universität wien

MAGISTERARBEIT

Titel der Magisterarbeit

„An Experiment on Information Aggregation and Voting”

Verfasst von

Mario Krapfenbauer, Bakk. rer. soc. oec.

angestrebter akademischer Grad

Magister der Sozial- und Wirtschaftswissenschaften
(Mag.rer.soc.oec.)

Wien, 2015

Studienkennzahl lt. Studienblatt:	A 066 913
Studienrichtung lt. Studienblatt:	Magisterstudium Volkswirtschaftslehre
Betreuerin / Betreuer:	Univ.-Prof. Dr. Jean-Robert Tyran

Table of Contents

Tables

Figures

Abstract

We apply an experimental framework to test for a difference in participation rates between endogenous and exogenous direct democracy. Participants are either confronted with an exogenous decision on implementing direct democracy or delegating to an expert or can vote on this delegation decision. They have to choose the correct out of two options which gives them a considerable payoff. We find no empirical evidence that supports our hypothesis of different participation rates between endogenous and exogenous direct democracy. Further research is needed by implementing an overruling mechanism to test the hypothesis in a more appropriate way.

JEL: C91, D72, D83

Acknowledgements

Without the great support of my parents it would not have been possible for me to write this thesis. My friend Hannes deserves special thanks for accompanying me during good and bad times, especially during the last weeks of writing this thesis.

I want to thank my supervisor Jean-Robert Tyran[1] for suggesting me the idea for this Master Thesis and initiating a lively and fruitful discussion with Lydia Mechtenberg[2], professor at Universität Hamburg. Both gave me great and extensive support and I am happy to have contributed to an ongoing research project. Manuel Schwaninger[3] and I discussed many times on this topic and I am also thankful for his help and support in the laboratory.

Furthermore, I am thankful to Jean-Robert Tyran for offering me the opportunity to work on this interesting topic and applying methods that go far beyond the usual extent of a Master Thesis.

[1] Jean-Robert Tyran, University of Vienna, Oskar-Morgenstern-Platz 1, 1090 Wien, AUSTRIA
[2] Lydia Mechtenberg, University of Hamburg, Von-Melle-Park 5, 20146 Hamburg, GERMANY
[3] Manuel Schwaninger, University of Vienna, Oskar-Morgenstern-Platz 1, 1090 Wien, AUSTRIA

1 Introduction

Voting behavior is one of the main research fields in behavioral economics. We participate in many votes or are at least affected by many of them. Analyzing voting behavior can be done by examining past votes and comparing them to find out the main factors that influence behavior. Unfortunately most votes differ from each other in one or more details. They differ in the number of voters, majority rules, location, time, private and public information that is available and even the weather can influence participation rates (Gomez, Hansford and Krause, 2007). So we are searching for a setting where we have tight control over these parameters, and therefore an experiment is the first choice for this purpose. The ceteris paribus changes in single parameters allow us to figure out the effects of each single independent parameter onto voting behavior.

When analyzing voting behavior, we first have to give an exact definition of the voting process. In our experiment we focus on small groups. These groups have to choose one out of two options. One of these gives every group member a positive payoff, the other option gives them no payoff at all. There is always a correct and a wrong option. It is clear that all group members have a common interest in choosing the correct option. People can only see two options, but do not know which of these the correct one is. A priori no group member has any information regarding the correct option, so there is an equal chance for them to pick the correct one. They can acquire private information that gives them a signal which option is the correct one with a certain probability. Every member gets his own signal, and they are not announced publicly. Voting takes place simultaneously and without any communication before or during the voting process. The simple majority rule is implemented and so we are concerned with the Condorcet Jury Theorem (Condorcet, 1785) in this experiment. We will call all of the steps mentioned above the decision stage.

The decision on one of the two options can either be taken by the group in the decision stage or by an expert who has a certain probability

of choosing the correct option. Whether the expert or the group decides on one of the options is either decided exogenously or endogenously. We will call the endogenous decision on delegating the decision the delegation stage.

The experiment has two main parts: An endogenous part, where the delegation stage is played in every round followed by the decision stage if the group voted for democracy and against the expert or the expert decision in the other case. And there is an exogenous part, where we take the delegation decisions of another group in the endogenous part and take i as given for this group in the exogenous part. Depending on what is implemented exogenously, either the expert decides on one of the two options or there is democracy.

Under the assumption of rational and self-interested individuals we can derive the equilibria and therefore predict voting behavior. In later parts of this paper we will see that the results often do not coincide with the predicted equilibria. We want to investigate on the difference between predicted and actual behavior within this paper.

The two main aspects we are interested in are the information aggregation and the motivation for participating in the vote. Information aggregation means that the group will more likely choose the correct option if more group members acquire the information and vote according to the signal they get. People who are influenced by altruism are also more likely to inform their selves and participate as the other group members would also profit from their action. We will test for this fact with a survey on social capital. An IQ-Test will control for mental abilities causing people to behave the way they do.

The crucial aspect of this experiment is that participants face a cooperation and a coordination problem. Beside the Nash equilibria there is a possibility to reach a state where everyone is better off than in equilibrium. The cooperation problem arises as Nash equilibria are the result of self-interested and rational individuals. If participants are willing to cooperate they can reach a state with higher payoffs through cooperation. Even if groups just reach a Nash equilibrium there is a priori a coordination problem: In some equilibria there are participants

who do not acquire information, so how can the groups coordinate which members acquire information and which ones stay uninformed?

