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Experimental Approach to the Study of Voluntary Contribution to Public Good Financing*

ANETTA CAPLANOVA[1] (*Corresponding author*) and EVA SIRAKOVOVA[2]

[1] Professor, University of Economics in Bratislava, Department of Economics, Faculty of National Economy, Bratislava, Slovak Republic. e-mail: anetta.caplanova@euba.sk
[2] PhD Candidate, University of Economics in Bratislava, Department of Economics, Faculty of National Economy, Bratislava, Slovak Republic. e-mails: eva.sirakovova@euba.sk

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ABSTRACT

The purpose of the article is to present the results of the online behavioral experiment focused on voluntary contribution to financing of public goods. The experiment using the public good behavioral game aimed to identify factors affecting voluntary contribution of individuals to financing of public goods. We created a behavioral game design that has elements of a standard public goods game. It was implemented in the form of an online game which was designed as a within-subject experiment. The data collected in the experiment were analyzed using appropriate statistics methods. We used the behavioral and experimental economics methods for designing our behavioral experiment. After the collecting data through online experiment we applied statistics methods to analyze our data, i. e. descriptive statistic, Spearman correlation coefficient and Multiple linear regression model. The results of the study show that an income is a statistically significant variable. Individuals with low income contributed to financing of public goods more than high income individuals. The identification of individuals with such factors as the opinion of the family, the warm-glow effect, the impact on the quality of life and the consent of family, all had a positive effect on individual contributions to financing of public goods. On the opposite side, the identification with factors such as moral obligation, satisfaction with services provided by public goods, the belief in cooperation among people and the perception of contribution as a social norm were all confirmed to decrease the contribution to financing of public goods.

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INTRODUCTION

The financing and provision of public goods are often associated with government intervention, which is based on the assumption that the private sector will not provide this type of goods if left on its own. Main problems linked to the private provision of public goods are related to the free rider problem and problems of disclosure of individual preferences. The development of behavioral and experimental economics has contributed to the shift from the standard theory of public goods towards new approaches. This research indicates that people are often willing to contribute voluntarily to financing of public goods. They can be motivated to do so by behavioral factors, that are usually not directly related to financial motivation. This has led to the emergence of alternative theories of public goods, which stipulate, under which conditions individuals are willing to contribute voluntary to financing of public goods.

The aim of this article is to present the results of a behavioral public good experiment and relate it to the state of the art. To obtain the data on the behavior of individuals, we created a design of behavioral public good game with special focus on the study of behavioral factors that affect individuals when deciding whether they contribute from their private resources to financing of public goods.

The paper is structured as follows. In the next part, we present a brief overview of relevant literature, then, research methodology is described, in the next section, we present the results of the behavioral experiment, finally, we conclude the paper with the discussion and conclusion section.

1. LITERATURE REVIEW

One of the alternatives to ensure the availability of public goods is their private provision and financing. This approach is based on the analysis of people's behavior in groups influenced by a number of economic as well as other factors such as respect, friendship, prestige, and others.

Bergstrom et al. (1986) developed a model of private financing of public goods based on voluntary contribution. It is a static model of voluntary contributions of individuals, who decide, how much to voluntarily contribute to the provision of a public good. However, the authors conclude that the amount of public goods provided voluntarily may be insufficient due to the fact that total marginal costs of providing public goods are borne by all individuals, but the same individuals later receive only a proportion of the benefit of the public good.

The popular studies on the private provision of public goods (e.g. Cornes and Sandler 1985, Andreoni, 1988) based the model of private provision of public goods on the voluntary contribution mechanism (VCM), which was later experimentally tested using the public goods game. The analysis of human behavior in the game theory setting led to the creation of preconditions for the development of voluntary contribution mechanism in the experimental environment. The willingness of people to contribute voluntarily to financing of public goods is often examined in the laboratory or field experiments. The related mechanism is based on the standard linear public good game, which has usually the character of a simple investment game. In this game, the participants decide on the investment of experimental money between two types of accounts – a private account and a group account with the later one representing a public good. In the public goods games, the choices and strategies of individual players are monitored.

First experiments with public goods based on the voluntary contribution mechanism (e.g. Marwell and Ames, 1979;1980) shoved that a relatively large number of people is willing to contribute to financing of public goods, even though, they could free ride. These experiments also examined the effect of the group size on individuals' voluntary contributions. In larger groups, the number of voluntary contributions to the group account was lower than the contributions observed in smaller groups. Other factors that could affect the number of contributions to the financing of public good were also studied, e.g., Isaac and Walker (1988) pointed out that the possibility of the communication between game participants increased the average amount of contributions to the group account.

