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Leadership in Solving Social Dilemmas: An Experiment in Mekong Delta, Vietnam

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To do this, EEPSEA builds environmental economics (EE) research capacity, encourages regional collaboration, and promotes EE relevance in its member countries (i.e., Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, and Vietnam). It provides: a) research grants; b) increased access to useful knowledge and information through regionally-known resource persons and up-to-date literature; c) opportunities to attend relevant learning and knowledge events; and d) opportunities for publication.

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LEADERSHIP IN SOLVING SOCIAL DILEMMAS: AN EXPERIMENT IN MEKONG DELTA, VIETNAM

Truong Cong Thanh Nghi, Ngo Hoang Thao Trang, Trinh Van Hop

EXECUTIVE SUMMARY

This study brought a lab experiment to the field by using an experimental method that tested the role of leadership in solving social dilemmas in the rural areas of Vietnam. The authors adopted the experiment design of Velez, Stranlund, and Murphy (2009) and Rivas and Sutter (2009) to examine the effects of leading-by-example. Specifically, this study compared two different types of leadership, namely, exogenous leadership (i.e., imposed leaders) and endogenous leadership (i.e., voluntary leaders).

The results showed that most of the subjects were willing to become leaders; however, it is difficult to conclude that the subjects volunteered to become leaders to foster cooperation within their groups. Likewise, the results of the experiment showed that followers followed the decisions of the voluntary leaders closely, while the imposed leaders did not influence the decisions of his/her followers. Moreover, followers tended to exploit the cooperative behavior of the leader when the latter had cooperative behaviors. Conversely, followers became cooperative when their leaders acted selfishly. In this study, the willingness to be leaders can be explained by two different motivations: (1) expectation to foster cooperation within their groups and (2) expectation to take the advantages of the first mover. This study also revealed that in the endogenous treatment, followers who faced the decisions of the voluntary leaders tended to follow the leaders' choices. Meanwhile, they tended to adjust automatically their choices to maintain "equilibrium" in their groups. In the exogenous treatment, imposed leaders were likely to cooperate when making their decisions.

The results of the study can help policy and decision makers in Vietnam to understand the role of leaders in fostering communities' cooperation. This would have implications to environmental management policies in the rural areas of Vietnam, in which formal institutions are ineffective, and therefore require cooperation within communities to enhance efficiency in implementation.

1.0 INTRODUCTION

Since Hermalin (1998) developed a formal theory of leadership—in which he cited that leaders can affect the behavior of others either by giving example or by self-sacrifice—a number of experimental studies have been conducted to test the effects of leadership, especially in solving social dilemmas. All of the studies have suggested that leadership significantly influences the contributions of group members in fostering cooperation in a public goods or public bad game, even when (1) leaders give only nonbinding suggestions (Levy et al. 2011); (2) there is leading-by-example or leading-by-sacrifice (Monxes and Van der Heijden 2003; Gaechter and Renner 2004); or (3) leaders are given formal authority to reward or punish those under his/her leadership (Gueth et al. 2007). Moreover, endogenous leadership (i.e., leaders volunteer to be leaders) is more efficient than exogenous leadership (i.e., leaders are imposed) (Rivas and Sutter 2009).

Most of the empirical studies dealing with leadership in social dilemmas are composed of laboratory experiments. Although these lab experimental studies provide evidence that confirms and expands the theory, there may be a gap in the results of nonstudent behavior in many different situations outside the lab environment.

This study attempted to bring the lab experiments to the field and tested leadership in social dilemmas within a framed field experiment in a developing country. There are two main implications in such design. First, it helps narrow down the above gap and observe the "wider variance in certain characteristics of the participants in the subject pool, if compared to college students as usually done" (Cardenas 2003,

p. 279). Second, formal institutions in developing countries are often absent or ineffective in dealing social dilemmas and in fostering cooperation; thus, people have to rely on informal institutions and norms, which are guided and implemented by one or a group of community leaders. As such, learning the role of leaders in social dilemmas under the situation of developing countries will be fruitful for institution designing and for improving policy-making process.

The context that the authors used in this experiment is the typical environmental problem in the rural areas of Vietnam. The experiment was conducted in Mo Cay district, Ben Tre province, where the pig population has been increasing rapidly.

On one hand, rapid growth of pig production helps improve the living standard of farmers. On the other hand, it leads to serious waste pollution. The wastes from pig production are directly discharged to the river system without any treatment. These activities are prohibited by the government, and many projects have been initiated to help farmers build biogas so that they can reuse or recycle animal wastes. However, due to unavailability of land and weak implementation, Thom River in Mo Cay district has become increasingly polluted due to pig farmers' improper waste management. In recent years, the local authorities of May Co district have implemented a campaign to encourage farmers to reduce the number of pigs raised for hog production. This campaign was implemented by several self-managed groups in the district; as the leader of the community, the heads of each self-managed group sets an example for the whole group and encourages other members to cooperate and solve this environmental problem. Some of the participating communities in this campaign have been reportedly successful, while some of the group heads have failed to promote cooperation within their groups. As such, the role of leadership needs to be examined in order to understand the factors that contribute to these successes and failures.

This study examined the role of leadership in solving social dilemmas. In particular, the researchers tested the impact of leading-by-example on the behaviors of the group members participating in a common-pool resource game with two different types of leadership, namely, exogenous and endogenous leaderships. The authors examined the following research questions in this study:

- | | |
|--------------------|--|
| <i>Question 1:</i> | Do followers condition their decisions based on their leaders' behaviors? |
| <i>Question 2:</i> | Is the influence stronger when the leadership is voluntary? |
| <i>Question 3:</i> | Is a cooperative-person more likely to volunteer to be the leader than the selfish person? |
| <i>Question 4:</i> | Does leadership increase cooperation in solving social dilemmas? |

2.0 EXPERIMENTAL DESIGN

2.1 Overview

This study followed the common-pool resource game used by Velez, Stranlund, and Murphy (2009) and Vollan (2008). The game consists of a 15-round exercise, which is played by a group of five participants. In each round, each player decides how many pigs s/he is going to keep for one production cycle. The minimum number of pigs for each participant is 10 and the maximum is 90. The more pigs a player wants to keep, the higher the private benefit s/he gets. However, the decision to keep more pigs would negatively affect the quality of the environment in the area (due to air pollution, water pollution, etc.), and thus the player would suffer a cost. The quality of the environment would depend on the total amount of pigs kept by all players.

The payoff function of an individual is expressed as

$$\pi_i = e_i + px_i - c(x_i + x_{-i}) - dx_i(x_i + x_{-i}) \quad \text{Equation (1)}$$

The parameter values of this function are as follows: $e = 900$, $p = 116.875$, $c = 17.875$, and $d = 2.750$. With these parameters, the Nash equilibrium is $x_i = 7$ and the social optimal is $x_{-i} = 2$.

