavior I rely on a unique survey designed to assess the role played by trust in pro-environmental behavior in four countries (see below). I rely on self-reported recycling behavior and survey measures of generalized social trust. Section 3 discusses strengths and weaknesses of the approach and describes design and measures. The test is reported in Section 4 and shows a robust positive effect of generalized social trust on recycling. This section also reports some additional tests performed to assess the validity of the theoretical explanation and to shed light on the generalizability effects of trust. Section 5 concludes.

2 Theory and hypotheses: How and when does generalized social trust enhance large-*N* collective action?

Generalized social trust is a distinctive form of trust: it reflects a person's perception of the social environment, not institutions, organizations, etc. It is generalized because it reflects trust in the generalized other, not in a specific person. Thus, a person's level of generalized social trust does not necessarily correspond to his or her trust in a specific person in a specific situation (cf. Rotter, 1971; Yamagishi, 2001). *Specific trust* is based on all sorts of specific cues like appearance, gender, reputation, and previous behavior (Bohnet and Baytelman, 2007; Frank *et al.*, 1993; Krumhuber *et al.*, 2007; Wilson and Eckel, 2006). In contrast, generalized social trust is context independent in the short run; it reflects a person's default expectation, or standard estimate, of other people's trustworthiness (Coleman, 1990, Chapter 5; Robinson and Jackson, 2001; Yamagishi, 2001). Note, however, that this definition does not imply that a person's level of generalized social trust is fixed; it may change gradually according to experience and institutional surroundings (Rothstein and Eek, 2009).

This definition gives us the first clue to why generalized social trust should enhance large-*N* collective action. Given the large number of actors it is very costly and difficult, even impossible, to get specific information on other actors' trustworthiness in large-*N* situations. In such situations, generalized social trust may be an alternative way to assess trustworthiness or a

shortcut to information on trustworthiness. Hence, it is argued to be a stereotypic perception of other people invoked when information on their trustworthiness is hard to get (Hayashi *et al.*, 1999; Macrae *et al.*, 1994; Petersen, 2009). This perspective is supported by experimental evidence. Yamagishi and collaborators (e.g. Yamagishi, 2001) find that generalized social trust affects perceptions of others' trustworthiness when no information is available, but not when information is available. In fact, generalized social trusters are sometimes less trusting of specific people (see also Rotter, 1971, 1980). Holm and Danielson (2005) and Gächter *et al.* (2004) find that generalized social trust increases cooperation in experimental anonymous public good games where participants have no information on the other players (though see Ahn *et al.*, 2003). Glaeser *et al.* (2000), Harbaugh *et al.* (2003), and Yamagishi (2001) find no correlation between survey measures of generalized social trust and behavior in non-anonymous experiments. Note that both Glaeser *et al.* and Harbaugh *et al.* argue that the non-effect of generalized social trust on cooperation undermines the validity of the generalized social trust measure. However, in light of the argument just presented, we should not expect any effects of generalized social trust in non-anonymous settings (see also Holm and Danielson, 2005).

Obviously, having established that generalized social trust is used to assess other actors' trustworthiness in anonymous situations does not suffice to link it with large-*N* collective action. Among the relatively few theoretical accounts of the beneficial effects of trust on collective action, the link is predominantly established by arguing that cooperation is the rational choice when others can be expected to cooperate (Lubell, 2004; Nannestad, 2009; Rothstein, 2005, Chapter 1, 3; Scholz and Lubell, 1998; Sønderskov, 2008a; Torsvik, 2000; see Sønderskov, 2008b, Chapter 3 for a summary of these arguments). While that might be true in small-scale repeated interactions, the argument is less valid in large-*N* situations. In small-scale situations, my contribution can help maintain a beneficial long-term cooperative equilibrium, making conditional cooperation or tit-for-tat a rational choice (Axelrod, 1990; Hardin, 1971). However, in large-*N* situations, my actions alone hardly affect other people's behavior; every rational actor should free ride and reap the benefits provided by others. Expectations about reciprocity are not sufficient to establish cooperation in large-*N* situations if humans behave rationally (Sugden, 1984). This implies that the existing account does not provide a consistent link between generalized social trust and large-*N* collective action. We lack an explanation of why actors who trust other people in general choose to cooperate in large-*N* situations.

One way to explain it is with the aid of the social exchange heuristic. Recent studies have argued that humans in general tend to follow a social

exchange heuristic in social dilemmas like collective action situations. The social exchange heuristic implies that most people prefer mutual cooperation even when free riding is the rational choice. When people follow the social exchange heuristic, they cooperate in social dilemmas if they expect others to do so as well; they are conditional cooperators (Kiyonari *et al.*, 2000; Tooby *et al.*, 2006; Yamagishi *et al.*, 2007).