One of popular modifications of the VCM mechanism is the introduction of a provision point (a threshold), i.e., of the minimum amount that must be collected so as the public good was financed. The threshold modification is consistent with Nash equilibrium outcome (Bagnoli and Lipman, 1989). The

authors state that the amount of contributions equals to the cost of a public good (and none of the individuals contributed more than their individual valuation of this good) and conclude that the threshold cannot completely eliminate free riders, but increased contributions can be expected if the threshold is lower than the overall benefit for potential contributors. The existence of a provision point adds to the conditions to pay the return from the group account. According to Croson and Marks (2000) unlike the standard linear public good game, in which there is only one Nash equilibrium identical to the dominant strategy, if a provision point is added, there will be two Nash equilibria (or their sets). The first one would be the set of inefficient Nash equilibria if the threshold was not reached, and the second one, would be the set of effective Nash equilibria if the threshold was reached. In a series of laboratory and field experiments, Rondeau and List (2008) confirmed a very strong influence of the threshold value on the results of their field experiment. The subjects of the experiment contributed more to the group account in those treatments, in which the provision point was specified. McBride (2004) observed the convergence of individual contributions to the group account up to the value of the provision point.

Andreoni (1988) concludes that the share of free riders varies across different public good experiments, but it is possible to identify three common features, which often occur. First, there is no significant incidence of free riders in a single-shot games. Second, in the repeated games, the number of free riders increases with each repetition. This phenomenon can be observed, when participants know the length of the game (Isaac, Walker and Thomas, 1984), but also in case when they do not know it (Isaac, McCue and Plott, 1985). Third, the number of free riders often increases after multiple rounds, but the pure free riding (i.e., the situation, when no one contributes to a public good) rarely occurs.

Factors influencing individual decisions to voluntarily contribute to financing of public goods.

In addition to examining the impact of the group size, or the threshold, in the literature other factors have been also identified that are proven relevant to individual decisions of their contribution to the financing of public good. From among these the effect of learning, altruism, warm-glow effect, individual income, and the effect of conditional cooperation belong to the most studied ones.

The effect of learning has been confirmed by the results of numerous studies, which show a decrease in contributions to public goods in repeated games. Andreoni (1988) conducted an experiment in which subjects were divided into “partners” and “strangers” to find out whether a subject will learn from the experience in the previous rounds of the game and formulate strategies. Voluntary contributions to public goods in both groups of participants decreased in each experimental round and this result supported the learning hypothesis. Contributions to the public goods in the “strangers” group were almost 20 percent higher than in the “partners” group, when strangers contributed a larger amount to the financing of public goods. These results were confirmed by a study of Palfrey and Prisbrey (1996). The research has also looked into international differences in the behavior of “strangers” and “partners”. Burlando and Hey (1997) concluded that in the United Kingdom, “strangers” contributed to the financing of public goods more than “partners”, but in the Italian context, “partners” contributed more to the public good financing than “strangers”. Also, a larger number of free riders was observed among the participants from the UK.

The effect of altruism and warm-glow effect.

Andreoni (1990) extended the model of giving based on altruistic behavior to the effect of satisfaction (i.e., warm-glow effect) caused by people contributing to financing of public goods for altruistic reasons, since altruism provides them subjective feeling of satisfaction. Experimental research of altruism is carried out in the frame of the dictator game and two types of subjects, a dictator and a receiver. The dictator distributes money between himself and the recipient, while the recipient has a passive role only. Even though the results of numerous experiments that have been undertaken using the dictator game (e.g., Bardsley, 2008; Servátka, 2009) have not been consistent, it has been shown that often without any economic incentives dictators decide to donate a fraction of their experimental money to recipients.

The income effect.

Several studies have looked at whether low-income participants contribute less to a group account, or whether knowing that there are income disparities between participants will change their decisions. Buckley and Croson (2006) found that lower-income individuals contributed approximately the same absolute amount to the financing of the public goods, i.e., a higher percentage of their income than individuals with higher income. These results are also consistent with the results of the study by Hofmeyr et a. (2007), who also did not find significant differences between the nominal contributions of low-income and high-income individuals. However, Seçilmiş and Güran (2012) came to the opposite conclusion. The results of their experiment showed that the income heterogeneity of participants had a statistically significant effect on the contributions to public goods and higher-income individuals contributed to the group account more than low-income individuals.

