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Testing Public Goods Provision: evidence from classroom experiments

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ABSTRACT

The main goal of this paper is to test hypotheses related to public goods provision in a dynamic setting. We report the results of multi-round laboratory experiments performed in a business school, involving students majoring in accounting, business administration and economics. The results obtained demonstrate that, contrarily to previous studies, subjects who major in economics tend to cooperate more and free ride less than non-majors do. We also find a result where subjects who are randomly assigned to groups with a fixed composition (named 'partners') tend to cooperate less than those who are reassigned in every round of the experiment ('strangers'). These results are important for providing additional evidence related to behavior in collective-action situations.

KEY WORDS

Experiments; Public Goods; Free-Riding Behavior.

1. INTRODUCTION

Pure public goods have two distinct characteristics: they are non-rival and non-exclusive. Examples of such goods are national defense, knowledge and the environment, just to cite a few. These goods are important mainly for the social benefits they generate. Since markets may not display enough incentives for the private provision of public goods, government intervention is frequently needed (Stiglitz 2000, ch.6).

One important question related to public goods is the following: how much money are people willing to pay for their provision? Two other questions are: (i) will people take part in collective actions involving public goods if they notice that the provision will take place regardless of individual contributions?; (ii) will individual actions lead to social inefficient results?

The main goal of this paper is to test hypotheses related to the voluntary provisions to public goods in a controlled environment, such as laboratory experiments. In doing so, we aim to investigate if subjects' choice of major tend to affect cooperation and if group composition matters during a multi-round experiment. We hope to contribute to a growing body of research related to the use of experimental methods as a means to uncover new results in Applied Social Sciences (Smith 1989)[1].

Our main results can be summarized as follows: (i) subjects who major in economics tend to cooperate more and free ride less than non-majors, with cooperation rates raising as subjects advance in their studies; (ii) random rematching can exert significant effects in the experiments' results, with groups formed in every round of the experiment (named 'strangers') displaying higher rates of cooperation than groups with a fixed composition ('partners'). In our view, these results are important not only for the questions they raise, but also for providing additional evidence related to behavior in collective-action situations.

The paper is divided as follows: the second section describes some of the literature related to laboratory experiments testing public goods provision, while the third section presents the mechanics of a linear public goods game as well as its main implications. The

[1] We also see the experiments reported here as an important pedagogical device. For more information on this, see Holt and McDaniel (1998) and Duffy (2008, 2011).

fourth section details the experiment performed and data construction. The fifth section contains our main findings. Finally, the sixth section concludes.

2. RELATED LITERATURE

Over the last decades, several studies attempted to analyze the provision of public goods using the experimental approach. For instance, after analyzing several laboratory experiments, Marwell and Ames (1981) found no robust evidence of free riding behavior involving single-shot games. Contrarily to what one could expect, subjects in experiments tended to cooperate more often than not, with reported rates around the 40-50% range.

The authors also reported a somewhat surprising result: economists tended to provide considerably smaller amounts for the provision of public goods (around 20%). Specifically, in the latter case, contributions to the provision of public goods were half the magnitude of the contributions from other experiments. Marwell and Ames (1981) concluded that economists would free ride significantly more than other subjects did. According to the authors, there were two possible explanations for their results: first, students worried about economic incentives might self-select in economics; second, as time went by, economics students may adapt their behavior to the theories they study.

When summarizing the available evidence in the 1980s, Andreoni (1988, p.291) reported three consistent results: (i) there was no significant evidence of free riding behavior in single-shot games; (ii) in experiments involving repeated games, subjects' provisions for public goods tended to decay with each repetition; (iii) free riding was often approximated after several trials, although exact free riding was seldom realized.

Because of these possibilities, Andreoni (1988) divided students in two groups: one with a fixed composition (named 'partners') and the other with randomly assigned members (named 'strangers'). He also tested two hypotheses related to public goods provision: 'learning' (where repeated play allowed subjects to learn the rules of the games they were playing) and 'strategies' (where repetition allowed subjects to signal future moves to each other). After finding mixed support for free riding behavior, the author concluded his study by pointing the need for theories of non-standard behavior[2].

Carter and Irons (1991) explored the robustness of Marwell and Ames' (1981) original study by implementing a simple ultimatum bargaining game experiment to test whether economics students behaved in accordance with the predictions of rational choice models. They found that economics students, when playing the role of 'responders' in ultimatum games, tend to accept less money offers, while they kept more when playing the role of 'proposers'.

