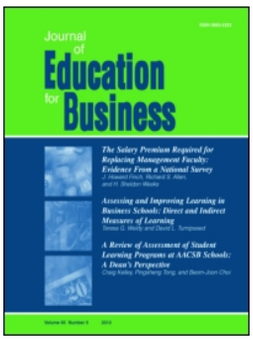

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Can teaching social dilemmas make people more prosocial? An experiment

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ABSTRACT
Economics and business students regularly behave less prosocially than others. Can ethics training reverse this tendency? Results from a repeated public goods experiment reveal that it can. Students who attend an interactive lecture on social dilemmas show significantly more cooperation than others. However, the lecture does not appear to increase the incidence of reciprocal behavior. As many current social problems qualify as social dilemmas, this result stresses the importance of ethics training for policy makers and curriculum designers alike in overcoming the incentive structure of social dilemmas.

KEYWORDS
Cooperation; ethics training; experimental economics; public goods

Economists have devoted considerable attention to the question of whether the constant exposure to self-interested and rational thinking alters their behavior and decision making (Hühn, 2014; Molinsky, Grant, & Margolis, 2012; Wang, Malhotra, & Murnighan, 2011). Empirical evidence suggests indeed that economists and economics students regularly behave more self-interestedly than others do. Not only do economics professors donate less money (Frank, Gilovich, & Regan, 1993), but various results from public goods and other experiments also reveal that economics students behave significantly less prosocially in games (e.g. Cadsby & Maynes, 1998). This does not appear to be because economists are less prosocial to begin with, but rather because they become so during their studies (Bauman & Rose, 2011; Frank et al., 1993).

Thus, if exposure to economics teaching seems to make people more selfish, can a different kind of teaching reverse this effect and make people more prosocial? This question has been analyzed by a relatively slim experimental literature. Ahmed (2008) found that cooperation among police cadets in a one-shot prisoner's dilemma game indeed significantly increased with the time of their studies. James and Cohen (2004) showed in another prisoner's dilemma experiment that participation in an ethics teaching module, which uses the prisoner's dilemma to make students aware of the consequences of their decisions, increases the probability of future cooperation (at least in the short term).

However, it is not clear how well these results extend to more general settings. To address this concern, we extend the design of James and Cohen (2004) to the case of a different teaching module and a repeated linear public goods game. Compared to the original prisoner's dilemma setting, the public goods experiment is more representative of many real world scenarios in two ways. The first is that it studies a group setting, rather than interaction among pairs, and the second is that it allows for intermediate levels of cooperation, rather than only the two extremes of full cooperation (contributing the entire income endowment) and defection (contributing nothing).

Literature review and hypotheses

Social dilemmas are situations in which the optimal prosocial outcome can only be achieved through the cooperation of individuals. However, cooperation bears the risk that others do not cooperate, which would make the cooperators worse off. This risk of being cheated makes behaving self-interestedly more tempting. Further, the social benefits of cooperation are often less obvious or lie farther in the future than the individual short-term benefits of noncooperation. Decision makers face a dilemma, as they have to decide whether to cooperate, thereby improving the situation for everyone, or not, thereby following their individually rational strategy. Many current social problems qualify as social dilemmas, as the social benefits are generally less obvious than the individual short-term benefits (Dixit & Nalebuff, 1991; Nagel, 2010).

The public goods experiment is a commonly used experiment to study dilemmas in groups. In its simplest

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form, participants each receive an income endowment, of which they may contribute a chosen amount to a public pot. Money contributed to the public pot is multiplied by a certain factor and equally distributed among all participants. The final payoff P_i of individual i is given by:

$$P_i = E_i - C_i + r\,\frac{\sum_{j=1}^{N} C_j}{N}$$

where N is the number of players, $r > 1$ is the public pot multiplier, and E_i and C_i denote player i's endowment and contribution, respectively. Because decisions are anonymous and simultaneous, the dilemma lies in the fact that every individual faces the temptation to benefit from the others' contributions by being a free rider and not contributing at all. If the game is finitely repeated, backward induction makes non-contribution the rational strategy. Consequently, the Nash equilibrium is a situation in which nobody contributes anything. Naturally, this behavior makes everybody worse off (Ledyard, 1995).