We expect a higher participation rate in endogenously chosen direct democracy compared to exogenously chosen direct democracy. Within the endogenous delegation stage group members could see a decision against the expert and for a decision stage as an indicator for a high participation rate and a high level of cooperation within the group . If they are conditional cooperators, they are then more willing to also participate, even if this is not rational and in accordance to their self-interest. The data cannot support our expectation, there is no significant difference between exogenous and endogenous direct democracy.

Once again, let us remember that there is a common interest in picking the correct option. The groups do not deal with moral questions or questions about their knowledge of various facts. There is the possibility of delegating the decision to an expert. Delegation is either decided exogenously or endogenously.

Small groups that have to take a decision and could delegate it are not limited to the lab. Also in companies decisions have to be taken either by the superior or the team. It is very helpful for the superior to know when it is better to delegate the decision to the group and when this is not helpful at all. We hope to give some useful hints how to react in this and similar situations to ensure a good decision.

My effort regarding this experiment consists of the following parts: My supervisor Jean-Robert Tyran presented me the topic and the main ideas regarding this experiment. I participated actively in the design process (with my supervisor and Lydia Mechtenberg) and wrote the source code of the experiment in z-tree (Fischbacher, 2007). I organized time slots in the laboratory and conducted all the sessions. I analyzed the data with inputs from Lydia Mechtenberg and Jean-Robert Tyran.

The following section will give an overview of the related literature. Afterwards we will introduce the theory that is at the core of our experiment. It is followed by the section on hypotheses, where we will define the hypotheses we are interested in. Section 5 describes the

experiment design, the different treatments and the adaptations we did after running a pilot session. Section 6 presents the results of the session and answers the hypotheses. It is followed by a section that concludes and gives some ideas how to further investigate on the topic.

2 Literature Review

We are especially interested if we can expect a high or low rate of information buyers. Persico (2004) finds that the voting rule is an important factor when we look at endogenous information as we do in our experiment. Low majority rules like the one we use (we apply the simple majority rule) increase the proportion of informed voters while rules like unanimity decrease this proportion. The reason is that information is noisy and with supermajority rules like unanimity it is very likely that at least one voter gets a wrong signal and no decision is made, while when applying the simple majority rule single wrong signals do not disturb the outcome.

Feddersen and Sandroni (2006) show that even with arbitrary low information cost some individuals stay uninformed. They also mention that the fraction of informed voters may decrease if the information quality becomes too high. This is one of the reasons why we decided to adjust the information quality downwards after running a pilot session.

Feddersen and Pesendorfer (1996) show in their theoretical framework that less informed voters strictly prefer to abstain even when voting is costless. This is supported by lab experiments, for instance the study done by Battaglini, Morton and Palfrey (2008). However, this is not in line with the results we found in our very first pilot session, where a large proportion of the uninformed voters voted for some alternative without having a clue which alternative is the correct one.

Grosser and Seebauer (2013) say that uninformed voting is a common phenomenon even in their treatment with voluntary voting. Elbittar et al. (2014) report similar results for their experiment. They compare their result to previous ones and conclude that costly information and imperfect signals are the main determinants of a high number of uninformed voters. In our experiment we are not interested in the proportion of uninformed voters. As some authors find there is a considerable proportion of those uninformed voters, we restricted voting on info purchase in our experiment.

Persico (2004) sees privately acquired information as a public good because buying information and voting increases the payoff of every group member. These positive externalities are not incorporated in the decision of a single voter if we assume selfish behavior, so information is underprovided relative to the social optimum. We will give a definition of social optimum in the theory section of this paper.

We will show that belief has a substantial impact on an individual's probability to vote. Duffy and Tavits (2008) find that a high subjective probability to be a pivotal voter increases the probability that an individual vote. In our data we find that believing many of the group members will vote also increases the probability that this individual votes. This in some way contradicts the findings of the mentioned paper as rational individuals expect a higher probability of being pivotal if the participation rate in his group is low.

Another concept is at the core of our experiment. A conditional cooperator is a person that contributes more to a public good if others also contribute more. Buying information and voting according to this information is a public good. According to Fischbacher, Gächter and Fehr (2001), 50% of the subjects in their public goods experiment were conditional cooperators and one third were free riders that contributed never, regardless of the contribution of the others. Thöni, Tyran and Wengström (2012) found an even higher rate of conditional cooperators which is 69% and only 15% free riders. They asked the participants how much they would contribute in a public goods game for different average contributions of the other group members.

This conditional cooperator idea is related to the endogenous treatment of our experiment. Participants could see the group decision for direct democracy as a signal that the majority of the group is willing to cooperate. So a conditional cooperator will also be willing to acquire information, even if he voted against direct democracy at first.

3 Theoretical Model

Let us assume there is a group of M members. $m \in M$ of these members are informed, i.e. they have received information. All individuals act rational and self-interested. Group members can acquire information on the correct option that is correct with probability $q > 0.5$. These signals are private and independent from each other.

Given the group is in a decision stage, we want to test if the number of informed people is an equilibrium. This clearly depends on the payoff, group size, information cost and information quality. These parameters can be used together with the formula of the Condorcet Jury Theorem (Condorcet, 1785) to calculate equilibria for each cost level.