That people rely on the social exchange heuristic is consistent with experimental and real-world evidence beyond the studies mentioned above. Without referring specifically to the social exchange heuristic, several studies show that people contribute more readily in social dilemmas when they expect others to contribute as well – and that also holds for large-*N* situations where contributing is not the rational choice (Dawes *et al.*, 1986; Fischbacher *et al.*, 2001; Lubell and Scholz, 2001; Lundqvist, 2001; Orbell and Dawes, 1991, 1993; Scholz and Lubell, 1998; see Cook and Cooper, 2003 and Ledyard, 1995 for overviews of the experimental literature).

In sum, the link between generalized social trust and large-*N* cooperation rests on the following assumptions, and they, in turn, rest on our existing knowledge of human behavior in social dilemmas: most humans are conditional cooperators. When faced with social dilemmas they are guided by the social exchange heuristic, which motivates them to cooperate when they expect others to do likewise. This mechanism is argued to be present and constant across humans. Generalized social trust, on the other hand, varies among humans according to their experiences and institutional surroundings (Rothstein and Eek, 2009), and perhaps their upbringing (Uslaner, 2002) or genetic differences (Sturgis *et al.*, forthcoming). Generalized social trust is used to assess the intentions of other people when information on their likely behavior is unavailable. Such information is unavailable in large-*N* dilemmas, implying that people holding generalized social trust believe that most people will cooperate in such situations. Thus, if people are guided by the social exchange heuristic, that is, if they cooperate when they expect others to cooperate, then a person's level of generalized social trust affects his or her level of cooperation in large-*N* dilemmas. This is the first implication of the argument.

Because the mechanism linking trust and cooperation originates in general human traits, a second implication is that the effect of trust on cooperation is stable across cultures. A third implication is that generalized social trust should affect behavior in collective action situations only. If generalized social trust really is activated when I assess other people's trustworthiness, then trust should only affect my behavior when other people's behavior affects me. In non-collective action situations, for example deciding whether to provide a private good, I can enjoy that good regardless of what other

people do. If the assumptions above are correct, generalized social trust should not affect my behavior in such situations. Another way to understand this implication is through the social exchange heuristic. According to the theory and empirics, the heuristic is only active when the actor realizes that he or she is in a social dilemma (Yamagishi *et al.*, 2007). Thus, a test to ascertain if empirics support this implication enables me to assess the validity of the theoretical account.

Hypotheses

The implications will be tested, using recycling behavior as the empirical indicator of cooperation in large-*N* collective action situations, with the following hypotheses:

> H_1: People holding generalized social trust – all else being equal – recycle more readily than low trusters (implication 1).
>
> The second and third implications are examined with H_2 and H_3:
>
> H_2: The effect of generalized social trust on recycling is equal across countries.
> H_3: The effect of generalized social trust upon recycling – all else being equal – increases when people perceive recycling as a true collective action dilemma, and conversely, the effect decreases when recycling is perceived as a means to obtain private benefits.
>
> H_3 relaxes the presumption that recycling always is cooperative behavior. Recycling might provide private benefits if, for example, it helps citizens dispose of excess refuse. Recycling is in that case not a collective action dilemma, and, according to the theory presented above, no effect of generalized social trust should be expected.
>
> In addition, a fourth hypothesis is tested:
>
> H_4: The effect of generalized social trust decreases as the costs of contributing increase – all else being equal.

This hypothesis is not derived from the theory, but is included to explore the boundaries of the effects of generalized social trust. An obvious objection against the relevance of generalized social trust is that its effect might be restricted to trivial collective action problems (Hardin, 2006, Chapter 3). If this is so, investing in generalized social trust may not be efficient. Using recycling as the case to investigate this is certainly not optimal. The costs of recycling are relatively modest, so even if H_3 is dismissed, it does not prove that generalized social trust can solve every collective action

problem. Nevertheless, exploring the boundaries of the effect of generalized social trust in the present data does provide valuable information on this matter.