After playing five practice rounds (base case), each group plays an additional 10 rounds of leading-by-example. The experiment involves two treatments as follows (Table 1):

Treatment 1: Endogenous. Any group member can volunteer to become the leader by being the first one to contribute to the public good. Three different situations may take place: (1) only one member volunteers to become the leader; (2) more than one individual volunteer to become leader, with only one of them randomly chosen to assume the leadership role; and (3) no one volunteers to become leader; hence, the group does not have a leader, and all members would decide simultaneously.

Treatment 2: Exogenous. Each group is matched with one group in the endogenous treatment. When one person in the endogenous treatment volunteers to be a leader, the person with the same code in the exogenous treatment is chosen to become the leader. This design was adapted from the experiment of Rivas and Sutter (2009).

Table 1. Summary of treatments in experiment

Treatment	No Leadership	Leading-by-Example	
		Exogenous	Endogenous
Base case			
Treatment 1		X	
Treatment 2			X

2.2 Procedures

The experiment was conducted in October 2011 at the meeting rooms of the communes. The venues had classroom-type of rooms suitable for the experiment. A total of 95 farmers (divided into 19 groups) from Mo Cay district, Ben Tre province participated in the experiment. The participants were chosen through the invitation of the district's local authority and farmers' union to ensure that all farmers were involved in livestock farming. Each group had five subjects, and the participations were randomly matched based on the invitation letters they had received from the farmers' union. The participants were arranged to sit comfortably in separate desks, far enough from one another to discourage communication among them, especially from exchanging or seeing each other's results.

Prior to the actual conduct of the experiment, the research team held two group meetings and pretested the experiment in order to review the instructions, prepare for any possible questions from the participants about the exercise, and to anticipate any problems that may arise. These procedures were done to minimize the likelihood that the different groups would receive different instructions.

Three groups were designed to be situated in each meeting room. An instructor was designated per room to explain the instructions to the subjects. Three assistants were also assigned in each room to arrange the working conditions, help the participants in answering the questions, and collect the results.

When the subjects arrived at the venue, the administrative staff checked their IDs and invitation letters, and they were subsequently guided to their seats. Thereafter, the subjects were given the experiment instructions, which gave an overview of the exercise and the rules of payment. Each group had 15 minutes to read the instructions. The instructors also read the instructions for the whole group, explained the procedures of the exercise, and the rules of payment (See Appendices 1–5).

The instructors gave two fixed examples of the procedure and payoff. After the examples, the subjects were permitted to ask (in private) the instructor any questions about the procedure. Then, the instructors let the subjects play two practice rounds; after each round, the instructors asked if there were any more questions from the participants. The instruction part continued until all questions were exhausted, and the instructors were sure that all participants understood the experiment.

At the beginning of each of the first five rounds, each player received a red slip from the assistants. These red slips included the players' codes and the round number (i.e., 1st round, 2nd round, etc.) and were

used to write the players' decisions on the number of pigs the player is going to keep for one production cycle. When the round started, the players had three minutes to decide on the number of pigs, and then the players wrote their respective decisions on the red slips. After three minutes, the assistants collected all the slips, calculated the total number of pigs for the entire group, and wrote the results on the result cards. These cards were then passed around to all participants; thus, they learned about the decisions of each group member and the total number of pigs incurred for the whole group. Based on the payoff table and the total number of pigs acquired, the players learned the scores of their group that would get them to the next round of the exercise. The instructors and the assistants monitored the players in order to prevent them from communicating to the other players or to any member of the research team.

After five initial rounds, the instructors announced the new rule of the game. The second part of the experiment's instruction was given to the players; the players had 15 minutes to read the instructions privately before the instructors started to explain them. The players then played 10 rounds in which the group leader decided first on the number of pigs s/he would keep for one production cycle. After the other group members had learned about the leader's decision, each group member decided on their own.

In the endogenous leadership treatment (10 groups), at the beginning of the 6th to the 15th round, each participant received a green slip. If they wanted to be the group leader, then they would write their choice of number of pigs on this slip and hand it to the assistants. There are three possible situations:

1. No one volunteers to be the leader. In this case, the group would continue the exercise as the first five rounds.
2. Only one person volunteers to be the leader. In this case, each group member would receive the information about the decision of the leader (identity of the leader would remain anonymous), and then they would make their own respective decisions.
3. Several individuals volunteer to be the leader. In this case, the assistants would randomly choose the group leader. The assistants would inform the group member about the decision of the leader (anonymous). The other group members then would make their own decisions.

At the beginning of the 6th to the 15th round of the exogenous leadership treatment (nine groups), each participant received a green slip. However, in each group, only one player received a green slip that notified him/her that s/he was chosen to be the leader. S/he was then asked to be the first to decide on the number of pigs s/he would like to keep for one production cycle. Each group in the exogenous leadership treatment was matched with one group in endogenous leadership treatment. The leader was determined in the exact same order as in the endogenous treatment.

After 10 rounds of leadership treatment, the instructors signaled the end of the exercise and then thanked the players for their participation. Meanwhile, the assistants calculated the total scores of each player. The players were then asked to approach the administrative staff and to present their invitation letters in order to collect their payments. The conversion rate was 100 points = VND 1,000. Each player received an amount, including a show-up fee of VND 50,000 plus his/her earning from the game.

3.0 EXPERIMENT RESULTS

3.1 Descriptive Results

Table 2 summarizes the main socioeconomic characteristics of the experiment sample. The average age of the subjects was 46 years old, and the average schooling years were nine years. About 25% of the subjects were women and 24% were members of the Communist Party. The average pigs per household were 24 pigs. About 63% of the pig farmers had biogas.

Table 2. Socioeconomic characteristics of the subjects (n = 95)

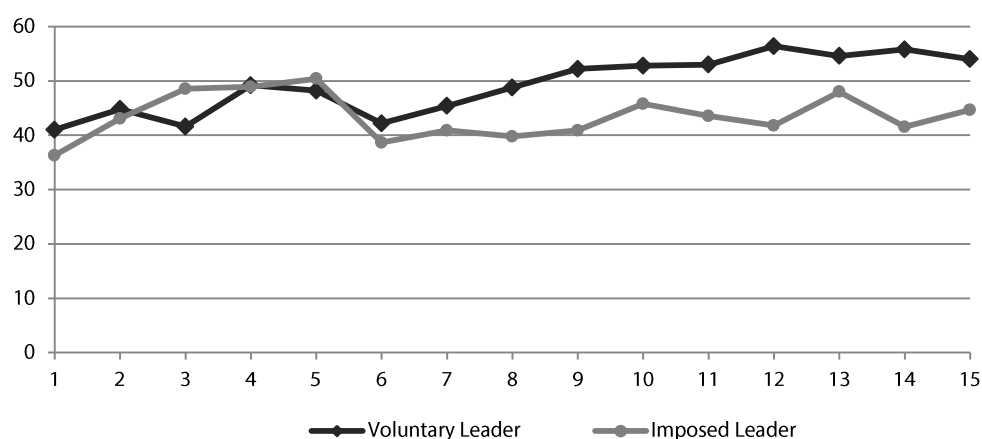
Variable	Mean	SD	Minimum	Maximum	Percentage (%)
Age	45.69	9.70	23	67	–
Female	–	–	–	–	25
Schooling years	8.88	3.47	3	14	–
Household size	4.50	1.43	2	8	–
Number of pigs	23.59	22.77	1	110	–
Member of Communist Party	–	–	–	–	24
Biogas	–	–	–	–	63

Note: SD = standard deviation

3.2 The Role of Leaders in Fostering Cooperation

Figure 1 describes the average decisions of the 95 subjects. In general, the average choices in the base case were lower than those in the voluntary treatment. Meanwhile, the average choices in the base case were higher than those in the imposed treatment. However, the Man-Whitney test at group level showed that only the difference between the base case and the voluntary treatment was significant ($p = 0.02$), while the difference between the base case and imposed treatment was not ($p = 0.177$).