Fischbacher and Gächer (2001) focused on identifying *conditional cooperation* and showed that people wanted to be closer to others with regard to the amount of their contributions to the group account. They also found that not only people want others to contribute about the same amount, but they are also willing to punish those, who do not contribute, or contribute very little. This finding applied, even if the costs of punishing free riders were high and did not bring any material benefits. However, in those rounds, in which free riders were allowed to be punished, higher contributions were allocated to the group account. A field experiment conducted in Switzerland to examine conditional pro-social behavior (Frey and Meier, 2004) was based on the study of university students, who had the opportunity to donate funds to university projects. The information that others had contributed more led to an increase in the contribution of experimental subjects.

2. THE DATA AND METHODOLOGY

To collect the data for our research, we created a behavioral game design that has elements of a standard public goods game. It was implemented in the form of an online game which was designed as a within-subject experiment. The behavioral game was run using the web platform www.onlineexperiment.sk. The game was played in 6 rounds, while in each round detailed instructions were provided to the participants. The experiment was run twice with different groups of research subjects. The first group of participants was recruited through the Facebook page of the authors' home department. The participants in this group were not rewarded financially for their participation, the reward was allocated only to the members of the winning group (a small group of 5 players). The winning group was the group with the highest value of their cumulative benefits earned during the entire experiment. At the end of the game, the players were paid according to the following ratio: 1 experimental money unit = 0.30 €. In the second experiment, the subjects were university students. They were not rewarded with real money, but additional points towards their assessment in the course. All students were awarded 2 additional points for participation, but the members of the winning group received 3 additional points.

In both experiment groups, the game was fully anonymized. In addition to studying voluntary cooperation among participants, we also examined the impact of income and group size on the willingness to voluntarily contribute to the group account. In the game, subjects were divided into small (5 people) and large (10 people) groups. Each group had its own group account, i.e., a *group account 1* (for small groups) and a *group account 2* (for large groups). In the fourth and fifth round, the participants were members of both groups and they decided to split experimental money between three accounts – private account, *group account 1* and *group account 2*. We ensured the income differentiation by carrying out a quiz before the start of the game. Thus, the behavioral game was divided into three parts:

- General instructions for participants, Quiz to allocate experimental money
- A behavioral game, similar to the standard public goods game, participants made investment decisions (four experimental treatments)
- Behavioral and demographic questionnaire

We chose the quiz to ensure differentiation of participants' experimental income and to ensure that participants perceived experimental money as earnings. The Table 1 shows the exchange ratio between the correct answers and experimental money.

Table 1. Exchange ratio between correct answers in the quiz and the corresponding amount of experimental money allocated

Number of correct answers	0-5	6-10	11-15	16-20
Amount of experimental money	10	20	30	40

Source: Authors' specification

After the quiz, each participant could see the amount of experimental money earned. The next round took the form of an investment game.

In the first treatment of the public good game, participants were randomly divided into small groups of 5 people. They were not aware with whom they were in a group. Each participant had to decide how much of their experimental money they would invest in each of two accounts, a private account and a group account 1. The money invested into the group account 1 were multiplied by 1.2 and then, equally distributed among the group members regardless of how much they contributed. Thus, the benefit of each individual consisted of the benefit from the private account and the benefit from the group account 1. After having invested, each participant could see, how much experimental money he/she earned. In the second treatment, a provision point of 20 units of experimental money was added to the group account 1. Thus, the benefit from the group account was conditioned by reaching the provision point. All other attributes of the game remained the same as in the previous round. Also, at the end of the second treatment, the participants learned how much money they earned. In the third treatment, a group account 2 was added. The funds allocated to group account 2 were multiplied by 1.3. In this round, there was no provision point, and other attributes of the game remained unchanged. In this treatment, the participants could contribute to both group accounts (group account 1 and group account 2) and to one private account. In the fourth treatment, provision points were added to both group accounts. The threshold for group account 1 was the same as earlier (i.e., 20 experimental money units). The threshold for group account 2 was specified at 30 experimental money units. After this treatment, the participants learned about their return for the entire investment.

At the end of the game, participants were asked to fill in a behavioral and demographic questionnaire. In the demographic part of the questionnaire, the participants provided information about their gender, age and education. In the behavioral part, they were asked to express their attitudes to possible behavioral factors, which could have affected their investment decisions to invest in a group account. They were asked to express their attitude on the scale between 1 (strongly agree) to 5 (strongly disagree). In the first experimental group there were 40 participants who were allocated to 8 small and 4 large groups. The participants applied to participate in the experiment using an online form, which included their consent to process their personal data. The second experimental group consisted of 60 students allocated to 12 small and 6 large groups. Both experiments were run using Microsoft Teams.