According to the Condorcet Jury Theorem (Miller, 1996), an even number of n voters have the same chance of choosing the correct alternative as $n-1$ voters. This is true for $q > 0.5$, where q denotes the probability of an informed voter choosing the correct alternative. The formula according to Condorcet is:

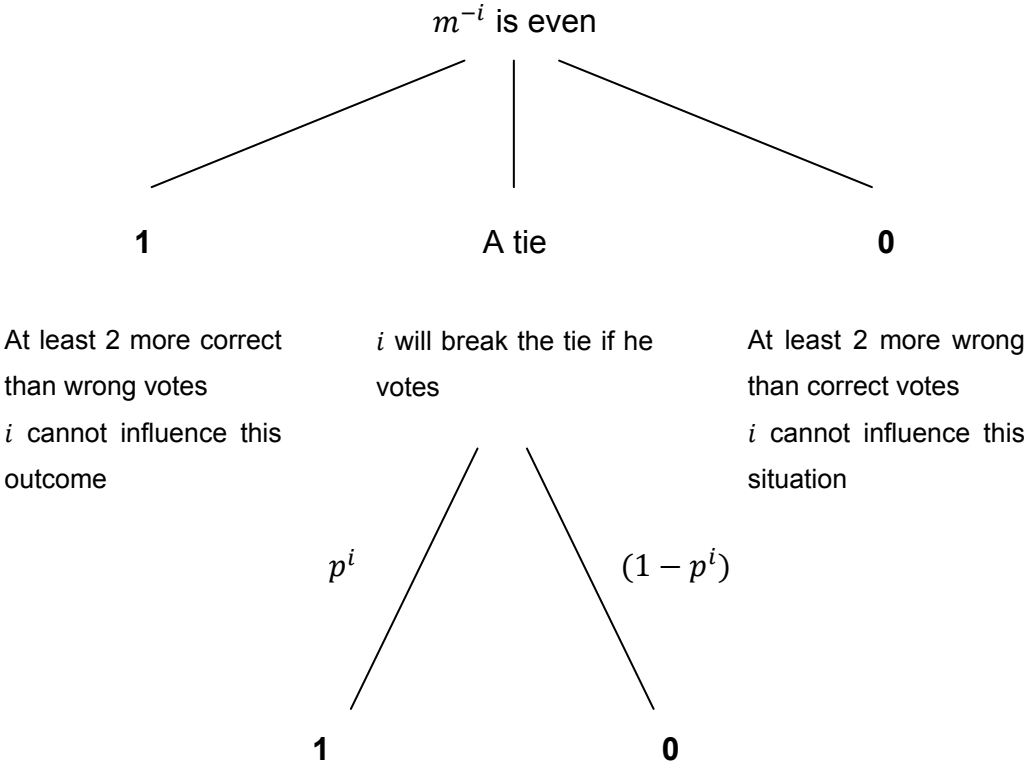
$$\boldsymbol{\pi}(\boldsymbol{m}) = \sum_{\boldsymbol{j}=(\boldsymbol{m}+\boldsymbol{1})/\boldsymbol{2}}^{\boldsymbol{m}} \left(\frac{\boldsymbol{m}!}{(\boldsymbol{m}-\boldsymbol{j})!\,\boldsymbol{j}!}\right)(\boldsymbol{q})^{\boldsymbol{j}}(\boldsymbol{1}-\boldsymbol{q})^{\boldsymbol{m}-\boldsymbol{j}} \qquad \textbf{(1)}$$

Formula (1) gives us the probability of the jury to choose the correct option, if we assume each of m voters gets an independent private signal that is true with probability q. This formula only holds if the voters vote according to the signal they get.

Let m^{-i} denote the number of informed voters without individual i. We now look at individual i.

In the case of m^{-i} is even, there are three possible situations.

Figure 1: Possible situations that can occur if m^{-i} is even.



Note: Bold numbers indicate the success of the vote. 0 stands for choosing the wrong option, 1 for choosing the correct one. Only in case there is a tie, i can break the tie and will choose the correct option with probability p^i. In all other cases i cannot change anything, regardless of his voting behavior.

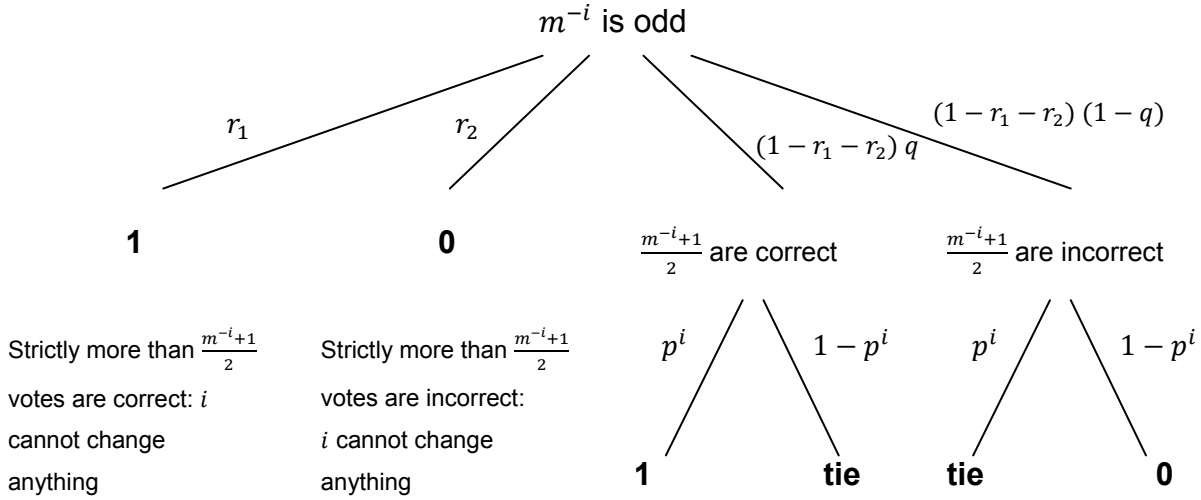
p^i denotes the probability of i choosing the correct option and is either 0.5 if i does not buy the information or q if he does.

Result 1: If m^{-i} is even, i will vote if he is informed and is indifferent if he is not informed.