The authors also presented some econometric evidence trying to disentangle 'selection' and 'learning' effects among the experiment's subjects. In this case, results were mixed: while self-selection seems to play a role in the choices reported, the same is not true for learning economic topics. Overall, they concluded that, although evidence was not conclusive, "(…) *economists are different*" (Carter and Irons 1991, p.177).

Frank, Gilovich and Regan (1993) investigated if exposure to self-interest models commonly used in economics could affect students. In doing so, the authors presented extensive evidence related to situations where economics students may display opportunistic behavior when compared to students from other areas. For instance, in one occasion, the authors mailed questionnaires to over a 1,000 professors of 23 disciplines asking for charity

[2] In the case of themes related to cooperation in laboratory experiments, see Dawes and Thaler (1988) and Andreoni, Harbaugh and Vesterlund (2008).

contributions. Based on the responses received, the authors uncovered a result where the proportion of free riders (those who reported giving no money to any charity) was significantly higher among economics professors (9.3%) when compared to other disciplines, whose percentage was between 3% and 4%.

In other occasion, the authors conducted 267 experiments related to the prisoners' dilemma's game involving both economics majors and nonmajors. When comparing defection rates between the two groups, they reported a 60.4% defection rate for economics majors, which was considerably higher than the value reported for nonmajors (38.8%). Interestingly, they also noticed that the overall defection rate declined significantly, as students progressed through school.

Additionally, they report the results of an honesty survey related to freshman students in a microeconomics and astronomy courses. The results from this survey showed that the proportion of 'less honest' responses raised after students passed one semester of introductory economics courses. The authors concluded that: (i) there were large differences in the extent to which economists and non-economists behave self-interestedly; (ii) however, there could be occasions where economists behaved in traditionally communitarian ways; and (iii) there exists some evidence suggesting that differences in cooperativeness were caused in part by economics' training.

Yezer, Goldfarb and Poppen (1996) questioned the validity of Frank, Gilovich and Regan's (1993) study. According to the former authors, it is not obvious that exposure to economics would be expected to encourage less cooperative behavior. In particular, they emphasized the importance of drawing inferences based on subjects' behavior in actual (as opposed to hypothetical) situations. They presented an interesting experiment, where envelopes containing currency were dropped in classrooms before classes in economics or other subjects were scheduled to meet (the 'lost-letter experiment'). In this case, the return rate on lost letters was used as a measure of cooperation.

The results of this experiment showed a considerable difference in cooperation between economics and noneconomics majors. Contrarily to the evidence presented by Frank, Gilovich and Regan (1993) and other authors, Yezer, Goldfarb and Poppen's (1996) results indicated that economics students were far more cooperative than students from other disciplines.

A very promising example of the use of experimental methods in the Brazilian context was Bianchi (1998)[3]. Inspired by Carter and Irons (1991), the author presented results of an experiment related to an ultimatum game, where each subject was asked to divide R$ 10 (US$ 9.70, in 1998) between him(her)self and another anonymous subject. The author reports a similar result to Carter and Irons (1993): subjects who were economics majors tended to accept less money offers when playing the role of 'responders' in ultimatum games, while keeping more money when playing the role of 'proposers'. She emphasized that, in the Brazilian context, fairness considerations might play a significant role in determining the negotiations' outcomes. In terms of econometric evidence, contrarily to Carter and Irons' (1991) original conclusions, self-selection did not seem to play a relevant role in the reported results. In addition, the regression results did not support the hypothesis of a learning effect, either[4].

[3] See also Antiqueira, Saes and Lazzarini (2007) and Silveira *et al*. (2013) for additional examples of the experimental approach in Brazil.

[4] One common point between our paper and Bianchi's (1998) is that we both dealt with Brazilian students in our experiments. In addition, we divided our sample between economics and noneconomics majors, in order to study distinct behaviors in the laboratory. In terms of differences, these are the following: (i) instead of using an ultimatum game, we based our analysis on a linear public goods game *à la* Andreoni (1988); (ii) we developed a

3. PARTNERS AND STRANGERS IN LINEAR PUBLIC GAMES[5]

Linear public goods games have been extensively used in experiments over the last decades (e.g., Marwell and Ames 1981; Andreoni 1988). In such games, individuals are given a budget (*m*), which can be invested either in a private (*x*) or public good (*g*), with x + g = m.