3 Design and measures

To test the hypotheses I rely on a unique dataset consisting of survey data from approximately 4,000 respondents in four countries, the UK, the USA, Denmark, and Sweden.[2] It enables me to test the hypotheses using individual level data and control for alternative explanations of recycling behavior. Obviously, the data is not truly cross-cultural, which narrows the test of H_2. However, the countries differ substantially in terms of aggregate levels of generalized social trust. Citizens in Scandinavia are among the most trusting people in the world, while the levels of trust in the UK and the USA are closer to world averages (Bjørnskov, 2007; Delhey and Newton, 2005; Sønderskov, 2008a; see also the appendix). In addition, including respondents from several countries makes it possible to assess the validity of the dependent variable by comparing stated levels of recycling to actual country level data (see below). The hypotheses are tested using self-reported recycling behavior and respondents from different countries. Obviously, both properties may give rise to problems that could undermine the validity of the findings. Using self-reported behavior is not without problems. Especially in relation to socially desirable behavior like recycling, respondents might overstate recycling behavior (Cummings *et al.*, 1995; Sønderskov, 2009a). The magnitude of this problem is discussed below.

As far as using survey data from different countries, two potential problems are especially relevant. First, the questions might be understood differently in different countries, undermining measurement validity. However, the independent variable, generalized social trust, is measured using items that have previously proven quite valid and reliable in cross-national surveys – at least in western countries. I will nonetheless further assess the validity and reliability after presenting the specific measure. Concerning the dependent variable, recycling behavior, I employ fairly simple questions that should not give rise to different interpretations across countries (see below). The second problem with cross-country data is possible spatial autocorrelation; that is, within-country dependency of responses. Country-level factors such as availability of recycling facilities could affect recycling behavior, which would imply that recycling behavior is not independent within countries. The significance tests could consequently be invalid. An initial analysis confirms this problem: a test to ascertain if between country variance on recycling behavior is zero yields a *p*-value below 0.0001 (see also Table 1).

Thus, a simple pooling of all respondents would yield invalid results. A fixed effects model is used to obtain valid significance tests despite spatial autocorrelation (and, in addition, it controls for all country-level explanations and thus eliminates bias from omitted country-level factors). Furthermore, I assess the robustness of this model by running the model on separate country samples. This also allows a test of H_2.

Measures

Recycling behavior, *the dependent variable*, is measured using three items that prompt respondents to indicate how much paper, batteries, and electronics they recycle. The appendix lists the full wording of the questions along with descriptive statistics. Recycling behavior is the mean of the three items (rescaled from zero to one). Respondents claiming that they recycle only an insignificant share of all three materials score zero, while those claiming to recycle almost all their paper, batteries, and electronics score one.[3]

To assess the validity of this measure, the claimed level of recycling is compared with actual recycling measures in the four countries. The first column in Table 1 shows that Swedes and Danes have the highest claimed level of recycling, clearly surpassing British and American citizens. A comparison of these numbers with actual recycling rates reveals that the rank order of the survey data corresponds to that of the official data. This is reassuring in terms of the reliability of the survey data. On the other hand, it is also evident that the claimed levels of recycling are higher than any of the

Table 1. Claimed and actual recycling rates in four countries

Country	Survey data[a]	Official data[b]		
	Recycling behavior, paper/batteries/ electronics (households)	Recycling rate, paper (households and industry)	Recycling rate, glass (households and industry)	Recycling rate, total waste (households)
Sweden	0.91 (0.90–0.92)	0.67 (2002)	0.88 (2002)	0.31 (2002)
Denmark	0.89 (0.87–0.90)	0.56 (2002)	0.76 (2002)	0.26 (2003)
UK	0.58 (0.56–0.60)	0.48 (2002)	0.26 (1998)	0.11 (2002)
USA	0.42 (0.40–0.44)	0.45 (2001)	0.19 (2001)	–

a. 95% confidence intervals in parentheses; n = 3,964; See note 2 for source.
b. Data is from the most recent year available (given in parentheses);
Sources: OECD (2005: Tables 4A and 4B); Eurostat (2008: tr4_1 Municipal waste collected, tr4_4_1 Municipal waste recycled).

actual levels. Because of temporal differences and differences in scope, none of the official levels are completely comparable to the survey data, but Table 1 raises the suspicion that respondents exaggerate their recycling behavior. If all respondents exaggerate equally, the analyses will yield unbiased estimates, but if there is a correlation between level of exaggeration and generalized social trust, the estimated effect of trust will be biased. I cannot assess if this applies to this data, but previous studies show that people holding generalized social trust are more honest than low trusters (Rotter, 1971, 1980). If that is the case and if it holds in survey responses, it actually works against obtaining a significant effect of generalized social trust on recycling behavior. If low trusters exaggerate their recycling behavior more than high trusters do, the estimated effect of trust will be biased towards zero. This would imply that the test is conservative. Furthermore, finding a positive effect of generalized social trust on recycling is consistent with a study using actual measures of recycling. Using actual country-level recycling rates and aggregate measures of generalized social trust, Sønderskov (2009a) finds a positive effect of generalized social trust on recycling. In sum, although the data is most likely plagued by some measurement error on the dependent variable, there are good reasons to trust the result if a positive effect is found.