Proof: The vote of i will only matter in case of a tie (see Figure 1). All other situations remain unchanged no matter if i is informed or not. An informed individual i can improve the expected outcome in case of a ties as $p^i > 0.5$. For an uninformed i we have $p^i = 0.5$ and so he does not change anything if he decides to vote. Hence an informed voter cannot change any of these situations and therefore is indifferent, while an informed voter can improve one situation while remaining the other ones unchanged. Hence he will vote.

In the case of m^{-i} is odd, there are 4 possible situations:

Figure 2: Possible situations that can occur if m^{-i} is odd.



Note: Bold numbers indicate the success of the vote. 0 stands for choosing the wrong option, 1 for choosing the correct one. Only in case there is just a slight overhang of correct or incorrect votes, i can influence the group decision.

i will not consider the first two situations since he cannot influence them. r_1 gives us the probability that so many voters vote correctly so that i cannot influence the result. r_2 gives us the probability of a situation where so many voters vote incorrect that i cannot change the result.

The remaining two situations occur with probability $(1-r_1-r_2)$. In these situations there is a pivotal voter. This pivotal voter is informed and hence chooses the right option with probability q and the wrong one with probability $(1-q)$. So the situation with a slight overhang of correct votes is more likely since $q > 0.5$.

In this situation individual i can either confirm this result with probability p^i or cause a tie with probability $(1-p^i)$ which would decrease the expected payoff. In the situation with a slight overhang of incorrect votes he either confirms the result with $(1-p^i)$ or causes a tie with probability p^i which would increase the expected payoff.

Result 2: If m^{-i} is odd, i is indifferent if he is informed and will abstain if he is not informed.

Proof: Consider an individual i. He only changes the result if he causes a tie in case of a slight overhang of correct or incorrect votes. If there is an overhang of correct votes, i decreases the probability of choosing the correct option by causing a tie by $\left(1-p^i\right)\cdot q\cdot(1-r_1-r_2)$. He can improve the probability of choosing the correct option if there is an overhang in favor of the incorrect option and he can cause a tie. The improve in the probability is $p^i\cdot q\cdot(1-r_1-r_2)$. i cannot influence any other situation.

For an uninformed individual $p^i=0.5$. So we have

$[0.5\cdot(1-q)\cdot(1-r_1-r_2)]-[0.5\cdot q\cdot(1-r_1-r_2)]<0$

This is true since $\mathrm{q}>0.5$. This means an uninformed voter would make the situation worse and will therefore abstain.

For an informed individual i it is true that $p^i=q$, so the term above is

$[q\cdot(1-q)\cdot(1-r_1-r_2)]-[(1-q)\cdot q\cdot(1-r_1-r_2)]=0$

So this means an informed individual i is indifferent.

Assumption: If an individual is indifferent between voting and abstaining, he abstains.

This assumption is more accurate than assuming individuals vote when they are indifferent since there are usually voting costs of ε (at least individuals have to make a small effort to vote, e.g. press a button, go somewhere, etc.).

Result 3: An uninformed group member will abstain.

Proof: According to result 2, an uninformed group member will abstain in case m^{-i} is odd. Result 1 says an uninformed group member is indifferent in case m^{-i} is even. The assumption we just stated says that indifferent individuals abstain. So an uninformed group member always abstains regardless of m^{-i} being odd or even.

Result 4: If $m \geq 1$ group members are informed, an equilibrium number of informed voters $m^* \leq m$ must be odd. $M - m^*$ remaining group members abstain.

Proof: According to result 3 uninformed group members always abstain. Assume all informed group members but individual i already decided if they vote or not. Let i be informed. According to result 1 i will vote if m^{-i} is even, hence making m^* odd. According to result 2 i is indifferent if m^{-i} is odd. The assumption states that indifferent individuals abstain, so i will abstain and m^* is odd.

Let us now analyze when an individual i will get informed. Let $c > 0$ be the information cost and $\widetilde{m}^{-i}$ denote the anticipated number of informed voters without i, anticipated by individual i.

Result 5: If individual i andicipates $\widetilde{m}^{-i}$ is odd, i will not acquire information and abstain.

Proof: Result 2 states that i will be indifferent if he is informed and m^{-i} is odd. Since information is costly, he will stay uninformed and hence abstain (according to result 3).

Result 6: If the number of informed voters m is odd, in a pure-strategy equilibrium all informed group members will vote, the rest abstains.

Proof: According to result 5, there is no informed group member that abstains. So all informed members will vote. m odd hence means m^* is also odd.

Result 7: For c low enough, ∃ a range of pure-strategy equilibria where an odd number m^* of informed members vote and the rest abstains.

Proof: This follows from result 6. For c low enough there is at least one group member that benefits from acquiring the information at this low cost c. This is true as he will increase the probability of getting a payoff and by choosing c low enough the cost will at some point become smaller than the additional profit.

Result 8: There is no pure-strategy equilibrium where an even number m^* of group members get informed and vote.

Proof: Assume there is such an equilibrium. An arbitrary informed voter i of this group will anticipate that all other informed group members $\tilde{m}^{-i}$ will vote. Since m is even, $\tilde{m}^{-i}$ is odd. If i now gets informed, he will be indifferent between voting and abstaining. According to result 5, i should not acquire the information which contradicts m^* to be even.

Conclusion: All pure-strategy equilibria of the voting game have the following properties: An odd number m^* of group members get informed and vote, $0 \leq m^* \leq M$, while the remaining $M - m^*$ stay uninformed and abstain.