Individual payoffs (P_i) are determined by the following formula:

$$P_i = x_i + \alpha\sum^{n}_{j=1} g_j \quad (1),$$

where *n* is the number of group members. The parameter α is chosen such that $0 < \alpha < 1$.

Given the payoffs of the linear public goods game described, investing R$ 1.00 in the public good has a private return of R$ 1.00, while it has a social return of R$ 2.50. Therefore, it is Pareto efficient for subjects to invest all of their money in the public good. However, since the private return from the private good exceeds the private return from the public good, the Nash equilibrium of this game is to invest zero in the public good (to free ride). In fact, it can be shown that investing zero in the public good is a dominant strategy for each player in this game[6].

As noted earlier, the strong version of the free-rider hypothesis is rarely observed in one-shot games (Marwell and Ames 1981). Instead, most results from experiments point to a decaying provision to public goods over time, in the case of several rounds of play (Andreoni 1988; Andreoni and Croson 2008). One possible conjecture for such behavior is the so called 'learning hypothesis': subjects may not immediately understand incentives, but after a few rounds, they start learning the 'rules of the game' (once they do that, free riding behavior tends to increase).

An alternative conjecture to explain decaying patterns in contributions to public goods is called the 'strategies hypothesis': subjects believe all other subjects behave rationally in an incomplete information version of the Prisoner's Dilemma[7]. For instance, if a subject believes that his or her partners may behave irrationally, then he or she may free ride to educate them. As a result, initial cooperation patterns may unravel to free riding behavior.

One advantage of dividing subjects between 'partners' and 'strangers' is that this allows us to test the 'learning' and 'strategies' hypotheses. For instance, in the case of the 'strategies' hypothesis, if a subject initially invests some positive amount in the public good, but learns during a specific round that free riding is the single-shot dominant strategy, he or she may continue to contribute to the public good (in the case of a 'partner').

However, if he or she is a 'stranger', there is no incentive to contribute to the public good (every round is seem as a one-shot game by 'strangers'). Given this, we expect that under the strategies hypothesis, giving by 'partners' will be greater than giving by 'strangers', especially in the first few rounds of the game. On the other hand, as the game approaches the end, we can expect both 'partners' and 'strangers' to free ride.

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multi-period experiment, which allows us to analyse the evolution of cooperation over time. We see our analysis as complementary to Bianchi's (1998).

[5] This section is based on Andreoni and Croson (2008, p.777).

[6] Since $0 < \alpha < 1$, free riding (g = 0) corresponds to a single-shot dominant strategy, while fully providing the public good (g = m) for all *i* is the symmetric Pareto efficient outcome (given that $n\alpha > 1$) (Andreoni and Croson 2008, p.777).

[7] For more details on games of incomplete information, see Gibbons (1992, ch.3-4).

4. DATA AND EXPERIMENTAL METHOD

The analysis performed in this paper is based on two stages. In the first stage, we conducted several classroom experiments related to the provision of public goods in a dynamic setting. The experiments reported took place in a Brazilian business school during the first semester of 2014. They involved students of three undergraduate courses: accounting, business administration and economics.

Specifically, we ran a five-round experiment where subjects filled a form deciding how to divide R$ 100 (R$ 1.00 = US$ .44, in August, 2014) between a private and a public good (for simplicity, the private and public goods were named *A* and *B*, respectively). For each R$ 1.00 invested in the private good, subjects would receive R$ 1.00 individually. On the other hand, for each R$ 1.00 invested in the public good, the group's members would receive R$ 0.50.

When designing our experiment, we followed mainly the guidelines contained in Andreoni (1988). We divided subjects in random groups of five members. Half of these groups had a fixed composition during distinct rounds (labeled 'partners') while the other half had their composition randomly changed in every round of the game (labeled 'strangers'). We did this in order to evaluate the effects of group composition in the experiments' main results[8].

In every class where we performed the experiment, subjects were randomly selected to compose each group ('partners' and 'strangers'). Those who were selected as 'partners' would remain in the classroom while the others ('strangers') were taken to a separate place where they could participate in the experiment. In the latter case, subjects were randomly assigned to a new group after the end of every round.

Once the experiment started, subjects were given instructions and time to ask questions. They were also told that the experiment would last five rounds. Experimenters suggested subjects not to communicate with each other during the rounds of the experiment, although no strict prohibitions were imposed. After each round, subjects were informed about how much money they had individually and as a group (that is, the outcomes of other groups were not known).