The data collected in the experiment were first analyzed using descriptive statistics and then the correlation analysis was performed using the Spearman correlation coefficient. Subsequently, we used the model of multiple linear regressions to analyze the impact of the game modification and the impact of the identification with the statements in behavioral questionnaire on investments to the group accounts. Formally, the multiple linear regression model can be written as follows:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots . \beta_n X_{in} + \varepsilon_i \qquad (1)$$

Where Y_i is the dependent variable defined as the experimental money allocated *to group account 1* and *group account 2* (as the percentage of experimental income allocated to both accounts) for an individual *i*, X_{in} are explanatory variables and ε_i is the standard error.

In our model, the dependent variable is defined as the amount of investment in the *group account 1* and *group account 2*, as we are interested in voluntary contribution to public goods. The explanatory variables are dummy variables created to estimate the impact of modification of individual treatments and the impact of social and demographic factors on voluntary contributions to public goods[1].

3. THE RESULTS

Table 2 below provides a summary of participants' demographic characteristics. We present the data in percentages of subjects by gender, age, education and the value of the experimental income that participants earned in the knowledge quiz.

Table 2. Socio-economic characteristics of participants

Experiment	*Characteristic*		*Percentage*
First experiment	Gender	Men	42.5%
		Women	57.5%
	Age	16 – 30 years	32.5%
		31 – 45 years	67.5%
	Education	High school graduate	22.5%
		Bachelor's degree	25%
		Master's degree	52.5%
	Experimental Income	Low-income (10 experimental money units)	22.5%
		Middle-low-income (20 experimental money units)	15%
		Middle- high-income (30 experimental money units)	30%
		High income (40 experimental money units)	32.5%
	Number of subjects		**40 (100%)**
Second experiment	Gender	Man	53.3%
		Woman	46.7%
	Age	16 – 30 years	100%
		31 – 45 years	0%
	Education	High school graduate	100%
		Bachelor's degree	0%
		Master's degree	0%
	Experimental Income	Low-income (10 experimental money units)	26.7%
		Middle-low-income (20 experimental money units)	28.3%
		Middle- high-income (30 experimental money units)	18.3%

[1] The description of variables is provided in the Appendix A.

		High income (40 experimental money units)	26.7%
	Number of subjects		**60 (100%)**

Source: Original data collected by the authors.

Next, we present the data on average contributions in each treatments of the experiments for all accounts (Table 3). Data on average contributions are given as a percentage of experimental income, since the participants in both experiments were income differentiated.

Table 3. Average contributions for each treatment to all accounts in both experiments (the data of average contributions as percentage of experimental income)

	Treatment	*Account*	*Low experimental income (10)*	*Middle-low experimental income (20)*	*Middle-high experimental income (30)*	*High experimental income (40)*
First experimental group	First	Private	57.0%	65.0%	51.58%	47.66%
		Group 1	43.0%	35.0%	37.42%	52.34%
	Second	Private	49.0%	55.0%	58.5%	53.4%
		Group 1	51.0%	45.0%	25.0%	75.0%
	Third	Private	49.0%	75.0%	61.5%	55.3%
		Group 1	34.0%	15.0%	15.7%	13.9%
		Group 2	17.0%	10.0%	22.9%	24.5%
	Fourth	Private	54.9%	60.0%	51.5%	67.5%
		Group 1	34.0%	20.0%	27.8%	11.1%
		Group 2	12.0%	20.0%	20.7%	15.2%
	Number of subjects		**9**	**6**	**12**	**13**
Second experimental group	First	Private	50.0%	60.0%	50.4%	53.9%
		Group 1	37.5%	40.0%	45.6%	42.1%
	Second	Private	55.0%	25.0%	54.7%	66.1%
		Group 1	45.0%	75.0%	42.0%	33.9%
	Third	Private	41.3%	25.0%	52.4%	60.6%
		Group 1	32.5%	25.0%	24.0%	15.3%
		Group 2	26.3%	50.0%	19.6%	20.1%
	Fourth	Private	43.75%	11.2%	41.1%	65.1%
		Group 1	27.5%	50.0%	28.4%	14.7%
		Group 2	30.0%	39.5%	26.5%	20.2%
	Number of subjects		**16**	**17**	**11**	**16**

Source: Original data collected by the authors.

We interpret the data from the Table 3 separately for each experiment. In the first experiment, in the first treatment, participants with higher experimental income invested higher percentage of their experimental income into the group account 1, which was the case also in the second treatment, where a provision point was added. Middle-high and high-income participants decided to increase their group account contributions in the second treatment, with high-income participants investing on average 75 percent of their experimental income into the group account 1. In the third treatment, the provision point was removed, but the second group account was added. The existence of the second group account resulted in the redistribution of contributions previously allocated to one group account between them. This becomes obvious when we compare the average investment into a private account in the second and in the third treatment. Low-income and middle-low income participants allocated a higher percentage of income to the group account 1 and middle-high income and high-income participants allocated a higher percentage of their income to the group account 2.