3.1 Equilibrium Condition

In equilibrium no individual has an incentive to deviate from his strategy. An uninformed member will only buy information and vote if his additional payoff exceeds the information cost. This condition has to hold for all group members in equilibrium (Let X be the payoff for an individual in case his group has chosen the correct option):

$$\pi(m^*) \cdot X - \pi(m^* - 1) \cdot X > c \quad \textbf{(2)}$$

with $c > 0,\ X > 0$ and $0 \leq m^* \leq M$. So there can exist multiple equilibria. Especially every odd number that is smaller than a known equilibrium is also an equilibrium. For an informed individual it is not optimal in equilibrium to get uninformed and not vote. The decrease in expected payoff would be greater than the information cost he could save by this change in behavior. In contrast, for an uninformed individual it is not optimal in equilibrium to get informed and vote since the increase in expected payoff is lower than the information cost. Since every equilibrium consists of an odd number m^* of informed voters, an additional voter would result in no increase in expected payoff.

3.2 Mixed Strategy Equilibrium

Beside pure-strategy equilibria there also exist mixed equilibria. They are usually hard to find and we will only deal with symmetric mixed strategy equilibria in this paper. Within symmetric mixed strategy equilibria every potential voter gets informed and votes with a certain probability r. For a mixed strategy equilibrium every potential voter must be indifferent between getting informed and vote or staying uninformed and abstain. The expected payoff for an arbitrary individual i if he does not get informed is:

$$\mathrm{E}(not\ inform) = \sum_{k=0}^{M} \binom{M}{k} \cdot r^k \cdot (1-r)^{M-k} \cdot \pi(k) \cdot X \quad \textbf{(3)}$$

This expression gives us the expected payoff and consists of all possible numbers of informed voters weighted by their respective probability. This has to equal the expected payoff if i gets informed and vote:

$$\mathrm{E}(inform) = \sum_{k=0}^{M-1} \binom{M}{k} \cdot r^k \cdot (1-r)^{M-k} \cdot \pi(k+1) \cdot X \quad \textbf{(4)}$$

So for a mixed strategy equilibrium this condition has to hold:

$$\mathrm{E}(not\ inform) = \mathrm{E}(inform)$$

$$\sum_{k=0}^{M-1} \binom{M-1}{k} r^k (1-r)^{M-1-k} \pi(k)X = \sum_{k=0}^{M-1} \binom{M-1}{k} r^k (1-r)^{M-1-k} \pi(k+1)X \quad \textbf{(5)}$$

3.3 Social Optimal Number of Informed Voters

By looking at NASH-equilibria and the symmetric mixed strategy equilibria individuals were considered to be only self-interested. These equilibria are not necessarily optimal for the whole group. A simple possibility is to maximize the sum of all expected individual payoffs:

$$\max_m \quad \sum_{i=1}^{M} \pi(m) \cdot X - c_i$$

$$\max_m \quad M \cdot \pi(m) \cdot X - m \cdot c \quad \textbf{(6)}$$

where c_i is the individual info cost which is c if i gets informed and 0 otherwise. Of course there are other criteria that can be used. A social optimal number of informed group members m is not necessarily a NASH-equilibrium. The reason is clear: While maximizing the individual's expected profit i just considers the info costs and the

change in his own expected payoff. When we optimize the profit of the whole group, the costs stay the same but the increase in payoff is now M times as much since every member profits from i's decision.

Please note that a social optimum is a normative concept while the NASH-equilibria in pure strategies are just describing the expected outcomes of the voting game.

3.4 Equilibria with Numeric Parameters

In this experiment we examine the behavior of groups consisting of 7 group members. The quality of the information group members can acquire is 0.6. We introduce two cost levels, a low cost level at 0.1 and a high cost level at 0.8. The payoff for a respective group member if his group has chosen the correct option is 20. So the parameters are the following:

$$M = 7\,, \qquad q = 0.6\,, \qquad c \in \{0.1, 0.8\}, \qquad X = 20$$

First, we start with calculating the probabilities of choosing the correct option depending on the number of informed voters. For this we just insert q and M into formula (1) which is the Condorcet formula:

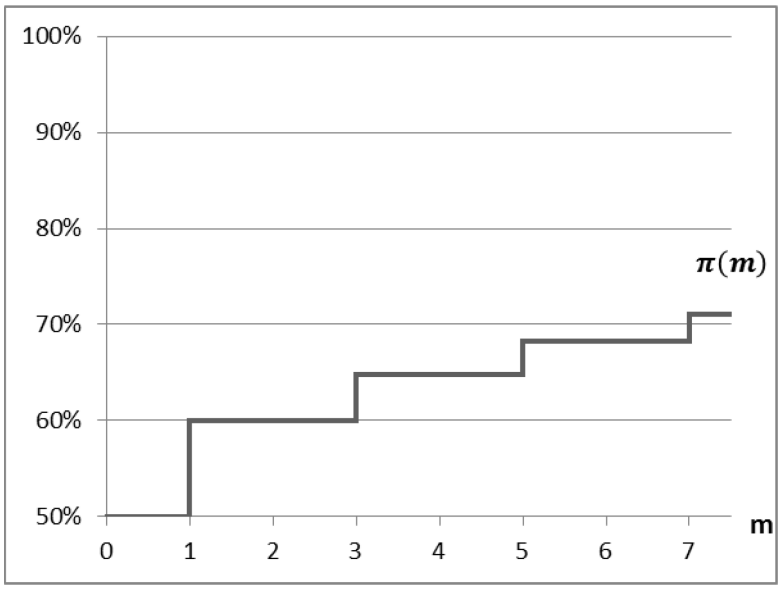
$$\pi\,(m) = \sum_{j=\frac{m+1}{2}}^{m} \left(\frac{m!}{(m-j)!\,j!}\right) (0.6)^j\ (1-0.6)^{m-j}$$

As we already mentioned when dealing with the Condorcet formula, even numbers cause the same success probability as this respective number minus 1. So we will now calculate the probability of choosing the correct option if m informed voters vote:

Table 1: Probabilities of choosing the correct option with m informed voters.