Generalized social trust, the key independent variable, is measured using three items asking respondents to evaluate their expectations about other people in general (see the appendix). This three-item scale is often used as a measure of generalized social trust, and is generally considered valid and reliable. Reliability and factor analysis on the present data confirms that they form a coherent scale, both on the pooled sample and on separate country samples. However, some authors argue that item 1 alone is the better measure of generalized social trust (Uslaner, 2002, Chapter 3), and other authors show that item 3 loads poorly on the other two in some instances (Reeskens and Hooghe, 2008). I have therefore rerun the analyses reported in Tables 2 and 3 using only item 1 and the mean of items 1 and 2. These models yield substantially the same results as the three-item index (not shown).

Uslaner (2002, Chapter 3) assesses the validity of the (single item) measure and concludes that it does indeed tap expectations about the generalized other. The measure loads highly with trust in ‘people you meet on the street’ and ‘where you shop,’ but only vaguely with trust in specific people like ‘your family’ and ‘people at work.’ This is also confirmed with the present data; the measure is only vaguely correlated with an item that asks about trust in ‘people who try to be different from the rest of us’ ($r = 0.21$).

Controls

To control for other factors that may influence recycling behavior, the following variables are included in the analyses: environmental values, age, gender, educational level, income, ethnic minority/majority, place of residence (city size), convenience of recycling, and trust in recycling authorities. These controls have previously been found to affect recycling behavior (Ackerman, 1997; do Valle *et al.*, 2005; Ewing, 2001; Johnson *et al.*, 2004; Kurz *et al.*, 2007; Owens *et al.*, 2000; Saphores *et al.*, 2006; Sønderskov, 2009a). The operationalizations of the controls are described in the appendix. Most operationalizations are straightforward and should need no further elaboration, perhaps except the measure 'ethnic minority/majority.' Whether or not a respondent belongs to an ethnic majority is measured using an item asking if the respondent is native or immigrant, so it does not completely control for ethnicity. This is somewhat problematic since ethnicity is correlated with generalized social trust (Patterson, 1999), and hence, some omitted variable bias cannot be ruled out. Nevertheless, all other relevant controls are included in the analyses, which warrants valid results.

Other variables

The test of H_3 requires a measure that taps whether the respondents perceive recycling as a contribution to a public good or to a private good. To measure this I rely on a question that asks whether the respondent perceives recycling as a means to dispose of excess refuse or not (see the appendix: 'private/public good'). The rationale is that if recycling is primarily perceived as a means to get rid of excess refuse, then recycling is associated with private benefits and is therefore not a collective action dilemma. On the other hand, if no private benefits are associated with recycling, then recycling contributes to a common good and probably involves a collective action dilemma.

4 Empirical analysis

Table 2 shows the test results for H_1. Model I assesses the effect of generalized social trust on recycling behavior and it includes the control variables prescribed by the existing literature, while Models II–VI assess the robustness of this model. Model I shows that people holding generalized social trust recycle more readily than low trusters. Although the effect is not astonishing, the effect is statistically significant and probably higher than most other individual level controls (recall that all variables except age are scaled from zero to one). Furthermore, the effect is quite robust as shown in Models