5. RESULTS

In this section, we present the main results related to our experiment. Table 1 contains descriptive statistics of the variables employed in the analysis below:

Table 1
Descriptive Statistics

	Sex	Age	Econ.Major	'Partner'	Senior
Mean	0.53	21.55	0.22	0.55	0.14
Median	1.00	20.00	0.00	1.00	0.00
Maximum	1.00	47.00	1.00	1.00	1.00
Minimum	0.00	17.00	0.00	0.00	0.00
Std. Dev.	0.50	5.13	0.41	0.50	0.35
Observations	100	102	102	102	102

Source: authors' calculations.
Notes:

[8] See Andreoni and Croson (2008) for a survey of the related evidence.

a. 'Sex' corresponds to a dummy variable that assumes the value of 1 for male subjects and 0 for female subjects.
b. Age corresponds to each subject's age at the date of the experiment.
c. 'Econ.Major' corresponds to a dummy variable that assumes the value of 1 for subjects majoring in Economics and 0 otherwise.
d. 'Partner' corresponds to a dummy variable that assumes the value of 1 for subjects who were assigned to a group with fixed composition during the experiment and 0 for subjects who were assigned to a group with random rematching (in the latter case, the group's composition changed in every round of the game).
e. 'Senior' corresponds to a dummy variable that assumes the value of 1 for subjects who have completed more than 50% of the economics major and 0 otherwise.

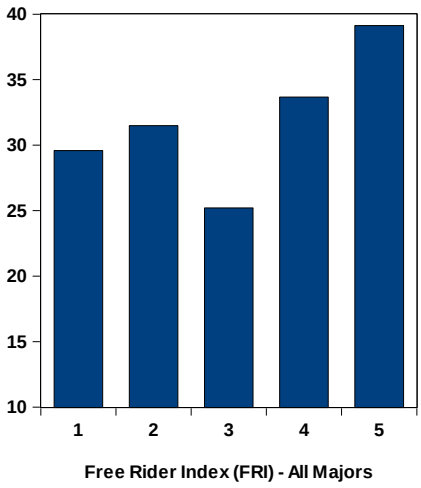
As said before, our sample is composed by undergraduate students from a business school. The results in the table show that 53% of the subjects are male students, with the mean age being around 22 years old. At the time of the experiment, 22% of the subjects were majoring in economics, while the remainder were majoring in business administration or accounting. Given that we decided to divide subjects between groups of 'partners' and 'strangers', we found that 55% belonged to the first type of group. In terms of senior students, 14% of the students have passed half the economics major, while the remainder have not ('freshmen').

In order to test opportunistic behavior, we first constructed a simple index, named 'Free Rider Index' (FRI) (Leuthold 1993). This index is based on the following formula:

$$FRI = (\text{Amount Invested in A}) / R\$\ 100 \qquad (2)$$

The FRI corresponds to a ratio between the amount invested in the private good (A) and the total amount available for each subject. We employ this index as a means to capture free riding behavior in classroom experiments involving public goods provision. Graph 1 displays results related to the FRI during all rounds of the experiment:

Graph 1
Free Rider Index (FRI) – All Majors



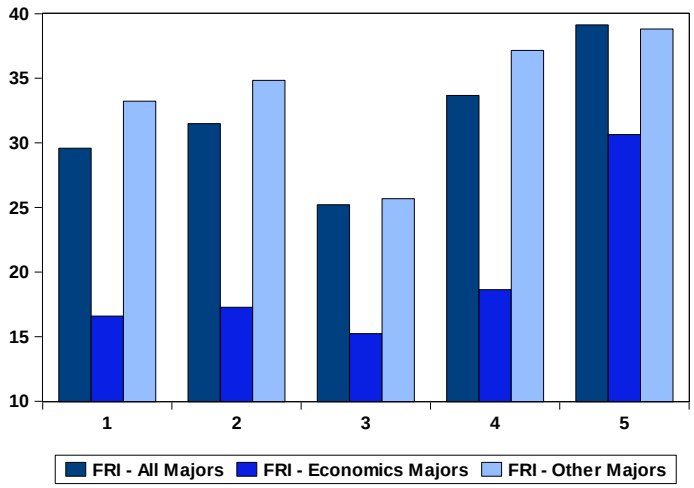
Source: authors' calculations.