The regression analysis of the followers' choices also confirmed these results (Table 3). The estimation showed that leaders who were voluntary had significant influence on the decisions of the followers, but the imposed leaders did not. These results are contrary to the findings of previous studies, which stated that leadership can foster cooperation in public good or public bad games no matter how leaders are defined (Arbak and Villeval 2007; Rivas and Sutter 2009).



Note: Mann-Whitney test (group level): Voluntary leader: $z = -2.327$, $p = 0.02$; Imposed-leader: $z = 1.348$; $p = 0.177$

Figure 1. Average number of pigs

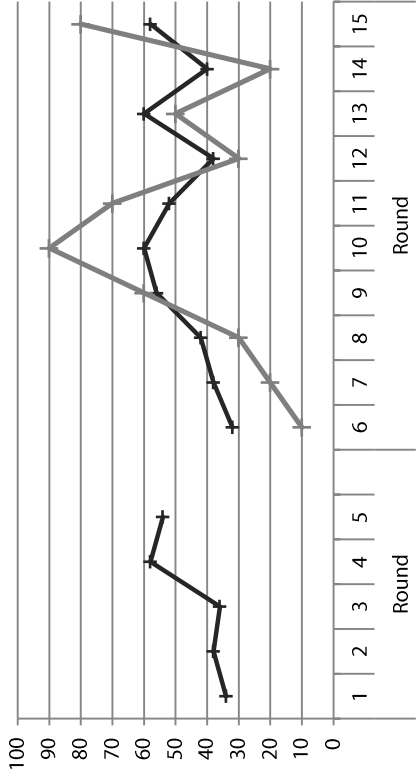
Table 3. Determinants of the followers' choices (Random-Effect GLS)

Variable: Followers' Choices	Voluntary Leader	Imposed Leader
Period	1.27 ** (0.00)	0.300 (0.480)
Female (= 1)	-0.92 (0.90)	2.600 (0.790)
Income	0.07 (0.68)	-0.060 (0.340)
Leader's choice	0.18 ** (0.00)	0.140 (0.057)
Constant	27.11 (0.00)	30.520 (0.000)
Observations	400.00	200.000
Prob > χ^2	0.00	0.002
R^2 (overall)	0.06	0.050

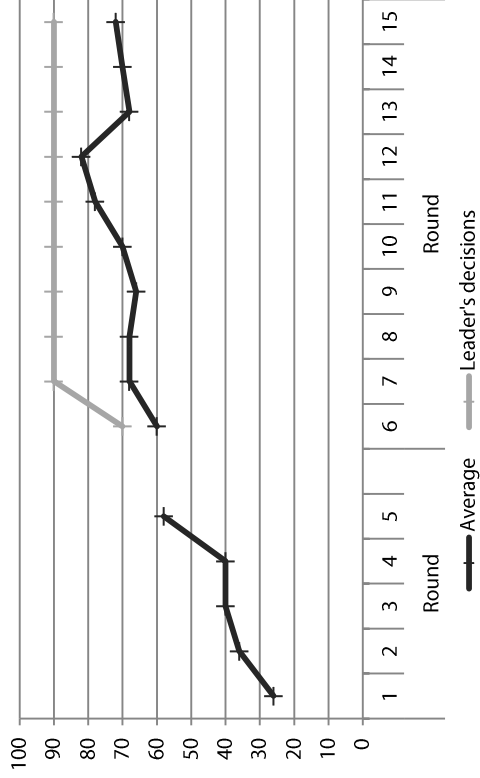
Note: *, ** refers to significance levels at 5% and 1%, respectively.

The results showed that only voluntary leaders had influence on the behavior of followers; thus, the authors looked at the group-level data of 10 groups in the endogenous treatment. Figure 2 presents the groups' average choices and the choices of each group leader in the 15 rounds of the game. The followers of all groups followed the decisions of their leaders closely. In the first round of the treatment (Round 6), most of the leaders' decisions were lower than the groups' 5th-round average choices. Therefore, most of the groups' average choices in the 6th round were lower than those in the 5th round. The followers continued to follow their leaders' choices in the next nine rounds. However, note that the followers were likely to "harmonize" their decisions based on the leaders' decision—when the leader's decision was low, the average choice of the group was higher than that of the leader; when the leader's decision was high, the average choice of the group was lower than that of the leader. In other words, followers exploited the cooperative behavior of the leader when the latter had cooperative behaviors; followers became cooperative when their leaders acted selfishly.

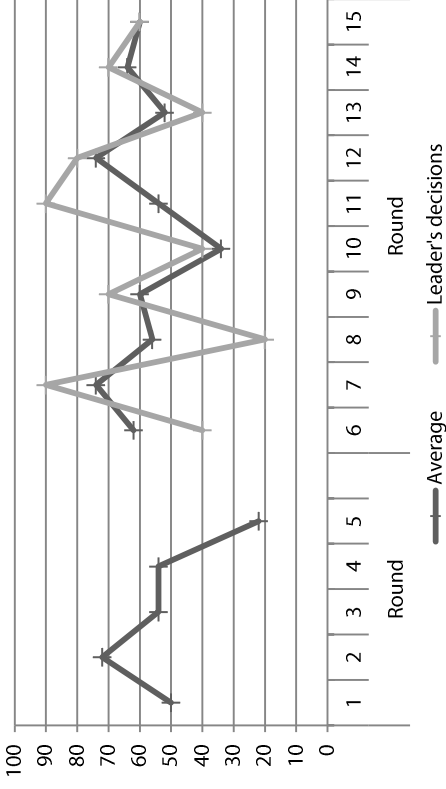
One question raised from this analysis is: why were the players willing to be leaders? The result of this study's experiment was different from that of Arbak and Villeval (2007). In the study of Arbak and Villeval (2007), leaders tended to sacrifice their own benefit to foster cooperation within their group, and therefore leaders were likely to be generous. In the present study, leaders might be cooperative or selfish people. When the "harmonization" mechanism was common and realized by all the groups' members, the decision to become a group leader was not always a signal of cooperation. In some cases, leaders could take the advantage of being the first mover to maximize their own benefits. The behavior of leaders will be discussed in more detail in the next part.