In the second experiment, we found that all subjects allocated approximately the same percentage of their income (i.e. 40 percent) into the group account 1 in the first treatment. In the second treatment, the opposite occurred, i.e. low and middle-low income participants increased their contributions into the group account 1, while middle-high and high-income participants reduced their allocations to the group account 1. Thus, the provision point had an effect on low-income and middle-low income participants only. In the third treatment, we observed similar behavior as in the previous experiment, the contribution to the private account did not change significantly, and the percentage of income allocated earlier to one group account in previous treatments was now distributed between the two group accounts. However, in the second experiment, low and middle-low income participants were more willing to contribute to the group account 2. We also observed that during the experiment, private accounts contributions decreased significantly. On average, in the first treatment, middle-low income participants allocated 65 percent of their experimental income to the private account, but, in the fourth treatment, this allocation was down to only 11.2 percent.

Before carrying out the regression analysis we tested the correlations between the variables of interest. First, we examined the correlation between contributions to the group account and behavioral factors, and age, gender, experimental income and education. We tested the correlation between social norms, the opinion of family, belief in people's cooperation, quality of life, the consent of family, satisfaction with public services, warm-glow effect and moral obligation effect and the contribution[2]. The results of the correlation analysis can be found in Appendix B. The correlation analysis shows that there are no statistically significant correlations between the analyzed variables. Next, we analyzed the correlation between behavioral factors for the first and second experimental groups and for both experimental groups together (the results of this analysis can be found in Appendix C). For the data of the first experimental group, we found a statistically significant correlation between the social norm variable and the quality of life. However, the correlation coefficient showed high correlation, thus, we excluded the quality of life variable from the regression model. The correlation analysis in the second experimental group suggests that there is high and significant correlation between the consent of the family and the belief in people's cooperation, the warm-glow effect and the social norm, the warm-glow effect and the quality of life. Thus, we excluded the family consent and the warm-glow effect variables from the regression analysis. The correlation analysis for both experimental groups is consistent with the findings with the previous results in Table F.3., thus, we excluded the correlated variables (quality of life, the consent of family and the warm-glow effect) from further analysis. Table 4 below presents the results of the multiple linear regression model.

[2] The description of variables is provided in the Appendix A.

Table 4. Effects of treatment modification, demographic and behavioral factors on public good contribution.

Variable	*First experimental group*			*Second experimental group*		
Variables	***Col. 1*** Group account 1 only	***Col. 2*** Group account 2 only	***Col. 3*** Group account 1 + Group account 2	***Col. 4*** Group account 1 only	***Col. 5*** Group account 2 only	***Col. 6*** Group account 1+ Group account 2
Constant	16.977** (14.748)	6.726* (15.546)	17.388** (16.781)	76.324*** (11.382)	19.421** (8.841)	76.747*** (11.707)
Second treatment	-5.729* (5.356)	-	-	-7.551* (5.993)	-	-
Third treatment	-25.791*** (5.356)	-	-2.447* (5.367)	-19.038** (5.993)	-	6.434* (5.534)
Fourth treatment	-23.208*** (5.356)	-4.146 (4.036)	-4.115* (5.367)	-2.371* (5.993)	2.064* (3.292)	26.975*** (5.534)
Social norm	-8.276** (4.459)	1.643 (4.956)	-11.589** (5.315)	-0.592* (5.093)	3.020 (3.704)	1.201 (5.431)
The opinion of family	0.488* (5.292)	0.797 (6.328)	0.449 (6.860)	0.269* (4.535)	5.474* (3.576)	1.623* (4.836)
Belief in people's cooperation	-1.908* (4.600)	4.975 (4.901)	-4.197 (5.323)	4.403* (5.563)	1.968 (4.074)	5.151 (5.932)
Quality of life	-	-	-	0.573* (6.272)	-3.556 (5.255)	1.140 (6.689)
The consent of family	3.941* (5.530)	-3.012 (5.366)	5.429 (6.141)	-	-	-
Satisfaction with public services	-3.941* (7.827)	-20.066** (7.532)	-9.705** (9.057)	-6.524* (5.702)	-14.918*** (4.277)	-6.007* (6.081)
Warm-glow effect	42.664*** (14.590)	10.262* (7.532)	43.397** (16.881)	-	-	-
Moral obligation	-15.312*** (4.568)	-2.333* (4.857)	-18.569*** (5.286)	2.288** (5.537)	-5.820* (3.930)	-2.218* (5.904)
Woman	7.308* (4.784)	3.356* (5.281)	11.883* (5.353)	-4.177* (4.777)	-4.128* (4.069)	-4.783* (5.093)
Experimental income	-0.459** (0.172)	0.035 (0.185)	-0.310** (0.199)	-1.062*** (0.241)	0.301* (0.180)	-1.239*** (0.257)
Age (16-30)	7.676* (4.910)	9.885* (5.282)	8.177 (5.681)	-	-	-
College/university education	3.616* (5.261)	2.987 (3.167)	-5.823 (6.087)	-	-	-
R^2	0.2894	0.1811	0.1594	0.2187	0.2621	0.1899