The graph shows two remarkable patterns: (i) the FRI increased between the first and final round of the game (average values range from 30% to 40%); (ii) although the FRI

presented a lower value in the third round, it raised again in the fourth round, reaching its peak by the end of the game. This last pattern is in accordance with most predictions from game-theoretic models with a finite number of repetitions (Gibbons 1992, ch.4).

Graph 2 plots the FRI index and its components, segmented by major. In this case, we divided our sample in two categories: 'Econ. Majors', representing subjects who major in economics, and 'Other Majors', representing subjects majoring in other fields (such as accounting and business administration).

Graph 2
Free Rider Index (FRI)
Distinct Majors (Economics and Others)



Source: authors' calculations.

A clear pattern in the graph is that the results for economics majors are significantly lower than for other majors, contrarily to what was previously expected. This is confirmed when we consider the FRI values for each round of the experiment, as reported in Table 2:

Table 2
Free Rider Index (FRI) – Different Majors
(Economics and Others) - Linear Public Goods Game Experiment

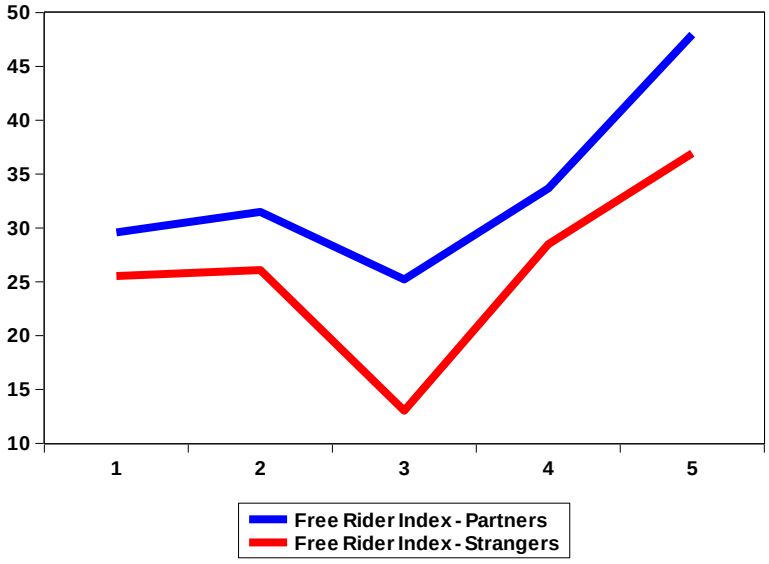
	Round 1	Round 2	Round 3	Round 4	Round 5
Economics Major	16.59	17.27	15.23	18.64	30.64
Other Majors	33.23	34.84	25.68	37.16	38.81
Difference	-16.64	-17.57	-10.45	-18.52	-8.18

Source: authors' calculations.

These results confirm that subjects who are economics majors tend to free ride significantly less often than those who are not. The reported differences between the two groups are in the 17-18% range. Interestingly, such differences drop to half these values (-8.18%) once the experiment reaches its final round.

In order to verify the effects of random rematching in the experiments' results, we report FRI values for each round, given the two groups considered ('partners' and 'strangers'). Graph 3 contains the main results:

Graph 3
Free Rider Index (FRI)
'Partners' and 'Strangers'



Source: authors' calculations.
Notes:
a. The Free Rider Index (FRI) was calculated by the formula FRI = (Amount Invested in A) / R$ 100, where *A* stands for a private good.
b. For more details, see Leuthold (1993).

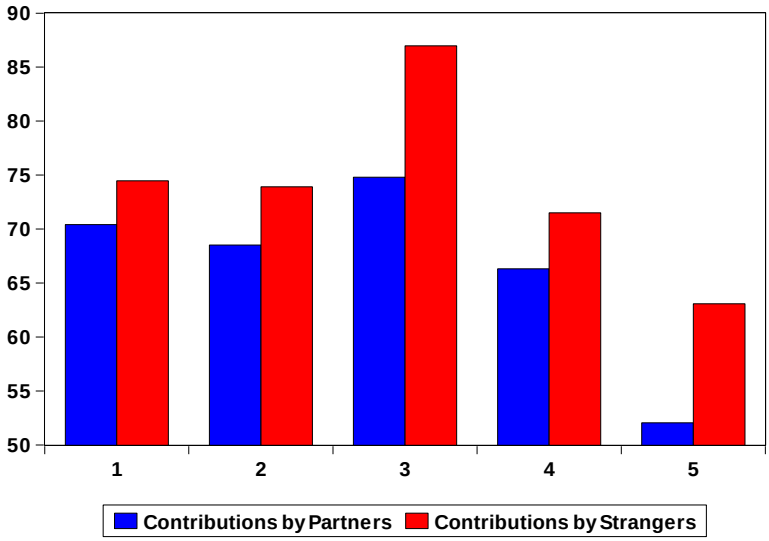
The graph displays a very clear pattern: 'partners' consistently free-ride more than 'strangers'[9]. On the other hand, it is interesting to notice that although free riding decayed towards the third round, it started to rise as the game approached its end. In the last round, 'partners' displayed the highest value for the FRI (47.96%), with a qualitatively similar pattern for the 'strangers' group (36.93%). This result holds for all rounds of the experiment.