Table 2. Testing H_1

Model Countries	I All	II All	III Sweden	IV Denmark	V UK	VI USA
Generalized social trust	0.08***	0.09***	0.06*	0.09**	0.12**	0.10*
	(0.03)	(0.03)	(0.03)	(0.04)	(0.06)	(0.05)
Environmental values						
Materialist			Reference			
Mixed	0.03**	0.02**	0.06***	0.00	0.02	0.04
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)
Postmaterialist	0.03*	0.03	0.04*	0.02	0.00	0.10*
	(0.02)	(0.02)	(0.02)	(0.03)	(0.05)	(0.05)
Age	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Females relative to men	0.01	0.01	0.03**	0.02*	−0.01	−0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Educational level	0.02	0.03*	0.01	−0.01	0.03	0.00
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.05)
Income	0.05**	0.07***	0.06**	0.03	0.04	0.11*
	(0.02)	(0.02)	(0.03)	(0.03)	(0.06)	(0.06)
Natives relative to immigrants	0.00	0.02	0.05*	−0.04	0.03	−0.07
	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)	(0.05)
City size						
> 500,000			Reference			
> 50,000	−0.01	−0.00	0.01	−0.02	−0.02	−0.01
	(0.01)	(0.01)	(0.02)	(0.02)	(0.04)	(0.04)
> 10,000	−0.01	−0.00	0.00	−0.01	−0.02	−0.02
	(0.01)	(0.01)	(0.02)	(0.02)	(0.04)	(0.04)
< 10,000	−0.02	−0.01	−0.00	−0.01	−0.05	−0.03
	(0.02)	(0.02)	(0.03)	(0.02)	(0.06)	(0.05)
Rural	−0.01	0.00	−0.03	−0.01	−0.02	0.02*
	(0.02)	(0.01)	(0.02)	(0.03)	(0.03)	(0.06)
Convenience of recycling	0.13***	–	0.08***	0.11***	0.07*	0.24***
	(0.02)		(0.02)	(0.02)	(0.04)	(0.04)
Trust recycling	0.07***	–	0.07***	0.12***	0.03	0.05
	(0.02)		(0.02)	(0.03)	(0.0)	(0.05)
Generalized institutional trust	–	0.06**	–	–	–	–
		(0.03)				
Country						
Sweden	Reference		–	–	–	–
Denmark	−0.04***	−0.05***	–	–	–	–
	(0.01)	(0.01)				
UK	−0.31***	−0.31***	–	–	–	–
	(0.01)	(0.01)				
USA	−0.44***	−0.47***	–	–	–	–
	(0.02)	(0.01)				
Constant	0.67***	0.59***	0.63***	0.71***	0.32***	0.27***
	(0.04)	(0.03)	(0.05)	(0.06)	(0.08)	(0.09)
N	3,008	3,311	772	752	726	758
R^2	0.41	0.39	0.11	0.11	0.05	0.12

Notes: Dependent variable: recycling behavior; Method: OLS; *, **, and ***: $p < 0.1$; 0.05; 0.01 respectively (two sided). Standard errors are in parentheses.

II–VI. Model II assesses the effect of generalized social trust after proximate causes of recycling have been excluded. People's confidence in the efficacy of recycling as well as inconvenience of recycling are obvious explanations of recycling behavior, but it could be argued that they are proximate causes, which might be tautological, especially in a survey context like this one. To test if the effect of generalized social trust is inflated by the inclusion of these proximate causes, convenience of recycling is excluded and confidence in recycling is measured using a more distant measure, namely generalized institutional trust.[4] Model II shows that the effect of trust is slightly increased by this change, indicating that the results obtained in Model I are not inflated by the proximate causes. On that basis, all remaining models include trust in recycling authorities and convenience of recycling.

Another way to assess the robustness is to run the test on the individual country samples (see Models III–VI for results). Although the *p*-values drop in tandem with the reduced sample sizes, there is a significant effect in all countries, which underscores the robustness of the results obtained in Model I. Models III–VI also test H_2, which stated that the effect of trust is stable across countries. Although the coefficients are not identical, they are quite similar. Testing interaction between country of residence and trust reveals that the effect of trust does not differ significantly between countries (a joint *F*-test of all country-trust interaction terms yields a *p*-value of 0.57; estimates not shown). In sum, Table 2 lends solid support to H_1 and H_2. Generalized social trust has a robust, significant, and positive effect on recycling behavior.

Table 2 also points to another interesting result. It is evident that the most influential factor on recycling behavior is country of residence. The differences in recycling levels across countries reported in Table 1 cannot be accounted for by the included individual level variables alone; country of residence remains highly influential after inclusion of the individual level factors. The lower R^2 in Models III–VI corroborates this result. So some country-level differences strongly affect recycling behavior. Such differences could be varying degrees of inconvenience of recycling due to different recycling policies or varying degrees of pro-environmental attitudes not captured by the environmental value measure. These differences are very interesting, but are irrelevant in this context as long as they are controlled for. However, I will briefly return to these differences below. Readers interested in recycling policies are referred to European Environment Agency (2007).