*, **, *** significant at 10, 5 and 1 percent level.

Note: Standard deviations are in parentheses.

Source: Original data collected by the authors.

The regression results for the first experimental group show that the third and fourth treatments have a negative impact on contributions to the *group account 1*, these estimates are significant at 1 percent level. The greatest decrease in the contributions was observed in the third treatment, where the second group account was added, thus, the participants contributed to the two group accounts (*group account 1* and *group account 2*) lower amount than when they contributed to one group account only. One of the possible explanations for the decreasing contributions could be that the participants played the game online, which could be reflected in their pro-social behavior. Both, in the laboratory environment and the online experiment, participants do not know, who they are in a group with, but they can see other participants (i.e. potential members of their group). Moreover, in the online environment, we were not able to control whether the participants focused only on the game or also engaged in other activities.

In the second experiment, only the third treatment (the addition of *group account 2*), has a strong negative impact (significant at 5 percent level) on contributions to the *group account 1*. The second and fourth treatment have only a marginally negative impact on contributions to the *group account 1* (significant at 10 percent level). In the second experiment, we observed a very strong positive impact (at 1 percent level of significance) of the provision point on the contributions to the public good in the fourth treatment (column 6).

People who experience a good feeling (warm-glow), when contributing to public goods contributed significantly more to both group accounts (at 5 percent level of significance when considering both group accounts, and 1 percent level of significance when considering *group account 1* only). Moral obligation to contribute was statistically significant at 1 percent level of significance in the first experiment (when considering *group account 1* only or *group account 1 together* with *group account 2*), and at 5 percent level of significance in the second experiment (when considering *group account 1* only). Individuals with a more pronounced feeling of moral obligation to contribute were 15, or 18 percent less likely to contribute to *group account 1,* and to both *group account 1* with *group account 2,* respectively. When considering contributions to *group account 2* only or to both group accounts jointly, the moral obligation was statistically significant at 10 percent level in the second experiment – individuals with a more pronounced feeling of moral obligation to contribute were 2.2 and 5.8 percent less likely to contribute to both group account jointly and to *group account 2*, respectively. The results differ, when comparing both experimental groups. In the first experiment, participants considering it to be a moral obligation to contribute to public goods did not behave accordingly, and their contributions to the group account were lower. Compared to the first experiment, in the second experimental group, participants agreeing with the moral obligation statement contributed more to the public account.

Another significant factor at the 5 percent level of significance in the first experiment (columns 2 and 3) and at the 1 percent level of significance in the second experiment (column 5) is the satisfaction with public goods or services. In both experiments, participants satisfied with public goods or services contributed to group accounts by approximately 4 to 20 percent less.

The social norm was statistically significant at the 5 percent level of significance only in the first experimental group. Also, those, who conditioned their contribution to public good by contributions of others allocated less of their experimental income to the group accounts. The size of the experimental income had significant negative effect on the contribution to the public (group) account. In the first experiment, it was significant at 5 percent level of significance and in the second experiment, at 1 percent level of significance. Thus, in both experiments, participants with higher income allocated smaller part of their income to public account(s).

CONCLUSIONS AND DISCUSSION

In this paper, we studied the possibility of financing public goods from private sources and presented the results of our original research. Alternative theories that have emerged in recent decades seek to find an effective mechanism that reflects as closely as possible the needs of people for the provision of public goods while addressing the free rider problem. Nowadays, none of the existing mechanisms is universally accepted and further research is needed to formulate new alternative models of private pro-

vision of public goods, while, at the same time, the development of experimental and behavioral economics creates new opportunities to shift towards private financing and provision of public goods.