$\boldsymbol{m}$	$\boldsymbol{\pi(m)}$
1	60%
3	64.8%
5	68.26%
7	71.02%

Figure 3: Visualisation of probabilites



We use the table above and the stated parameters and insert them into formula (2) to calculate the pure strategy equilibria:

$$\pi(m^*) \cdot 20 - \pi(m^* - 1) \cdot 20 > c, \qquad 0 \leq m^* \leq 7, c \in \{0.1, 0.8\}$$

$$m^* \in \{1, 3, 5, 7\} \qquad \text{for } c = 0.1$$

$$m^* \in \{1, 3\} \qquad \text{for } c = 0.8$$

For a mixed symmetric strategy equilibrium the expected payoff of getting informed must equal the expected payoff of not getting informed. Every group member gets informed with probability r. By inserting the parameters into formula (5) we obtain:

$$\sum_{k=0}^{6} \binom{6}{k} \cdot r^k \cdot (1-r)^{6-k} \cdot \pi(k) \cdot 20 = \sum_{k=0}^{6} \binom{6}{k} \cdot r^k \cdot (1-r)^{6-k} \cdot \pi(k+1) \cdot 20$$

$$0 \leq r \leq 1$$

$$r = 1 \qquad \text{for } c = 0.1$$

$$r = 0.189 \qquad \text{for } c = 0.8$$

So this means for the low cost level the mixed symmetric strategy equilibrium degenerates into a pure strategy equilibrium where every group member acquires the information and vote. For the high cost level, every group member acquires information with a probability of $r = 0.189$.

4 Hypotheses

Within our experiment we want to test 3 main hypotheses:

Groups that choose direct democracy have a higher participation rate than groups where direct democracy is exogenously imposed. **H 1**

Participation rate is related to voting in the decision stage. The group decision for democracy can be seen as a commitment of the majority of the group to participate in the vote. Voting in the decision stage is conditional on buying the information in this experiment, so every person that votes gets a private signal of a better quality than just choose one option randomly. If people are conditional cooperators they may participate in the vote even though they voted against democracy in the delegation stage. Within this hypothesis we have to control for a selection bias by analyzing the IQ-test scores. High participation rates can also result from a high share of altruistic people. These people want to improve the situation of the other group members by voting for democracy and then participating in the vote.

Self-imposed direct democracy leads to higher payoffs compared to an expert decision (Direct Democracy is more efficient than an expert decision when it is chosen). **H 2**

This hypothesis should be true in the long-term if our assumption of rational individuals holds. Rational individuals would not choose democracy if it is not better than delegating to the expert.

In a decision stage groups reach a NASH-equilibrium. **H 3**

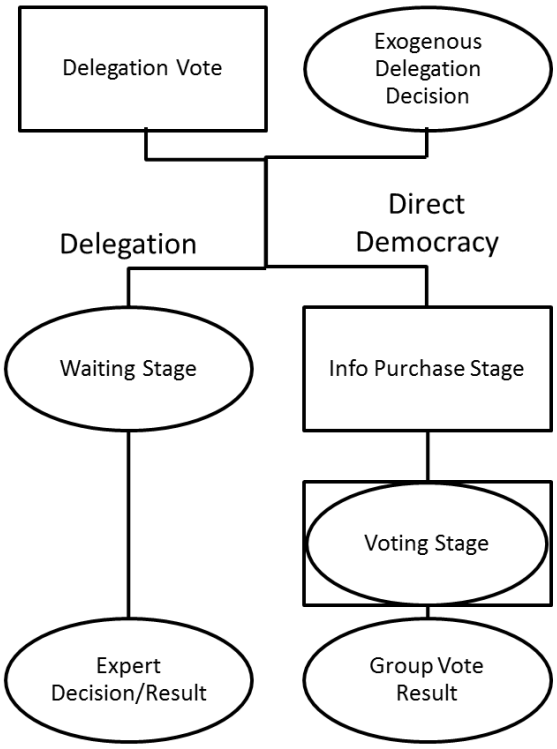
In the previous section we calculated for the equilibria we would expect for rational and self-interested individuals. When analyzing the results we will check if groups reached an equilibrium state.

5 Experiment Design

Within this experiment, groups had to decide for one out of two options. Before that, there was a decision whether the group decided on its own or an expert took the decision. We formed groups of 7 subjects, which stayed the same during the whole experiment. There were 3 parts. The first part was the main part, where groups had to decide for one out of two options. The second part was an IQ-Test that consisted of 15 short tasks. The last part consisted of a short questionnaire. Within the first part, there were two phases, an endogenous phase and an exogenous phase.

In the first part, groups have to choose one of two options: Circle or Triangle. One of these is randomly assigned to be the correct one. If the group decides for the correct option, every group member gets a payment of 20 Euros, 0 otherwise. The decision on one of the two options is either taken by an expert or by a group vote. The expert has a probability of 60 % to choose the correct option. If the group decides for a group vote, every group member has an ex ante 50 % chance of voting for the correct option. Every single subject is able to improve his or her probability of choosing the correct one through acquiring information. This gives the respective person a signal that is correct with a 60 % chance. After the info purchase stage there is the voting stage where only informed voters are allowed to vote for one of the two options. The group chooses the option that gets more votes in the voting stage, so the simple majority rule applies. In case of a tie, one option is chosen randomly. If the group chooses the correct option, every group member gets a payment of 20 Euros minus information cost (if the subject bought the information). Additionally, subjects earn an extra 20 Cents for correctly estimating the number of informed voters. The information cost is either 10 or 80 Cents. Both cost levels occur equally often in the first and second part.