Table 3. Testing H_2 and H_3

Model	VII	VIII	IX
Countries		All	
Generalized social trust (GST)	0.08***	0.02	−0.03
	(0.03)	(0.04)	(0.05)
Environmental values			
Materialist		Reference	
Mixed	0.03***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)
Postmaterialist	0.03*	0.03*	0.03*
	(0.02)	(0.02)	(0.02)
Age	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Female relative to men	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)
Educational level	0.03	0.03	0.03
	(0.02)	(0.02)	(0.02)
Income	0.05**	0.05**	0.05**
	(0.02)	(0.02)	(0.02)
Natives relative to immigrants	0.00	0.01	0.00
	(0.02)	(0.02)	(0.02)
City size	Insignificant in all models (estimates not shown)		
Convenience of recycling (CR)	0.14***	0.14***	0.20***
	(0.02)	(0.02)	(0.04)
Trust recycling	0.05***	0.05***	0.05***
	(0.02)	(0.02)	(0.02)
Private/public good (PG)	−0.09***	−0.17***	−0.18***
	(0.01)	(0.04)	(0.04)
Interactions			
GST × PG	–	0.15**	0.15**
		(0.07)	(0.07)
GST × CR	–	–	−0.10
			(0.07)
Country			
Sweden		Reference	
Denmark	−0.03**	−0.03**	−0.03**
	(0.01)	(0.01)	(0.01)
UK	−0.30***	−0.29***	−0.29***
	(0.02)	(0.01)	(0.01)
USA	−0.42***	−0.42***	−0.42***
	(0.02)	(0.02)	(0.02)
Constant	0.72***	0.75***	0.78***
	(0.04)	(0.04)	(0.05)
N	2,935	2,935	2,935
R^2	0.41	0.42	0.42

Notes: Dependent variable: recycling behavior; Method: OLS. *, **, and ***: $p < 0.1$; 0.05; 0.01 respectively (two sided). Standard errors are in parentheses.

Table 3 shows the results of the test of H_3 and H_4. First, Model VII assesses the validity of the private/public good variable. The variable is scaled from 0 to 1, where zero signifies that recycling is solely perceived as a means to get rid of excess refuse. Low values thus indicate that the respondent associates high private benefits with recycling, whereas higher values indicate low private benefits. As expected, the results show that the smaller the private benefits associated with recycling, the less recycling there is. Model VIII tests H_3, which stated that the effect of generalized social trust on recycling should increase when recycling is perceived as a collective action problem; that is, when recycling does not provide private benefits. Conversely, generalized social trust should not affect recycling when it provides large private benefits. The test clearly supports this hypothesis. The interaction term between generalized social trust and private/public good is positive and significant. This implies that the effect of generalized social trust increases significantly when recycling is perceived as a collective action problem. Moreover, the coefficient of the first-order generalized social trust term is not significantly different from zero, indicating that for people who associate recycling with high private benefits, generalized social trust does not affect their behavior. This was as anticipated in H_3. The same conclusion can be drawn from the change in the effect of the private/public good variable between Models VII and VIII. When the interaction term is included the first-order coefficient of private/public good shows its effect when generalized social trust is zero. It thereby shows the effect for people with very low generalized social trust. To such people it matters a lot whether or not recycling provides private benefits, whereas it matters less to people with higher levels of trust (again indicated by the positive interaction). Figure 1 depicts this conditional relationship between generalized social trust and recycling behavior as the private benefits diminish.

Figure 1 shows that when recycling is associated with private benefits (when private/public good is low), generalized social trust has a small and insignificant effect on recycling behavior. The effect becomes significant at the 0.05 level when 'private/public good' reaches about one-third of its range. For people who clearly associate recycling with public good provision (when public good equals 1), the effect of generalized social trust on recycling behavior is 0.16 – or double the average effect found in Model I.[5]

In sum, the analysis lends considerable support to H_3. Generalized social trust only affects recycling when recycling is perceived as a collective action dilemma. Hence, there are good reasons to expect that generalized social trust has a positive effect on collective action for the reasons outlined in the theoretical account.

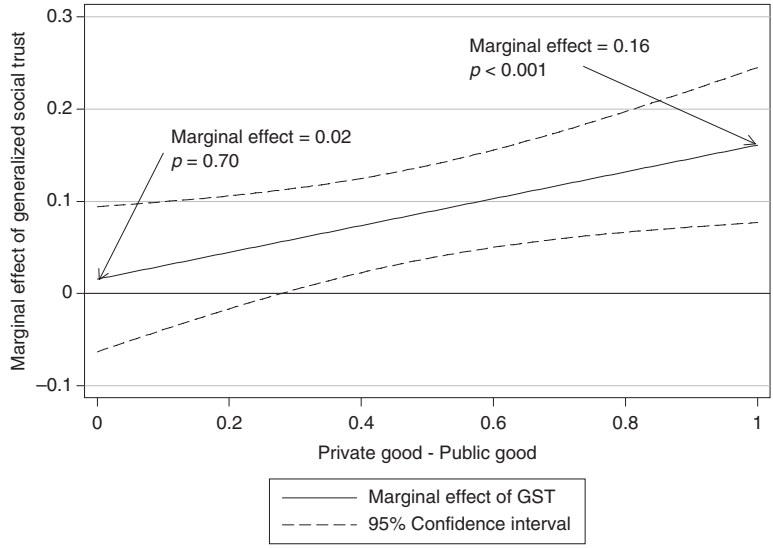

Figure 1. Marginal effect of generalized social trust on recycling behavior with different perceptions of recycling