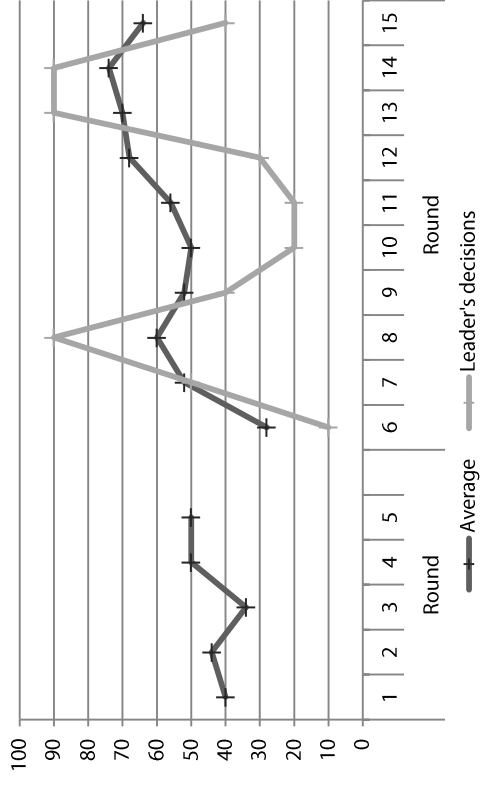
Group 1



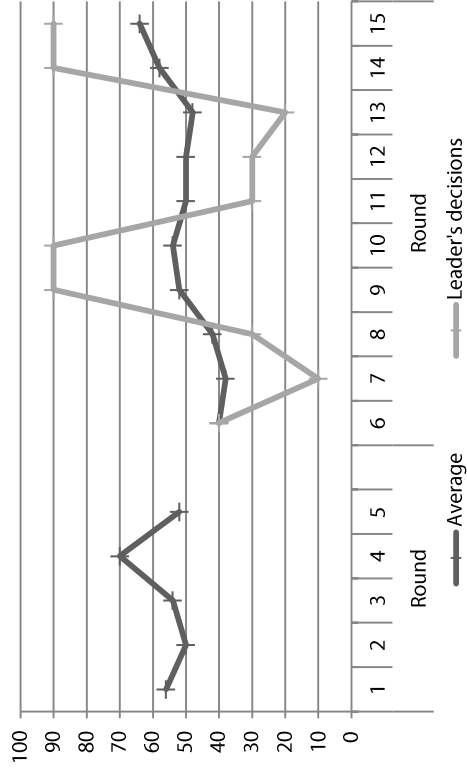
Group 3



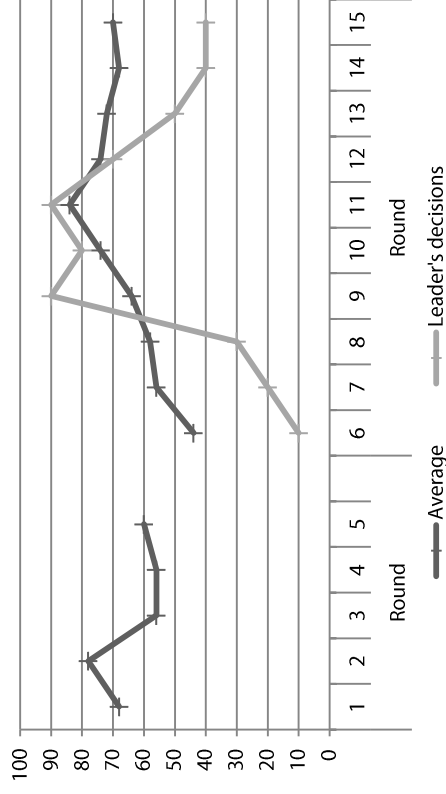
Group 2



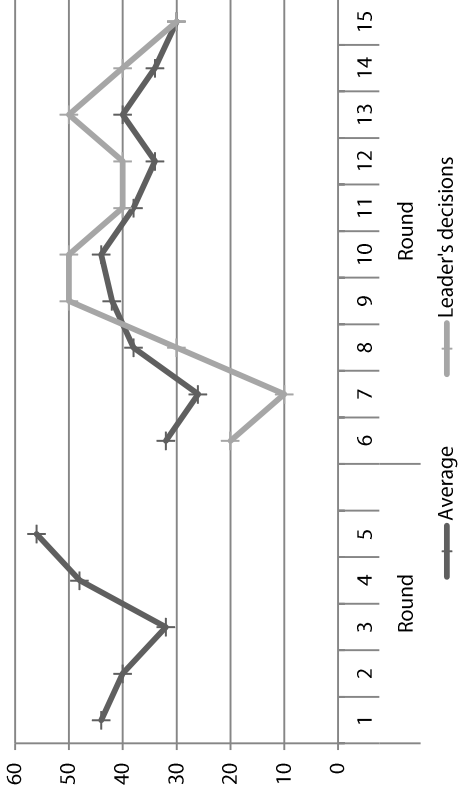
Group 4



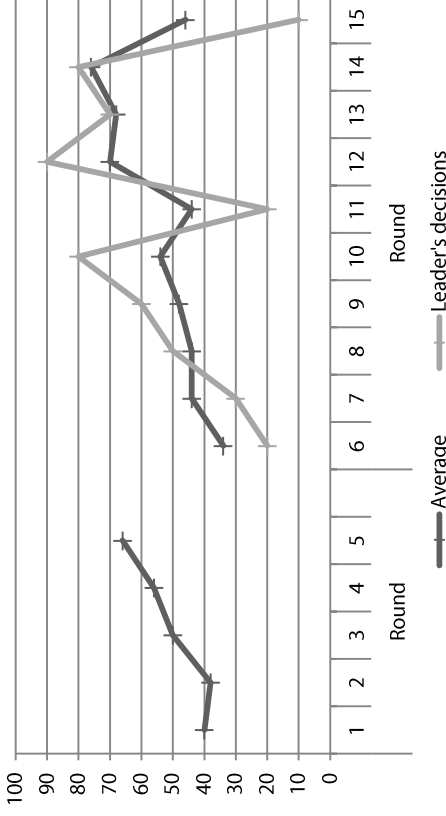
Group 5



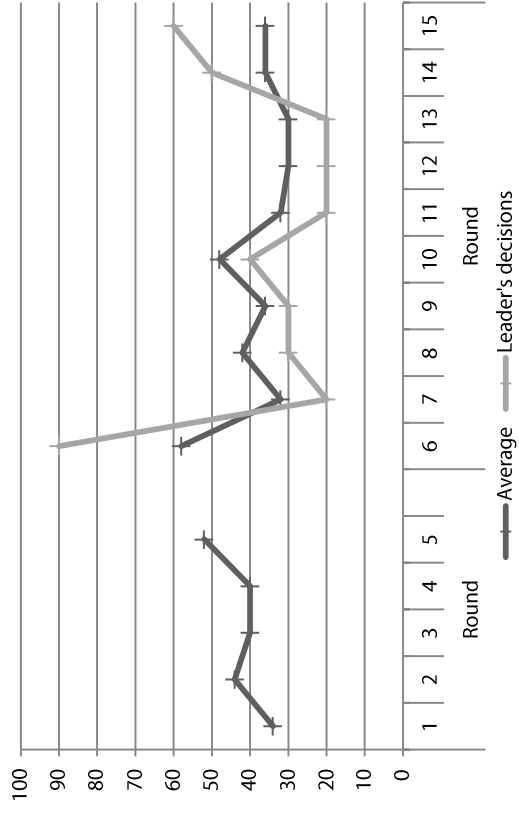
Group 7



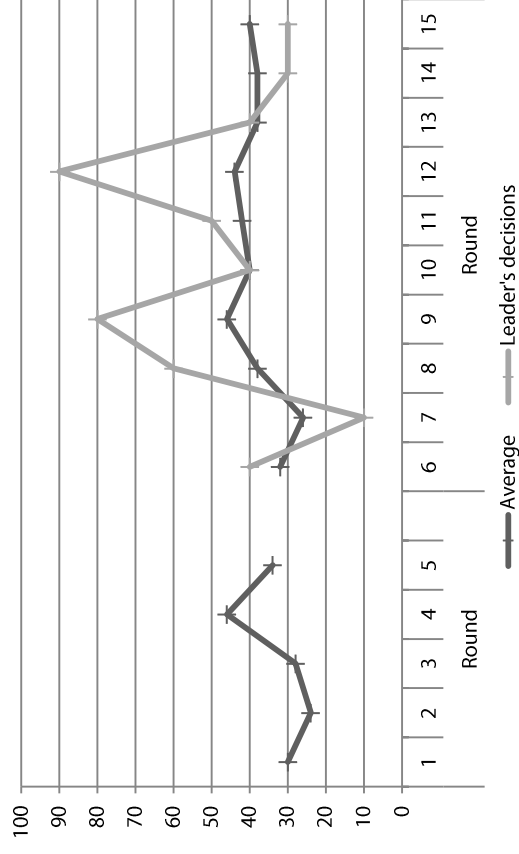
Group 6



Group 8



Group 9



Group 10

Figure 2. Average pigs and leader's decisions by group

3.3 Leaders' Behaviors

Table 4 presents the leaders' behavior in the two treatments. In each round of the exercise, on average, 2.34 participants were willing to lead. This proportion of subjects who were willing to lead is the same with the result of Arbak and Villevall (2007). However, the average choice of leaders who were voluntary (51.4) was significantly higher than that of the leaders who were imposed (38.55) ($p < 0.01$; Mann-Whitney U-test).

The distribution of the leaders' choices in the two treatments also shows that voluntary leaders tend to keep more pigs than the imposed leaders (Figure 3). Whereas the percentage of imposed leaders decreases with the increase of the intervals (10–30, 40–60, 70–90), the percentage of voluntary leaders remains around 30% for all intervals. It is apparent that imposed leaders were more cooperative than voluntary leaders. This result is also contrary to the results of previous studies in which voluntary leaders' decisions were likely to be more cooperative than that of the imposed leaders (Rivas and Sutter 2009).

The authors used the random-effects probit models to analyze why the subjects volunteered to lead. The dependent variable in the model had the value of 1 if the subject was the leader candidate at that particular period. The model had three main groups of independent variables. The first group represents the evolution of the willingness to be leader over time, including the variable period. The second group describes the sociodemographic characteristic of the subjects, including variables about gender, income, and party (equals to 1 if subject was a member of the Communist Party). The third group focuses on the level of cooperation of the subjects, including the variable of average choice of subject in the base case. Table 5 presents the result of the regression analysis.