Figure 4: Stages of a respective round of an endogenous vs. exogenous phase.



Note: Circles represent stages where individuals only participated passively and had nothing to do. Rectangles represent stages where individuals participated actively, which means they had to decide or vote. A combination of circle and rectangle denotes a stage where some individuals participated actively and some passively, depending on their decision in the previous stage.

Figure 4 illustrates the different stages of the first part of the experiment. A representative round of the endogenous phase starts with the delegation vote where group members have to decide whether to delegate the decision to an expert or not. Subjects have to vote for or against delegation and are told the information cost in advance. When there is a majority for delegation, subjects proceed to the next screen, where they have to wait for 20 seconds. This is labeled decision time of the expert. We implemented this waiting time to avoid subjects from choosing the expert just because it is the fast lane to a considerable payoff. After waiting for 20 seconds, every subject of the group is told the decision of the expert, the correct option and the resulting payoff. Then the next round starts.

If the majority of the group votes for direct democracy, the participants of this group continue with the information purchase stage. Within this stage, they can acquire costly information and have to

estimate the total number of informed voters among the other group members. If a subject buys the information, he or she continues to the voting stage and has to vote for one of the two options. On the same screen, the subject is given the information, which indicates the correct alternative with a 60 % chance. Subjects are not allowed to vote if they did not buy the information. When everyone has decided whether to buy information or not and when every info-buyer has voted for one of the options, the result of the group vote is presented to all members. The group chooses the option that got the majority of the votes. In case of a tie, one option is randomly chosen. The subjects see the group option, the correct one, the number of informed voters and the resulting payoff. Afterwards, the next round starts.

The labeling of the options can cause framing effects, especially if one uses labels like numbers or letters which can imply a certain ordering. To reduce framing effects we decided to label the options “Triangle” and “Circle”.

For half of the groups, this treatment was repeated for 16 periods. We call this treatment the Endo-Exo-Treatment. After completing the first 16 periods, subjects had to participate in 16 exogenous rounds. Subjects faced the same series of cost levels as in the first part. Now they were not able to vote for or against delegation to an expert, but were matched with another group of the same session. So they started in the exogenous delegation decision stage (See right side of Figure 4). The decision on expert delegation was taken from the first part of this matched group. For instance, group 1 decided to delegate to the expert in the first period of the first part. Group 2 is matched with group 1, so in the second part group 2 will also delegate in the first period. There is no vote on delegation, all the delegation decisions for the second part are taken from the first part. Everything else remains the same. The subjects of a group were told that they will delegate or will not delegate in this period because another group took this decision in a similar situation. Everything else remained the same.

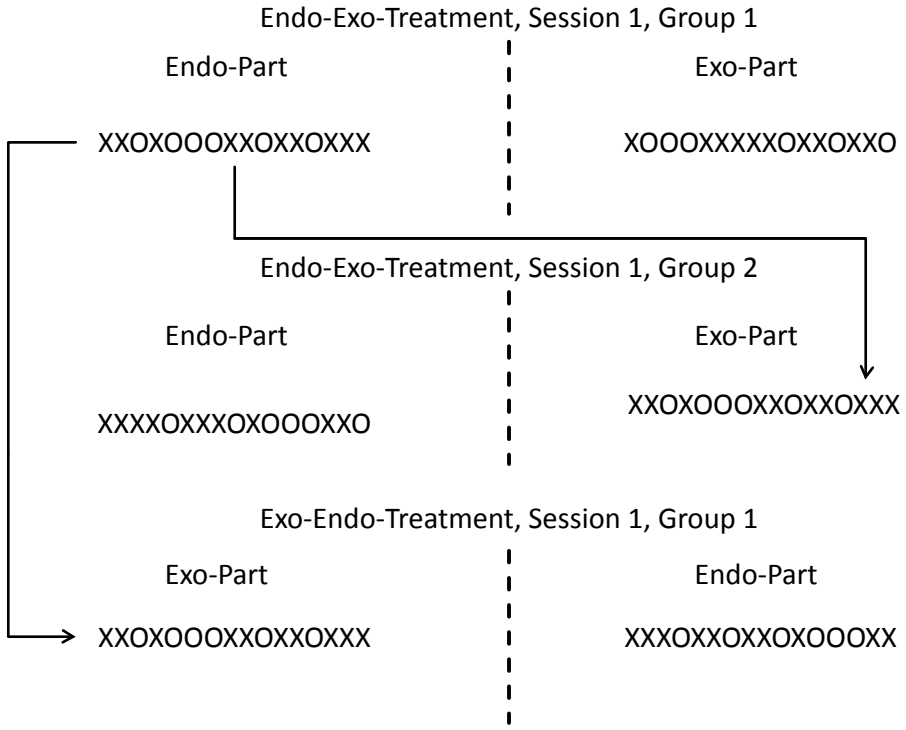
The second half of the groups was running the Exo-Endo-Treatment which was quite similar to the treatment mentioned before,

but the ordering of the endogenous and exogenous part was reversed. The exogenous delegation decisions were taken from the first part of the groups that ran the Endo-Exo-Treatment. This enables us to perform a between subjects analysis with the data.

For both treatments subjects participated in 3 trial periods at the very beginning of the experiment. Within these periods subjects started with the Info Purchase Stage to let them know how direct democracy works in this experiment.