Studies have shown that contributions average between 40% and 60% of income (Dawes & Thaler, 1988), and that with repetition the number of free riders usually increases and contributions fall (Dawes & Thaler, 1988; Fehr & Schmidt, 1999; Isaac, McCue, & Plott, 1985). Several ways to increase contributions have been identified. External motivators (e.g., a higher multiplier; see Isaac & Walker, 1988b; Isaac, Walker, & Williams, 1994, and monetary punishment, see Fehr & Gächter, 2000, 2002) directly influence the monetary returns of cooperation. However, internal motivators (e.g., communication; see Isaac & Walker, 1988a) can also play an important role in encouraging cooperative outcomes.

One such motivator is teaching

Teaching has been shown to alter behavior across a variety of situations. For example, students who attended a lecture on the bystander effect (the likelihood of someone helping in case of emergency decreases with the number of obvious witnesses) were shown to be 40% more likely to help a person in need than others (Beaman, Barnes, Klentz, & McQuirk, 1978). In the domain of voting, people who were taught about the voting paradox (the infinitesimal probability of their vote actually making an impact and the consequential negative expected utility of voting) were less likely to participate in the next election (Blais & Young, 1999). Finally, there is evidence that the general study of economic concepts such as backward induction has a similar effect of making people more selfish (Johnson, Camerer, Sen, & Rymon, 2002).

Ethics training is one form of teaching that seeks to address behavior in social dilemmas. Such training programs are popular at both public and private institutions, and span a variety of fields (such as medicine, business, engineering and law). The available experimental evidence suggests that training is capable of affecting cooperation rates in a one-shot prisoner's dilemma setting (Ahmed, 2008; James & Cohen, 2004); however it is not clear how well this result extends to repeated group interactions or other domains (Frey & Meier, 2003). We hypothesized that this also applies to teaching social dilemmas and their particular characteristics, thereby making people more prosocial: Students who attend an ethics module on social dilemmas would behave more prosocially than would their peers.

Research methodology

The experiment consisted of a teaching intervention and a public goods experiment. The public goods experiment took place a week after the teaching intervention. Participants were 18- and 19-year-old students from three different secondary commercial colleges and had no previous training in economics or game theory. Students were randomly assigned into three cohorts to account for possible class-specific effects. They were told that a business education student would come to their school to practice teaching and that each group would listen to a different lecture. The ethics cohort was given a lecture in which a social dilemma situation was simulated. The lecture illustrated the concept of social dilemmas and let the students experience the consequences of their own decisions. The no lecture cohort had a regular class delivered by another student, and the control cohort received a different training class held by the ethics instructor to control for potential instructor effects (see the Appendix for further details on the cohorts and the ethics module).

The ethics instructor was not present on the days the public goods experiment took place, and the experiment was not announced before the day it took place. These measures served to minimize the risk that students associate the ethics module with the experiment and avoid experimenter demand effects. The lectures and the experiment itself represented a part of normal class activity during class time. A total of 136 students from eight different classes are included in the data set. Table 1 shows the allocations of the participants to the different

Table 1. Participants' distribution among cohorts and schools.

Cohort	School 1	School 2	School 3	Total
Ethics cohort	12	32	16	60
Control cohort	24	0	8	32
No-lecture cohort	16	16	12	44
Total	52	48	36	136

cohorts and schools (the numbers vary as the rooms made available by the schools varied in size; the control group did not take place in school 2 due to limited resources and time).

Public goods experiment

The experiment was designed as a repeated linear public goods game with groups of four participants and a multiplier of two ($N = 4$; $r = 2$). The experiment, programmed and conducted in z-Tree (Fischbacher, 2007), took place in the schools' computer rooms. Students entered their decisions on the computer anonymously and did not know who their fellow group members in the game were, although they were aware that they were colleagues from the same school. All members of a group came from the same intervention cohort.

The public goods game was repeated 12 times and framed as a tax year. Participants were informed about the number of rounds prior to the experiment. At the beginning of each month, participants received a certain amount of income and had to decide how much tax they were willing to pay (and hence contribute) to the public pot. After each period, students received feedback on their individual contribution and share of the public pot, their final payoff of the period, their accumulated wealth, and the average contribution and wealth of the group. To control for variation in contributions possibly caused by differences in understanding, we included comprehension questions on the general logic of public goods games prior to the first round.