We implemented a behavioral public good game to study people's willingness to voluntarily contribute to financing public goods. We have shown that people are willing to contribute to public goods when they are members both of a small and a large group. The results suggest that an individual's income is a significant factor affecting the contribution to the public goods. Higher-income participants contributed a smaller percentage of their experimental income to public goods than lower-income participants. This conclusion is consistent across both experimental groups. In addition, these findings are consistent with the literature (e.g., Buckley and Croson, 2006; Hofmeyr et al., 2007).

We also analyzed factors that may affect the motivation of individuals towards pro-social behavior. Here, we noticed slight differences between both experimental groups. In the first experiment, the identification with factors such as the consent of the family, the opinion of family members and the warm-glow effect positively affected the contribution of participants to public goods. In the second experiment, the identification of participants with such factors as the opinion of the family, belief in the cooperation among people, the quality of life and the moral obligation were linked to the increased contributions to public goods.

This research can be extended to contribute further to understanding of an appropriate mix between the use of public and private financing of public goods. This suggests that there is the scope to use the private provision of resources, especially in case of local public goods. Laboratory economic experiments are frequently criticized for taking place in an isolated and modeled environment due to which it is not possible to fully estimate how would people behave in real-world setting. However, the practical experience shows that our findings could correspond to how people would behave in reality. An interesting analogy of the VCM mechanism is the civic crowdfunding, where people get together to fund public projects such as bicycle paths, libraries, public spaces, city parks or cultural events.

The results of this research could be verified using a larger sample of participants, possibly in a laboratory setting. Next, the between-subject design could be used instead of the within-subject design, i.e. different subjects would be used in different treatments. Also, the addition of more experimental rounds within individual treatments would allow further investigation of individuals' behavior with regard to their willingness to contribute to financing public goods.

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APPENDICES

Appendix A. Coding of variables

The name of variable	*The type of variable*	*Statement in questionnaire*	*Code*
Contributions to the group account 1	Dependent variable	-	The contributions to the group account as a percentage of experimental income
Second treatment	Independent variable/ dummy variable	-	Value 1, if the second treatment, otherwise 0
Third treatment	Independent variable/ dummy variable		Value 1, if the third treatment, otherwise 0
Fourth treatment	Independent variable/ dummy variable	-	Value 1, if the fourth treatment, otherwise 0
Experimental income	Independent variable	-	The value of experimental money, that the player earns in the knowledge quiz
Woman	Independent variable/ dummy variable	-	Value 1 if the player was a woman, otherwise 0
Age (16-30)	Independent variable/ dummy variable	-	Value 1 if the player was in age category 16-30, otherwise 0
College/university education	Independent variable/ dummy variable	-	Value 1, if player has indicated that he has complete the college/university education, otherwise 0
Social norm	Independent variable/ dummy variable	I'm not interested in contributing to public benefit projects (public goods or collective goods), if I know that others from my areas will not contribute to them	Value of 1, if the players has indicated that he/she agrees or partially aggress with the statement, otherwise 0
The opinion of family	Independent variable/ dummy variable	My family's opinion on voluntary contributing to public benefit project (public goods or collective goods) is important to me.	Value of 1, if the players has indicated that he/she agrees or partially aggress with the statement, otherwise 0
Belief in people's cooperation	Independent variable/ dummy variable	People from my area are willing to contribute voluntary to public benefit project	Value of 1, if the players has indicated that he/she agrees or partially aggress with

		(public goods or collective goods).	the statement, otherwise 0
Quality of life	Independent variable/ dummy variable	I perceive public benefit projects (public goods, collective goods) as a means of improving the quality of life of me and my surroundings.	Value of 1, if the players has indicated that he/she agrees or partially aggress with the statement, otherwise 0
The consent of family	Independent variable/ dummy variable	My family identifies with the fact that I voluntary contribute to public benefit projects (public goods or collective goods).	Value of 1, if the players has indicated that he/she agrees or partially aggress with the statement, otherwise 0
Satisfaction with public services	Independent variable/ dummy variable	The current level of public services in my area is at very good level and I do not feel the need for further additional contributions to public projects.	Value of 1, if the players has indicated that he/she agrees or partially aggress with the statement, otherwise 0
Warm-glow effect	Independent variable/ dummy variable	I have a good feeling when I contribute to a good cause in the form of a public benefit projects.	Value of 1, if the players has indicated that he/she agrees or partially aggress with the statement, otherwise 0
Moral obligation	Independent variable/ dummy variable	It is my moral obligation to contribute voluntary to public benefit projects (public goods or collective goods).	Value of 1, if the players has indicated that he/she agrees or partially aggress with the statement, otherwise 0

Appendix B. The correlation analysis between contributions to the group account and behavioral and socio-economic factors