Table 4. Summary of the descriptive statistics of leaders' choices

Treatment	Voluntary Leader		Imposed Leader	
	Control	Leader	Control	Leader
Number of observations	250	500.0	225	450.0
Number of candidates	–	234.0	–	–
% group with leader	–	100.0	–	100.0
Actual number of pigs of leader	–	51.4	–	38.5

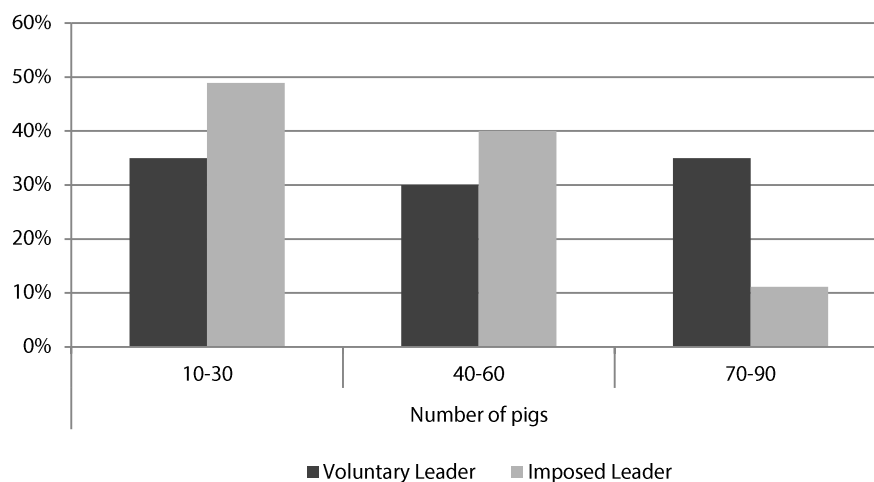


Figure 3. Leaders' decisions

Table 5. Determinants of the decision to lead (Random-Effect probit model)

Variable: Willing-to-Lead	Coefficient	Marginal Effects
Period	–0.050* (0.079)	–0.020
Female (= 1)	–2.040** (0.005)	–0.560
Income	–0.030* (0.057)	–0.011
Average choice in base case	0.004 (0.810)	0.002
Party	0.780 (0.260)	0.305
Constant	1.430 (0.220)	
Observations	500	
Log-Likelihood	–201.6450	
Wald chi ²	14.6700	
Prob > chi ²	0.0119	

Notes: (1) *, ** are significant at 10% and 5% levels, respectively; (2) Figures in () are standard deviations

Based on the estimation results in Table 5, the probability that a subject would be willing to lead would decrease over time. In the sociodemographic variable group, gender and income are correlated with the probability that a subject would be willing to lead at the significant level of 10%. Female subjects are less probable to lead than male subjects, which can be explained by cultural constraints. In Vietnam, women are traditionally less encouraged to express themselves and to become group leaders than men. The income variable is significantly correlated with the probability to lead—the richer the individual is, the less probable that s/he would lead.

There is no significant correlation between the average choices in the base case and the probability to lead. This result confirms the conclusion from nonparametric analysis that leader candidates can be cooperative or self-interested people.