In an effort to increase external validity, individual income levels were determined by the students' performance on a performance test at the beginning of the experiment (e.g., Becker, Büchner, & Sleeking, 1987; Webley, 1987). Students with the highest 25% of scores on the performance test earned 2,800 experimental currency units (ECU) per month, the weakest 25% earned 1,200 ECU, and the remainder earned 2000 ECU. Each group consisted of one low earner, two average earners, and one high earner. At the end of the experiment accumulated wealth was converted into Euro at the rate of 5,000:1. Average earnings were €6.70.

Findings

Effects of teaching social dilemmas

To investigate the influence of teaching social dilemmas on cooperative behavior, we examined the effect of having attended the ethics module on contribution rates (individual contribution as a percentage of individual income) in the public goods game. Figure 1 displays the development of contribution rates $c_{i,t} = C_{i,t}/E_i$ over the course of the 12 periods. It shows that the ethics students consistently contribute on average more than twice as much as members of the other two cohorts (see the Appendix for descriptive statistics).

A regression of contribution rates on cohort dummies, controlling for time and school effects, confirms this picture by indicating that participants of the ethics cohort contributed on average 41 percentage points more of their income than did the no lecture cohort ($p < .05$), and even more (56 percentage points) than did the control cohort (see the Appendix for details). Rank tests applied to test for differences in contribution rates between the ethics cohort and each of the other two cohorts confirms this result (Kruskal-Wallis, $p < .01$ in both cases). We conclude that the positive effect of teaching social dilemmas holds, which supports our hypothesis. Consequently, the result by James and Cohen (2004) that teaching can indeed increase cooperative behavior is

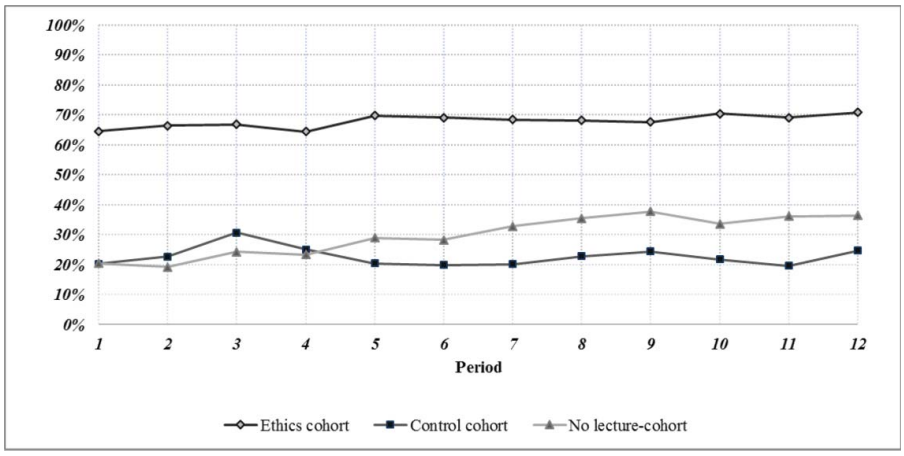

Figure 1. Mean contribution rates.

found to extend to the case of a repeated linear public goods game and a modified teaching module.

Conclusions

This study contributes to the literature on the influence of teaching on cooperative behavior. We used a repeated public goods experiment to show that teaching social dilemmas can increase cooperation and moderate reciprocity in a way that positively influences cooperation. We suspect that this effect is caused by merely illustrating the concept of social dilemmas and letting students experience the consequences of their own decisions. In particular, the understanding of two main messages can lead to the insight that cooperation is a worthwhile strategy. First, individual short-term advantages might lead to long-run social costs; second, selfish behavior may be ultimately self-destructive as it can cause others to respond by adopting the same behavior.

This research is important as it provides evidence that nonmonetary tools can be effective at increasing prosocial behavior. For policy makers, it provides additional reason to believe that scandals that have rocked financial markets in recent years may be mitigated by the use of ethics training requirements. For curriculum designers in the area of business and economics, in light of the prevalent empirical evidence that teaching economics makes people less prosocial, it shows that appropriate changes to the curriculum can counterbalance the effect of traditional economics education.

This study has studied the short-term effects of teaching social dilemmas on prosocial behavior. A natural next step would be the study of long-term effects to investigate how long the effect of the training prevails, possibly using different training designs and cooperation measures.