Again, it is interesting to notice that the differences among each group's subjects diminished as the experiment approached its end. In the first round, the difference between groups was in the 20%-30% range, coming to a peak in the third round (46.9%). By the fifth round, this difference was reduced to 14.23%.

Graph 4 contains the evolution of cooperation among group members during the rounds of the experiment. In this case, individual contributions (*Ci*) were calculated through the formula Ci = R$ 100 – FRI, where FRI represents the Free Rider Index.

[9] A similar result was obtained by Andreoni (1988). When comparing the performance of groups of 'partners' and 'strangers' in several experiments, the related evidence presents mixed results, in general (Andreoni and Croson 2008).

Graph 4
Contributions to Public Goods Provision
'Partners' and 'Strangers'



Source: authors' calculations.
Notes:
a. Each group's contributions to public goods was calculated by the formula: Contribution = R$ 100 - FRI, where FRI stands for the Free Rider Index.

These graphical results confirm two interesting patterns: first, contributions by 'Strangers' were larger than contributions for 'Partners' during all rounds of the game, reaching a peak in the third round; second, both groups' contributions were significantly lower in the last round of the experiment.

Interested in testing the same predictions as Carter and Irons (1991) and Bianchi (1998), we present econometric results related to the experimental data collected in Table 3. This table contains the results of specifications of the following form:

$$FRI_i = \alpha + \beta_1 * \text{'Econ.Major'} + \beta_2 * \text{'Partner'} + \beta_3 * \text{Controls} + \varepsilon_i \quad (3),$$

where 'FRI_i' stands for the FRI calculated for each subject in our sample (average across all rounds of the experiment), while 'Econ.Major' corresponds to a dummy variable that assumes the value of 1 for subjects who were majoring in economics during the experiment and 0 for subjects who were not. The term 'Partner' corresponds to a dummy variable that assumes the value of 1 for subjects who were assigned to a group with fixed composition during the experiment ('partners') and 0 for subjects who were assigned to a group with random rematching ('strangers'). We regress FRI on several controls, while attempting to capture some causal relation among these variables. All regressions were run through Ordinary Least Squares (OLS)[10].

[10] A word of caution is needed here. While Carter and Irons (1991) and Bianchi (1998) perform an ultimatum game experiment, we deal with a linear public goods game. This difference in procedures might complicate comparisons involving each experiment's results. We see our results as complementary evidence to Carter and Irons' (1991) and Bianchi's (1998).

Table 3
Regression Results
FRI and Subjects' Characteristics

Dep. Variable	FRI (Rounds' Average)				
	(1)	(2)	(3)	(4)	(5)
'Partner'	10.57**	11.66**	11.05**		
	(5.25)	(5.25)	(5.24)		
Econ. Major				-15.49**	-5.64
				(6.29)	(7.90)
Senior and Econ. Major					- 25.16**
					(10.83)
Male		-0.19			
		(5.38)			
Age			-5.05		-0.91*
			(3.16)		(0.50)
$(Age)^2$			0.08		
			(0.06)		
Constant	26.01**	26.10***	96.22**	35.16***	55.19***
	(3.89)	(4.55)	(40.71)	(2.92)	(11.22)
R^2	0.039	0.125	0.077	0.057	0.140
R^2 Adj.	0.029	0.107	0.049	0.048	0.114
Observations	102	102	102	102	102