4.0 CONCLUSION AND DISCUSSION

Based on the study of Velez, Stranlund, and Murphy (2009); Vollan (2008); and Rivas and Sutter (2009), the authors designed an experiment that examined the role of leadership in solving social dilemmas in the Mekong Delta of Vietnam. The results of the experiment showed that a large proportion of the participants volunteered to become group leaders. However, the average choices of voluntary leaders were higher than that of the imposed leaders. Therefore, it is hard to conclude that participants volunteered to become leaders to foster cooperation within their groups.

During the treatment rounds, it was apparent that the followers followed the decisions of the voluntary leaders closely, while the imposed leaders were not able to influence the decisions of his/her followers. There was a “harmonization” mechanism in the responses of followers to the decisions of leaders—when the leader’s decision was low, the average choice of the group was higher than that of the leader; when the leader’s decision was high, the average choice of the group was lower than that of the leader. In other words, followers tended to exploit the cooperative behavior of the leader when the latter had cooperative behaviors. Conversely, followers became cooperative when their leaders acted selfishly.

The regression results also suggest that the motivation to volunteer to lead do not come from altruism or from the subjects’ level of cooperation. The decision to lead was explained by the sociodemographic variables (e.g., gender and income), but the average choices in the base case—which represented the level of cooperation of the subjects—did not explain such decision. This study also determined that the probability to lead tend to decrease over time.

The willingness to be leaders in this study can be explained by two different motivations: (1) expectation to foster cooperation within their groups and (2) expectation to take the advantage of the first mover. Therefore, in the endogenous treatment, leaders had both cooperative and selfish choices. Arbak and Villeval (2007, p. 2) also found these two motivations in their study and argued that “instead of trying to set an example, by moving first, these subjects make it clear that the burden of contributing to the public good is transferred onto the others.”

One noticeable point of the results was the behavior of followers in the endogenous treatment. On one hand, followers who faced the decisions of the voluntary leaders tended to follow the leaders’ choices. On the other hand, they tended to adjust automatically their choices to maintain “equilibrium” in their groups. What were the motivations behind such “harmonizing” decisions of the followers? The data from the experiment could not answer this interesting question.

In the exogenous treatment, imposed leaders were likely to cooperate when making their decisions. This can be explained by the feeling of being monitored when the leadership position is imposed by an external agent. However, followers did not follow the choices of the leaders. Consequently, in both endogenous and exogenous treatment, leadership did not foster cooperation.

The striking results of this study suggest that behavior of people outside the lab may be different from that from lab experiments, especially in some particular situations such as transitional society. Due to limitations in time, budget, and knowledge, this study could not answer completely many questions, including:

1. Under what conditions do voluntary leaders expect to foster cooperation and under what conditions do they expect to take the advantage of being the first mover? In other words, under what conditions do voluntary leaders act cooperative and under what conditions do they act selfishly?
2. Is the “harmonization” mechanism common and how does this mechanism work?
3. Why do imposed leaders tend to be cooperative?

Further research is needed to confirm the results of this study in order to find more satisfactory explanations for these questions.

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APPENDIX 1

EXPERIMENTAL INSTRUCTIONS FOR COMMON-POOL RESOURCE GAME

The instructions given in this experiment were adopted from Volla (2008) and Rivas and Sutter (2009), and then were translated into Vietnamese. The instructions were both delivered and read to the participants. The participants could interrupt and ask questions at any time.

Good morning everyone,

We want to thank everyone here for attending the research project of University of Economics, Ho Chi Minh City. This game may take approximately 2–3 hours from explaining the exercise, playing it, and answering a short survey at the exit. If you think you will not be able to stay that long without leaving, please let us know now.

At the end of the whole exercise, you will be paid a cash amount. This amount includes a VND 50,000 show-up fee and an extra cash amount. The extra amount will be different for all participants, depending on your decisions in all rounds of the game.

We are about to begin the game. It is important that you listen carefully, because only people who understand the game will be able to play it.

So let's get started.

This exercise is similar to a situation in which a group of people has to decide how to use a natural resource together. For this game, assume that a group of five people represents a community. Each of you can decide how many pigs you want to keep in one production cycle. A 1-unit pig in the game means 1–10 pigs, a 2-unit pig stands for 11–20 pigs, 3-unit pig stand for 21–30 pigs (and so on), and a 9-unit pig means 81–90 pigs. In each round, you will earn points that are equivalent to an amount in Viet Nam Dong. The reason why we use money in this exercise is to represent real-life situations in which your economic decisions will bring yourself monetary consequences. You will play 15 rounds, divided into two parts. Part 1 consists of five rounds, and Part 2 has 10 rounds.

At the end of the exercise, we will add the total number of points earned from all the rounds, and we will personally hand the cash payment to you, the amount will be in accordance with that in the conversion rate in the Earnings Table. A total of 100 points is equivalent to VND 1,000.

The instruction sheets detail the procedures on how to participate in the exercise. Please read them carefully. We will also read this aloud, and if you have any question, please raise your hand and we will come to your seat to answer your queries privately. Please do not speak with the other participants during the experiment. All the decisions you will make in this experiment will be used for research purposes only and will be kept confidential.

1.1 Earnings Table

We will now give you the Earnings Table, which contains all the information you will need to make your decisions in this exercise.

[MONITOR: Show Earnings Table in the poster and distribute the Earnings Table to the participants]

Each group will have five members. In each round, each one of you will decide how many pigs you will keep for one production year. The more pigs you want to keep, the higher private benefit you get. However, your decision to keep pigs will have a negative effect on the quality of the environment in your area (due to air pollution, water pollution, etc.), and thus you will suffer a cost. This quality of environment will depend on the total number of pigs that all the group members will decide to keep in your groups. Thus,

the cost you have to suffer also depends on the total number of pigs that your group decides to keep. Therefore, your final payoff will depend on your decision and on the decisions of the other group members.

The score you get after each round will be the sum of such benefit and cost; therefore, it will be based on your own decision as well as that of the other four players. The Earnings Table will show you a summary of the number of points you will get for each of your own decision and of others' decisions. All participants have the same Earnings Table that you have.

In each round, you have to decide how many pig you intend to keep. We will call your decision "MY PIG." These units correspond to columns 1–9 in the Earnings Table. In this exercise, each participant can have a maximum of 9 units, and a minimum of 1 unit. The number "1" stands for 10 pigs, "2" means adding another group of 10 pigs and so on.

In the Earnings Table, the decisions of the other four members in your group correspond to the column "PIG OF THE OTHERS," which is numbered from one to four. This means that each of the other four participants in the group will have the minimum of 1-unit pig and maximum of 9-unit pig. A 36-unit pig can be achieved if the other four participants choose the maximum of 9 units. This number (i.e., 36) is the total number of units decided by the other four group members. When you make your decision, you will not know the decisions made by the other members of your group. The composition of each group will be assigned randomly and will NOT change during the entire experiment. The identities of your group members will remain anonymous all throughout the experiment.