Model IX tests H_4 that the effect of generalized social trust on recycling behavior decreases as the costs of contributing increases. The expectation is that the interaction between generalized social trust and convenience of recycling is positive. The hypothesis is not supported by the data. The interaction term is insignificant (and negative), and the effect of trust does not decrease when costs and/or inconvenience increase. So within the relatively narrow span of inconvenience investigated here, there is no basis for claiming that the collective action enhancing effect of generalized social trust diminishes when the costs of contributing go up. Note, however, that I do not claim that generalized social trust solves every dilemma. The results in Models III–VI combined with Table 1 could also be taken as a rejection of H_4. Suppose that some of the country differences in recycling behavior are caused by differences in convenience of recycling; in that case, the inconveniences, or costs, of recycling are highest in the US and the UK. It is evident from Models III–VI that the effect of generalized social trust is not lower in these countries.

5 Conclusion

This paper has given a novel theoretical account of the relationship between generalized social trust and large-*N* collective action. I propose that generalized social trust is particularly important in large-*N* dilemmas because specific trust cannot be applied in such circumstances. The link between generalized social trust and large-*N* collective action was further established by incorporating the social exchange heuristic. Generalized social trust enhances large-*N* cooperation because most humans tend to cooperate when they expect others to do the same.

The empirical analyses support this account. People with high levels of generalized social trust recycle more readily, which suggests that generalized social trust enhances cooperation in large-*N* dilemmas. The effect of trust is fairly constant across countries, which indicates that the relationship between trust and cooperation originates in evolved human traits. Moreover, the analyses showed that generalized social trust only affects behavior when people face a social dilemma. Hence, the analyses showed a robust positive effect when it was expected and, just as importantly, no effect when no effect was expected. In sum, the paper has provided much-needed individual-level evidence for the alleged positive effect of generalized social trust on collective action. Cooperation in large communities, where the actors do not know one another, is more likely when most actors possess generalized social trust.

However, the reliance on recycling behavior as an indicator of collective action constricts the range of generalization. Although recycling is a valid indicator of cooperation in large-*N* collective action, the associated costs and potential loss if others turn out to free ride are small compared to what we could find in other large-*N* dilemmas. This study has only investigated the effect of generalized social trust on a minor large-*N* collective action dilemma. This implies that we do not know how severe collective action problems trust has the potential to help solve ‘ to ‘This implies that we do not know how great the potential of trust to help solve severe collective action problems is. Therefore, more studies with higher costs of contributing are needed.

A related question left unanswered by this study is the role of institutions. The analyses showed that the most important background factor of recycling was country of residence, which indicates that institutions and policies are far more relevant than trust in solving collective action problems. While probably true, this does not imply that investing in generalized social trust is inefficient. It could very well be that investing in generalized social trust yields cooperation at a lower cost compared to the cost of institutions. Only further studies can settle this issue.

Appendix

Table A1. Details on wording and coding

Variable	Wording/coding	Range	Mean	Standard deviation
Recycling	'How large a share of your refuse do you recycle within the following categories?'			
Item1	'Paper/cardboard' (5 categories)	1–5	4.14	1.44
Item2	'Batteries' (5 categories)	1–5	3.58	1.72
Item3	'Electronics' (5 categories)	1–5	3.67	1.66
Recycling behavior	Mean of items 1–3, rescaled from 0 to 1	0–1	0.70	0.34
Generalized social trust				
Item1	'Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?' (11-point scale)	0–10	5.75	2.59
Item2	'Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?' (11-point scale)	0–10	5.90	2.39
Item3	'Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?' (11-point scale)	0–10	5.45	2.33
Generalized social trust	Mean of items 1–3, rescaled to a 0–1 range	0–1	0.57	0.21

(Continued)

Table A1. (Continued)