Source: authors' calculations.
Notes:
a. The dependent variable in each specification is the Free Rider Index (FRI) (average across all rounds of the experiment).
b. 'Econ.Major' corresponds to a dummy variable that assumes the value of 1 for subjects majoring in Economics and 0 otherwise.
c. 'Partner' corresponds to a dummy variable that assumes the value of 1 for subjects who were assigned to a group with fixed composition during the experiment and 0 for subjects who were assigned to a group with random rematching (in the latter case, the group's composition changed in every round of the experiment.
d. 'Senior' corresponds to a dummy variable that assumes the value of 1 for subjects who completed more than 50% of the economics major at the experiments' date and 0, otherwise. The term 'Senior and Econ. Major' represents an interaction between 'Senior' and 'Econ. Major'.
e. 'Male' corresponds to a dummy variable that assumes the value of 1 for male subjects and 0 for females.
f. 'Age' corresponds to each subject's age at the experiments' date, while '$(Age)^2$' represents 'Age' squared.

When considering the influence of group composition in the regressions above, we noticed that subjects who were in groups of 'partners' tended to free ride more often. This result holds for all the specifications considered, with estimated coefficients being positive and statistically significative at the 5% level (specifications 1, 3 and 4).

In terms of major, we first noticed that subjects majoring in economics tended to free ride less (estimated coefficient of -15.49) in a parsimonious specification (2). However, this result vanishes when we consider an interaction dummy relating the economics major and senior students. In the latter case, we cannot reject the hypothesis that the estimated coefficient for the economics major is equal to zero.

On the other hand, we noticed that the interaction dummy delivers an even larger value for the free-riding effect: in this case, the data suggests that, contrarily to most available

evidence, subjects who were senior economics students tended to free ride less often than other subjects did. This is a particularly surprising result, since previous studies usually found the opposite pattern (e.g., Marwell and Ames 1981), where economics majors would free ride more often than not.

Additionally, we noticed that subjects' gender and age did not seem to exert a significant effect on free riding. If anything, the sign of the estimated coefficients suggests that male and older subjects tended to free ride less often, albeit its lack of statistical significance. Overall, we see these results as suggestive, rather than representing definitive evidence related to opportunistic behavior.

6. CONCLUSIONS

In this paper, we presented results of several classroom experiments where subjects should decide how to allocate their money in linear public goods games over several rounds. Specifically, we performed five-round experiments related to the provision of public goods with undergraduate students in a business school.

The results obtained were somewhat surprising: when deciding on how much to contribute for public goods provision, economics majors provided, on average, higher amounts than non-majors did. These results are in stark contrast with other contributions previously reported in the literature (Carter and Irons 1991; Frank, Gilovich and Regan 1993).

Our results also demonstrate that random rematching can play an important role in explaining the evolution of cooperation in the laboratory. We noticed that 'strangers' tended to cooperate more often than 'partners'. This result implies that the theoretical prediction that 'partners' would tend to cooperate more than 'strangers' is not supported by our data. At the same time, we noticed that cooperation diminished in both groups as the experiment came to an end, as predicted by game-theoretic models.

When analyzing these results, we present three possible reasons for the results reported. First, it is well known that one of the major difficulties related to experimental research is the difficulty in extrapolating results (external validity). This implies that the results reported here might not be valid in other settings. While this is a potential drawback of our work, we would suggest that this conclusion would be tested through additional experiments, with a special emphasis on field situations (List 2011).

Second, there is the possibility that, contrarily to what most authors previously emphasized, economics majors tend to play experimental games in a strategic way. Because of that, subjects may contribute not because they are more altruistic than others, but because they are willing to receive higher payoffs in future rounds of the game. While this is an exploratory hypothesis, it would be interesting to test for the occurrence of strategic behaviors in public goods games, as originally proposed by Andreoni (1988), for instance.

Third, the fact that communication was not strictly forbidden during the experiment may have affected our results. Specifically, the experiments' subjects had the opportunity to talk to each other and possibly combine strategies during the experiment. Additionally, since subjects were classmates, we believe that the existence of social ties may have affected results. Because of this possibility, it would be interesting to repeat the same experiment in a setting where subjects did not have any previous relationships and where communication would be forbidden[11].

[11] Ostrom (1999) discusses the possible emergence of cooperation in experiments involving public resources management, where communication among subjects is allowed. For additional evidence, see Henrich *et al.* (2001), Cárdenas and Ostrom (2004) and Fehr and Leibbrandt (2013).

In our opinion, experiments can represent an important research and pedagogical device in modern classrooms. We hope to see more experimental results related to behavioral responses in collective-action settings in the near future as a means to provide a better understanding of subjects' actions in real-life situations.

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