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Appendix: Discusssion of cohorts

Ethics cohort

The Ethics cohort were given a lecture in which a social dilemma situation was simulated. The lecture illustrated the concept of social dilemmas and let the students experience the consequences of their own decisions. Emphasis was placed on transferring the following main messages:

- Individual actions affect other people, sometimes in a negative way. Consequently, an individual short-term advantage might lead to social costs in the long run.
- Unethical behavior is ultimately self-destructive as it can be assumed that others will react in the same way.

The lecture began with the question of whether students were aware of situations where individual and group interests diverge. After a brief discussion, the students played several rounds of a combination of the *Envelope Game* and the *Fishing Game* developed by the Swiss National Bank (Schweizerische Nationalbank, 2012). Every round, students decided how much game money they wanted to contribute in "tax" to social security. Envelopes served to collect the individual contributions anonymously. Leftover money was used to purchase sweets for the individual. The sum of contributions financed a number of discount-priced sweets for the group. These were in turn put into a pot located in the center of the classroom and the students were given one minute to take the amount of sweets they considered "right" from the pot.

The lecture continued with a discussion of the students' experience to illustrate the first message. The students were made aware of the maximum amount of sweets they could have financed collectively, and the discussion revealed the dilemma they faced when deciding how much to contribute. Social security fraud, tax evasion and environmental problems, such as air pollution and overfishing served to illustrate that such dilemmas frequently exist in the real world. Finally, the students brainstormed on possible measures to improve the result for everybody, such as trust, laws and communication.

The second message was illustrated by the example of the 2012 Greek economic crisis. At the end of the lecture, the students' attention was drawn to the fact that the estimated annual amount of tax evasion in Greece almost reached the level of the annual deficit in 2012. It was emphasized that Greece was—among others—facing exactly the same type of dilemma the class had just experienced and that the country would be far better off could this dilemma be solved. The second message illustrated that even self-interested students might have an interest in cooperating, as it makes them better off in the long term.

Control cohort

The Control cohort simulated the process of money creation by playing different roles of an economic system, such as the central bank, a bank, a family and a company. They filled out a simplified balance sheet and simulated simple actions of the economic circuit. With the help of the balance sheets they kept track of the impact of their transactions on the amount of money in circulation (cash and deposits).

This concept was chosen for two reasons. First, its content is not related to the goal of the experiment and is consequently not assumed to influence the students' decisions in the experiment. Second, it also consists of a classroom experiment. Consequently, besides capturing personal effects of the instructor, differences between the Control cohort and the Ethics cohort are unlikely to be due to different teaching methods used.

No-lecture cohort

This cohort never met the instructor and did not receive a lecture. They only participated in the public goods experiment. This group served as control to measure the possible effect caused by a lecture given by a person external to the school.

Extended analysis

Discusssion of Table A1

The estimates shown in Table A1 show that the effect of income is weakly significant and participants with higher income levels contribute a slightly lower share of their income. The remaining coefficients are not statistically different from zero. This indicates that contribution rates

Table A1. GLS regression of contributions rates.

Contribution rates	
	(1)
Ethics cohort	0.414*
	(0.137)
Control cohort	−0.145
	(0.147)
Income	−0.0000990†
	(0.0000386)
School 1	−0.0765
	(0.111)
School 2	−0.146
	(0.0806)
Period	0.0171†
	(0.00741)
Understanding	0.0147
	(0.00891)
Constant	0.374**
	(0.0908)
Observations	1,632
R^2	within: .0518 between: .4234 overall: .3581

Notes: Standard errors are adjusted for heteroscedasticity and clusters in groups of the public goods game and are shown in brackets below the coefficients. Interaction effects between cohorts and income, period and understanding included in the model are not shown.
†$p < .1$. *$p < .05$. **$p < .01$.

do not vary with instructor (Control cohort) or across schools. As in previous work, *understanding*, defined as the percentage of correctly answered comprehension questions, has no significant influence on cooperation (Goetze & Orbell, 1988).

Development of contributions over time

Results from the estimation in Table A1 also show that contributions actually increase over time ($p < .10$). This is contrary to rational choice theory and previous results from public goods experiments.