When the round starts, you will have three minutes to decide your number of pigs. Once all participants have handed in their decisions, we will add all the levels of extraction and subsequently announce the group's TOTAL PIG. With this information, you will be able to calculate the "PIG OF THE OTHERS," which is equal to the "TOTAL PIG" minus "MY PIG." We will explain the calculation later.

Let's see some examples so that you can understand how to use the Earning Table.

[MONITOR: Show poster with the examples]

Imagine that "MY PIG" is 4 units, and that the other four members of the group decided to play 4 units each. The total number of units of the others is therefore 16.

HOW MANY POINTS DID YOU EARN IN THIS ROUND?

[Pause for answers]

Thus, as seen in the table, your earnings will be 344.

[MONITOR: Point at the number in the corresponding cell, referring to the column with "4" as "MY PIG" and the row of "16" for "PIG OF THE OTHERS"]

Imagine that you chose a 4-unit pig, and the number of units of the others is 20. In this case, you see—with the help of the table—that your earnings are *[Pause for answers]* 302 points.

Take a few seconds to look at the Earnings Table and understand how it works. If you have any questions, please raise your hand and one of us will come to you.

At the end of the experiment, we will convert your total points into VND; the exchange rate is 100 points = VND 1,000. Your earnings will be handed to you in private.

1.2 Decision Card

Now, I will explain how we can know your level of extraction in each round. In each round, you will receive a "Decision Card." The Decision Cards are these small pieces of paper.

[MONITOR: Show Decision Card in poster and distribute Decision Cards to participants]

In each round you will have to write the following:

1. The number of the round that we have announced,
2. Your secret participant number, and
3. Your decision "MY PIG" or the number of units of pigs you would like to keep in one production year, which is a number between 1 and 9.

After all the members of your group have made their respective decisions, we will collect the five participants' cards and calculate the groups' "TOTAL PIG." Once we announce the total herd size of the group, you will be able to calculate the "PIG OF THE OTHERS." With this information and your amount of "MY PIG," you will be able to see how much you earned by looking at the Earnings Table.

It is very important that you remember that your decisions are private, and that you must not show them to the other members of the group. We will only announce the "TOTAL PIG" in each round.

1.3 Calculations Sheet

Each one of you will receive a Calculations Sheet where you will record your decisions and earnings. Please write your participant number in the Calculation Sheet.

[MONITOR: Show Calculation Sheet in the poster and distribute Calculation Sheets to participants]

Let's see how the Calculation Sheet works by looking at an example. Suppose you decided to have a 4-unit pig. You then have to write the number "4" under column (A) of the Calculations Sheet, as shown in the example.

[MONITOR: In the poster, point at the example numbers in the respective cells]

After all the group members have decided, we will collect the cards of the five participants and calculate the groups' "TOTAL PIG." Suppose the "TOTAL PIG" is 20 units. You should write "20" in the column (B) of the Calculations Sheet.

[MONITOR: In the poster, point at the example numbers in the respective cells]

In order to calculate accurately the "PIG OF THE OTHERS," you should subtract column (A) ("MY PIG") from column (B) ("TOTAL PIG"). You should write the result in column (C) ("PIG OF THE OTHERS"). In our example, the "PIG OF THE OTHERS" is 16 ($20 - 4$).

[MONITOR: In the poster, point at the same example numbers in the respective cells]

In order to calculate your earnings, use the Earnings Table. In this case, given that "MY PIG" is 4 and the "PIG OF THE OTHERS" is 16, then your earnings will be 344. This is the information you should write in column (D).

[MONITOR: In the poster, point at the number in the respective cells referring to column "4" and row 16]

In the previous examples, all members of the group played the same level of pig. However, each person can pick a different number. For example, if you choose 4 and the other members of the group choose 2, 3, 7 and 8, we will announce that the "TOTAL PIG" is 24, which is equal to $4 + 2 + 3 + 7 + 8$.

[MONITOR: In the poster, point at the example numbers in the respective cells]

Write "24" in column (B) of the Calculation Sheet. To calculate "PIG OF THE OTHERS," subtract column (A) from column (B). Write the result in column (C). In our example, the "PIG OF THE OTHERS" is 20 ($24 - 4$).

In order to calculate your earnings, use the Earnings Table. In this case, given that “MY PIG” is 4 and the “PIG OF THE OTHERS” is 20, then your earnings will be 302. This is the information you should write in column (D).

[MONITOR: In the poster, point at the number in the respective cells referring to column “4” and row 20]

1.4 Practice Rounds

Before we begin the exercise, we will do some practice rounds. Your decisions in these practice rounds will not affect your earnings today.

We will do the first practice round together.

First, write the round number on the Decision Card—in this case, “P1” for practice—and your participant number. In the Earnings Table, suppose that each of you picked 5 units of pigs. Write this then in the Decision Card and in column (A) of the Calculation Sheet. Write your decision in two places—in the Decision Card, which you will hand in back to us, and in the calculations sheet. Please make sure that you have written the same number in the two sheets before you hand in the Decision Card.

Given that all the members of the group picked 5, in this example, the TOTAL PIG for the group is 25. Each one should write now 25 under column (B) (“TOTAL PIG”) in the Calculations Sheet.

[MONITOR: In the poster, write the same example numbers in the respective cells]

Now, subtract “MY PIG” (5) from the “TOTAL PIG” (25). In other words, column (B) minus column (A) equals to 20. This number is the true “PIG OF THE OTHERS,” which you should write under column (C). Using the number in column (A) (“MY PIG”) and the number in column (C) (“PIG OF THE OTHERS”), use the Earnings Table to determine your earnings for this round. In this case, your earnings will be 316. Write your earnings in column (D).

[MONITOR: In the poster, point at the numbers in the respective cells]

We did this example and the previous one supposing that everyone choose the same number of units of pigs. However, when you make your decision, you may choose the amount of pig that you want by looking at the Earnings Table.

Are there any questions?

Let’s continue with the next practice round. First, write down the round’s number in the Decision Card—in this case, “P2” for practice. Now, each of you has to decide on your own the number of pigs you want to keep using the Earnings Table. Write it down in the decision card and under column (A) of the Calculation Sheet. Before you hand in the Decision Card, check that the number under column (A) of your Calculation Sheet is the same as the one you wrote in “MY PIG” in the Decision Card.

APPENDIX 2

INSTRUCTIONS BY TREATMENT

2.1 Treatment 1: Endogenous Treatment (Voluntary Leaders)

In this second part of the experiment, your group still has five members and the composition of your group does not change. The second part consists of 10 rounds, with each round consisting of two stages.

2.1.1 First stage of the endogenous treatment

In the first stage, decide whether you want to volunteer to be the first decision maker or prefer to wait for the second stage of the exercise. Deciding immediately means that in the first stage, you will choose the number of pigs you want to keep before the rest of the group does. The person who does this is called **"the early decision maker."** The other four group members will be informed of this choice before they make their own decisions in the second stage.