	First experiment		*Second experiment*		*First + second experiment*	
Factor	Correlation coefficient	p-value	Correlation coefficient	p-value	Correlation coefficient	p-value
Social norm	0.2028	0.0731	0.0083	0.4997	-0.1350	01805
The opinion of family	-0,1506	0.3536	0.1807	0.1671	0.0474	0.6395
Belief in people's cooperation	0.1286	0.4290	0.2438	0.0605	0.1713	0.0833
Quality of life	-0.0968	0.6684	-0.0272	0.6844	-0.0388	0.2016
The consent of family	0.0559	0.7321	0.1017	0.4393	0.0608	0.5480
Satisfaction with public services	-0.0618	0.7051	0.1097	0.4043	0.0505	0.6177
Warm-glow effect	0.2292	0.1548	0.0369	0.7797	0.0957	0.3433
Moral obligation	-0.1501	0.3554	0.2331	0.0730	0.0630	0.5336
Age (16-30)	0.0602	0.1721	-	-	0.0382	0.7043
Experimental income	-0.0654	0.1688	-0.3853	0.0024	-0.2278	0.0226
Woman	0.1974	0.2271	0.0309	0.2845	0.0836	0.4082
University education	-0.2680	0.0946	-	-	-0.1055	0.2963

Source: Original data collected by the authors.

Appendix C. The correlation analysis of behavioral factors

Table C.1. Correlation analysis of behavioral factors (first experimental group)

Factor	*Social norm*	*The opinion of family*	*Belief in people's cooperation*	*Quality of life*	*The consent of family*	*Satisfaction with public services*	*Warm-glow effect*	*Moral obligation*
Social norm	1.00	-	-	-	-	-	-	-
The opinion of family	0.23	1.00	-	-	-	-	-	-
Belief in people's cooperation	-0.39*	-0.11	1.00	-	-	-	-	-
Quality of life	0.53**	0.06	-0.18	1.00	-	-	-	-
The consent of family	0.09	0.06	0.23	-0.10	1.00	-	-	-
Satisfaction with public ser-	0.19	0.07	0.07	0.12	-0.04	1.00	-	-
Warm-glow effect	0.12	0.09	0.18	-0.07	0.26*	0.05	1.00	-
Moral obligation	-0.01	0.02	-0.03	-0.16	0.25	0.01	0.22	1.00

*, **, *** significant at 10, 5 and 1 percent level

Source: Original data collected by the authors

Table C.2. Correlation analysis of behavioral factors (second experimental group)

Factor	*Social norm*	*The opinion of family*	*Belief in people's cooperation*	*Quality of life*	*The consent of family*	*Satisfaction with public services*	*Warm-glow effect*	*Moral obligation*
Social norm	1.00	-	-	-	-	-	-	-
The opinion of family	0.08*	1.00	-	-	-	-	-	-
Belief in people's cooperation	0.02*	0.08*	1.00	-	-	-	-	-
Quality of life	-0.18*	0.24*	-0.05*	1.00	-	-	-	-
The consent of family	-0.11*	0.16	0.51***	0.13*	1.00	-	-	-
Satisfaction with public services	-0.20	0.12	0.10	0.00	0.05	1.00	-	-
Warm-glow effect	0.47***	-0.02	0.11	0.48***	0.16	-0.05	1.00	-
Moral obligation	0.28*	0.11	0.33*	0.22*	0.28*	0.17	0.27*	1.00

*, **, *** significant at 10, 5 and 1 percent level.

Source: Original data collected by the authors

Table C.3. Correlation analysis of behavioral factors (both experimental groups)

Factor	*Social norm*	*The opinion of family*	*Belief in people's cooperation*	*Quality of life*	*The consent of family*	*Satisfaction with public services*	*Warm-glow effect*	*Moral obligation*
Social norm	1.00	-	-	-	-	-	-	-
The opinion of family	0.12	1.00	-	-	-	-	-	-
Belief in people's cooperation	-0.14	-0.07	1.00	-	-	-	-	-
Quality of life	0.37**	0.16*	0.05	1.00	-	-	-	-
The consent of family	-0.02	0.05	0.38***	0.05	1.00	-	-	
Satisfaction with public services	0.18*	0.14	0.02	0.03	-0.02	1.00	-	-
Warm-glow effect	0.29**	-0.04	0.16*	0.33***	0.21	-0.06	-	-
Moral obligation	0.16	-0.00	0.25	0.07	0.33*	0.06	-	-

*, **, *** significant at 10, 5 and 1 percent level.

Source: Original data collected by the authors