One possible explanation for this result is that the subject sample used in this study differs from common studies on public goods experiments in two aspects. Participants in most economic experiments (undergraduate students) come to a laboratory and do not know each other, whereas the students in our study (secondary school students), even if they did not know specifically who their fellow group members were, knew that they were students from the same school, whom they had met before, most likely talked to and spent some time with together. This knowledge alone could lead to a certain level of trust and feeling of connection towards fellow group members. It could serve to maintain cooperation in this setting even over the course of time, as free riding could lead to a more intense feeling of betrayal than if the others were people they would most likely never see again. This argumentation is supported by the results of Hofmeyr, Burns, and Visser (2007), who also find non-decreasing contributions among secondary school students in a repeated public goods game.

Effects of reciprocity: Discusssion of Table A2

The dependent variable is the change of the individual contribution rates from one period to the next ($\Delta C_{i,t} = C_{i,t} - C_{i,t-1}$). Reciprocity is based on the change in individual contribution rates relative to the difference $D_{i,t-1} = C_{i,t-1} - G_{i,t-1}$ between the individual contribution $C_{i,t-1}$ in period t-1 and the average of contributions in

Table A2. Generalized least squares regression on reciprocity.

	ΔContribution rates		
Dependent variable	Full sample	$D_{t-1} > 0$	$D_{t-1} < 0$
	(2)	(3)	(4)
D_{t-1}	−0.177†	−0.226	−0.451*
	(0.0774)	(0.121)	(0.138)
D_{t-1} * Ethics cohort	−0.0776	−0.147	0.0344
	(0.114)	(0.207)	(0.209)
G_{t-1}	−0.152	−0.233	−0.407*
	(0.0783)	(0.174)	(0.142)
Period	0.00140	−0.000197	0.00372†
	(0.00158)	(0.00313)	(0.00176)
Income	−0.0000270*	0.0000100	−0.0000806*
	(0.00000824)	(0.0000300)	(0.0000299)
Constant	0.0926**	0.0393	0.254*
	(0.0245)	(0.0535)	(0.0896)
Observations	1,496	561	639
R^2	within: .2790 between: .0542 overall: .1261	within: .2728 between: .0145 overall: .1269	within: .0986 between: .1741 overall: .0489

Notes: Standard errors are shown in brackets below the coefficients and are adjusted for heteroscedasticity and clusters in groups of the public goods game. The dummy variables for the cohorts, schools and interaction effects between the cohorts and all variables included in the model are not shown.
†$p < .1$. *$p < .05$. **$p < .01$.

Table A3. Descriptive statistics on contribution rates.

	Income (ECU)							
	1,200		2,000		2,800		Full sample	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Ethics cohort	72.19%	35.62%)	64.42%	38.51%	70.93%	31.19%	67.99%	36.22%
Control cohort	22.14%	23.01%	22.24%	20.28%	24.06%	17.02%	22.67%	20.22%
No-lecture cohort	40.93%	30.05%	26.54%	27.88%	23.28%	22.20%	29.73%	28.16%
Full sample	50.03%	37.26%	42.24%	37.31%	45.13%	34.86%	44.95%	36.83%

Note. ECU = experimental currency units.

individual's *i*'s group $G_{i,t-1}$. If reciprocity holds, the changes in contributions should depend negatively on the difference between the individual contribution and the group's average of the previous period.

The estimation is repeated separately for contributions above (3) and below (4) the group average. The effect of reciprocity is not statistically significant in regression (3), which indicates low levels of punishment in response to free-riding by other group members. Again, this is not so surprising given the social closeness of the participants.

Regression (4) shows that participants increase their contribution rates if they have contributed less than their group's average in the previous period. This indicates that people feel obliged to reciprocate cooperation by cooperating more.

The negative and statistically significant coefficient of the average contribution of the group in the previous period $G_{i,t-1}$ in regression (4) shows that higher levels of cooperation lead to more intense reciprocity. If the group's average contribution is high and students realize that they have contributed less than their group's average, they increase their contributions by more than if the group's average is low.

Finally, we analyse whether teaching social dilemmas can somehow not only influence cooperation levels, but also influence reciprocity. This is done by including an interaction effect between the treatment and the independent variable D_{t-1}. The results suggest that this is not the case and that reciprocity still exists in the Ethics cohort, but not more or less so than in the other cohorts (see Table A3).