If you want to volunteer to be the early decision maker, please write the number of pigs you want to keep on DECISION CARD 1. The other four members of your group will be informed of your decision before they make their own. If you **do not** want to be the early decision maker, please write "0" on DECISION CARD 1.

Only one member per group can contribute in the first stage. Three scenarios can occur as follows:

1. *Scenario 1: Only one member chooses to be the early decision maker.* The procedure described above will apply.
2. *Scenario 2: More than one group member choose to be the early decision maker.* A random draw will determine which decision will be considered. This random draw is independent of the chosen number of pigs submitted for consideration. The one or those who have not been randomly drawn will be informed; their first-stage decision will not be counted, and the other group members will not be informed about this choice. They will move on to the second stage, and they can modify the decision they previously made. Only those who were involved in the random draw and were not drawn will be informed about the existence of this random draw.
3. *Scenario 3: No member in the group decides to contribute in the first stage.* The five group members move directly to the second stage.

We will hand DECISION CARD 1 to you and after 2 minutes, we will collect all of them. Subsequently, we will give each participant one DECISION CARD 2 and one INFORMATION CARD where the information on the number of pigs of the group's early decision maker is written. Note that you will receive only the information about the early decision maker's answer; you will not know who this person is.

2.1.2 Second stage of the endogenous treatment

After learning about the early decision maker's choice in the first stage (if there was any), those who did not decide in the first stage will decide simultaneously the number of pigs they want to keep for this particular period by writing their answers on DECISION CARD 2. The early decision maker will write number "0" on this DECISION CARD 2. The next procedure and the point you get will be calculated in the way as the previous rounds.

2.2 Treatment 2. Exogenous Treatment (Imposed-Leader Treatment)

In this second part of the experiment, your group still has five members and the composition of your group does not change. The second part consists of 10 rounds; each round consists of two stages.

2.2.1 First stage of the exogenous treatment

One of the five group members will be assigned to be the early decision maker. The other four group members will be informed of this choice before making their own decisions in the second stage.

If you are assigned to be the early decision maker, you will receive a DECISION CARD 1 with a notice on it. You have to decide how many pigs you want to keep and write your answer on DECISION CARD 1. After two minutes, we will collect all DECISION CARD 1. After that, we will give each participant one DECISION CARD 2 and one INFORMATION CARD where the early decision maker's answer is written. Note

that you will receive only the information about the number of units of pigs that the early decision maker chose; you will not know who that person is.

If you are not assigned to be the early decision maker, you will receive a DECISION CARD 1 with a notice on it. Write the number "0" on DECISION CARD 1. After two minutes, we will collect all DECISION CARD 1. Subsequently, we will deliver to each participant one DECISION CARD 2 and one INFORMATION CARD where early decision maker's answer is written.

2.2.2 Second stage of the exogenous treatment

After learning about the answer of the early decision maker (if any) in the first stage, those who did not decide in the first stage will choose simultaneously the number of pigs they want keep for this particular period by writing this number on DECISION CARD 2. The early decision maker will write number "0" on this DECISION CARD 2. The next procedure and the point you get will be calculated in the way as the previous rounds.

APPENDIX 3

SUMMARY OF THE INSTRUCTIONS

3.1 Voluntary Leader Treatment

To each participant of this research project, please accomplish the following tasks:

1. For each of the 15 rounds of this exercise, decide how many pigs you want to keep for one production cycle this year.
2. From Round 6 onward, you can volunteer to be the early decision maker.
3. If you do not wish to be the early decision maker, for the next 10 rounds, base your answer about the number of pigs you want to keep on the early decision maker's answer.

Please be reminded that your decision on the number of pigs should range from 10 to 90. You are not allowed to communicate with the other participants of this exercise. After we finish the whole exercise, you will receive a cash amount, which includes a show-up fee of VND 50,000 and an amount based on the calculation of the total points you get from the experiment. The exchange rate is 100 points = VND 1,000. This amount will be paid to you in private.

3.2 Imposed Leader Treatment

To each participant in this research project, please accomplish the following tasks:

1. For each of the 15 rounds of this exercise, decide how many pigs you would want to keep for one production cycle this year.
2. From Round 6 onward, you can be assigned to be the early decision maker.
3. If you are not assigned to be the early decision maker, for the next 10 rounds, base your answer about the number of pigs you want to keep on the early decision maker's answer.

Please be reminded that your decision on the number of pigs should range from 10 to 90. You are not allowed to communicate with the other participants of this exercise. After we finish the whole exercise, you will receive a cash amount, which includes a show-up fee of VND 50,000 and an amount based on the calculation of the total points you get from the experiment. The exchange rate is 100 points = VND 1,000. This amount will be paid to you in private.

APPENDIX 4

EARNINGS TABLE

Amount of Pigs Owned Amount of pigs of the other 4 group members	1	2	3	4	5	6	7	8	9
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
4	360	399	435	469	501	531	558	583	606
5	353	390	425	458	489	518	544	568	590
6	346	382	416	448	478	505	531	554	575
7	339	374	407	438	466	493	517	539	559
8	331	366	397	427	455	480	503	524	543
9	324	357	388	417	443	467	489	509	527
10	317	349	379	406	432	455	476	494	511
11	310	341	369	396	420	442	462	479	495
12	303	333	360	385	408	429	448	465	479
13	296	324	351	375	397	417	434	450	463
14	289	316	341	364	385	404	421	435	447
15	281	308	332	354	374	391	407	420	431
16	274	300	323	344	362	379	393	405	415
17	267	291	313	333	351	366	379	390	399
18	260	283	304	323	339	353	366	375	383
19	253	275	295	312	328	341	352	361	367
20	246	267	285	302	316	328	338	346	351
21	238	258	276	291	304	315	324	331	335
22	231	250	267	281	293	303	311	316	319
23	224	242	257	270	281	290	297	301	303
24	217	234	248	260	270	278	283	286	287
25	210	225	238	249	258	265	269	271	271
26	203	217	229	239	247	252	256	257	256
27	196	209	220	229	235	240	242	242	240
28	188	201	210	218	224	227	228	227	224
29	181	192	201	208	212	214	214	212	208
30	174	184	192	197	201	202	201	197	192
31	167	176	182	187	189	189	187	182	176
32	160	168	173	176	177	176	173	168	160
33	153	159	164	166	166	164	159	153	144
34	146	151	154	155	154	151	146	138	128
35	138	143	145	145	143	138	132	123	112
36	131	135	136	135	131	126	118	108	96

APPENDIX 5

CALCULATION SHEET

Name: _____		Player Number: _____		
	COLUMN A	COLUMN B	COLUMN C	COLUMN D
Round No.	MY PIG	TOTAL PIG	OTHERS PIG (B minus A)	MY EARNINGS
P 1	4	20	16	344
P 2	4	24	20	302
T 1				
T 2				
T 3				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTAL POINTS				
RAND				

APPENDIX 6

DECISION CARD

DECISION CARD	
Round number:	
Your Player Number:	
My Pig:	

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