Variable	Wording/coding	Range	Mean	Standard deviation
Country mean of generalized social trust	Sweden	0–1	0.64	0.20
	Denmark		0.68	0.18
	UK		0.45	0.21
	USA		0.47	0.22
Environmental values	Inglehart's 4-item postmaterialism measure (cf. Inglehart 1997, Chapter 4) (3 categories represented with dummy variables)			
Age	'Please indicate which year you were born' (recoded to age in years)	18–88	0.45	13.50
Gender (*Females relative to men*)	'Please indicate your gender' (females = 1)	0, 1	0.53	–
Educational level	'What is the highest educational level that you have attained?' (9 categories) (rescaled to a 0–1 range)[a]	0–1	0.65	0.27
Income	'What is the current household income before taxes?' (10 categories, rescaled to a 0–1 range)[b]	0–1	0.36	0.26
Ethnic majority/minority (*Natives relative to immigrants*)	'Finally, we would like to know if you were born in USA.'[c] (Natives = 1)	0, 1	0.94	–
City size	'Do you live in ...?' ['A city with 500,000 or more residents'] and so on; 5 categories represented with dummy variables; see Table 2)	–	–	–

Table A1. (Continued)

Variable	Wording/coding	Range	Mean	Standard deviation
Convenience of recycling	'The recycling options where I live are worse than in most other places in the US'[c] (5 categories; inverted and rescaled to a 0–1 range)	0–1	0.62	0.32
Trust in recycling authorities (*trust recycling*)	'You can trust that the majority of the refuse sent for recycling are actually recycled' (5 categories; rescaled to a 0–1 range)	0–1	0.63	0.26
Generalized institutional trust	'How much do you personally trust each of the following institutions?'			
Item1	'The legal system' (11-point scale)	0–10	5.67	2.66
Item2	'Congress'[c] (11-point scale)	0–10	4.43	2.65
Item3	'The police' (11-point scale)	0–10	6.29	2.45
Item4	'The civil services' (11-point scale)	0–10	5.24	2.34
Item5	'The government' (11-point scale)	0–10	4.14	2.77
Generalized institutional trust	Mean of items 1–5, rescaled to a 0–1 range	0–1	0.52	0.22
Private/Public good	'If I couldn't recycle, it would be difficult for me to dispose of all my refuse' (5 categories; inverted and rescaled to a 0–1 range)	0–1	0.48	0.35

Notes: Names in italics indicate the names used in Tables 2 and 3. All variables (except dummy variables) are coded so higher values signify higher recycling/trust/age/education/income/convenience/perception of public good.
a. The name and the number of categories vary between countries. The categories are the same as in the General Social Survey (US), European Social Survey (DK + SE), and European Values Study (UK).
b. The categories vary between countries but are equivalent.
c. The wording varies between countries but is equivalent.

Notes

1. Relying on macro data is justifiable if it is argued that aggregate levels of generalized social trust are a proxy for something else, for instance social capital (e.g. Nannestad, 2009). On the other hand, if this course of action is followed it must be specified which factors then enhance collective action. Sadly, this is all too often done in a tautological manner like 'features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions' (e.g. Beugelsdijk and van Schaik, 2005; see Sønderskov, 2009b).
2. The survey is a self-administered web survey with participants sampled from standing panels. It consists of representative samples (on various demographic parameters) of approximately 1,000 respondents from the UK, the USA, Denmark, and Sweden. Only respondents not living with their parents (or grandparents) are sampled to ensure that they actually have a say on food consumption (Stolle *et al.*, 2005, pages 245–269). The response rate varies between 39% and 57% across countries. Although this is rather low, there is no reason to expect substantial sampling bias as non-responders did not know the topic before refusing to participate. The fieldwork was conducted by AC Nielsen and Survey Sampling International in April/May 2008. Codebook and data are available upon request.
3. According to the appendix the highest recycling rate is found in relation to paper/cardboard, whereas recycling of batteries and electronics is approximately on a par at a lower level. On that basis it could be argued that paper recycling should be weighted down when constructing the index. I have explored the differences between the simple index and an index based on the mean of the standardized scores (which weights recycling of paper down). Using this weighted index yields similar but stronger effects of generalized social trust compared to the unweighted simple index. However, to keep the measure as simple as possible I report the results obtained with the simple measure.
4. Refer to the appendix for operationalization. Including generalized institutional trust also serves another purpose. Generalized institutional trust has been shown to increase generalized social trust (Rothstein, 2005, Chapter 5), so omitting this factor might inflate the effect of social trust due to omitted variable bias.
5. The private/public good variable is treated as an interval scaled variable, but this is questionable since it is based on a single 5-point item. Therefore, I have rerun the analyses using dummy variables instead of the continuous measure, and the result holds.

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