Figure 5 illustrates the matching relations between the groups in both treatments.

Figure 5: Matching pattern.



Note: The delegation decision (represented by X and O for or against delegation in the delegation decision stage) of a representative group in the Endo-Exo-Treatment were used as the exogenous delegation decision in the second part of the Endo-Exo-Treatment and in the first part of the Exo-Endo-Treatment.

After completing part one and two, subjects had to answer some questions out of an IQ-Test. We use the same IQ-Test Putterman, Tyran and Kamei (2011) and Kamei, Putterman and Tyran (2011) use in their experiments. This test is based on the work of Séréville and Myers (1994).

The IQ-Test consisted of 15 tasks. Every task contained a 3x3 matrix with one missing item. Participants had to answer which out of 8 possible items fits into this matrix. There was a time limit of 40 seconds for every task. Every correct answer gave the subjects a payoff of 50 Cent, for every wrong or missing answer 10 Cent were deducted. See the Appendix for the tasks.

After completing this IQ-Test subjects had to fill in a short survey with questions on social capital. Then subjects got their payoffs. Payoffs consisted of a randomly chosen period out of part 1, a randomly chosen period out of part 2, the earnings out of the IQ-Test and a fixed payment of 3 Euros for completing the survey.

In total we ran 10 sessions and tested 12 groups for each treatment, so we had 168 subjects. The experiments were held at the lab of the Vienna Center for Experimental Economics (VCEE) at University of Vienna. The experiment was held in German. Subjects were recruited via an experiment database where subjects can register if they want to participate in experiments. Psychology students and subjects that participated in more than 10 experiments did not receive an invitation to this experiment. The experimented was programmed in z-tree (Fischbacher, 2007). A session lasted on average 1 hour and 40 minutes and the average payoff was 31.67 Euros for all participants.

The exact steps of the experiment were:

- Participants were welcomed in the lab and assigned a random cube. If there were too many participants, some were paid 8 Euros until we reached the needed number of participants. A cube consisted of a table, a chair, a PC, a pen and the lab guidelines. Participants were not able to see the participants next to or in front of them.
- Instructions for the first part were handed out. Participants had to read them carefully and raise their hand when they were finished. Then they were given a short quiz to control if they have understood the instructions.
- When all participants completed the quiz successfully, the program was started in z-tree. Participants then did the 3 trial

periods and the 16 endogenous or exogenous periods (depending on the treatment they were in). When all groups completed these periods, a waiting screen appeared and the instructions for the second part where handed out.

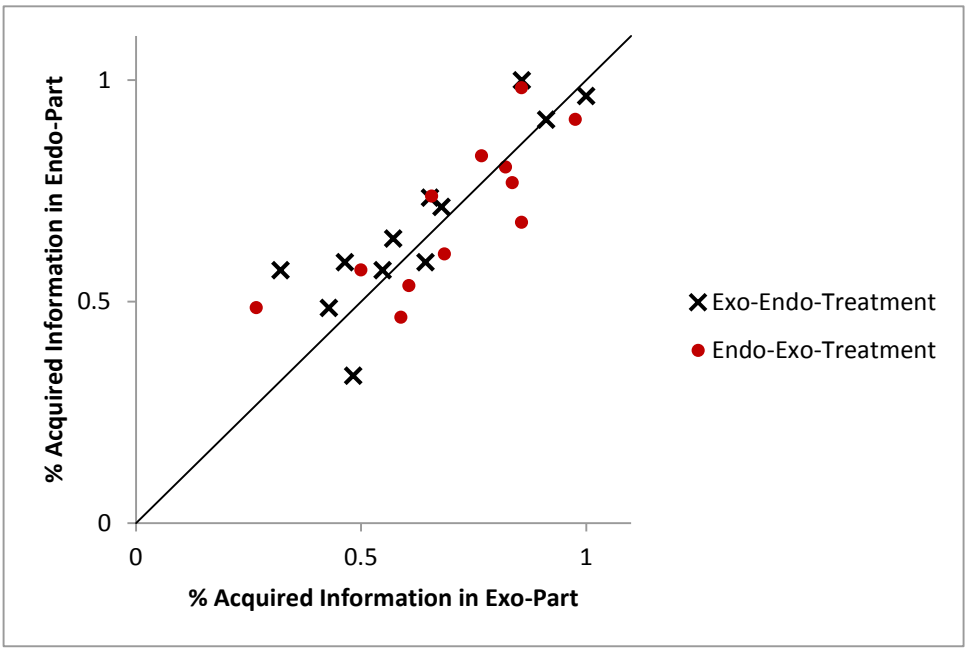
- After reading the instructions participants had to confirm on the screen that they have understood the instructions. When all participants confirmed, the second part started.
- Participants did another 16 periods, now exogenous or endogenous (depending on the treatment).
- When all groups completed these 16 periods, a waiting screen appeared and instructions for the third part were handed out. This was an IQ-test. Participants had to confirm that they have understood the instructions and the IQ-test started immediately after this confirmation.
- When all participants completed the IQ-Test, they were told to fill in a survey and would get 3 Euros for doing so. After completing the survey, the subjects were picked up at their cubes by one of the assistants and guided to the cash desk where they got their payment. They signed a receipt, were handed over their payment and left the lab.

6 Results

This section is structured as follows: First we will give some overall descriptive statistics on the experiment. Then we will show descriptive and inference statistics for each hypotheses separately.

All in all we cannot find sufficient support for our hypotheses, especially for hypothesis 1. Figure 6 shows the average proportion of informed voters over all periods, separated for treatment and part. Each point represents one group. According to our hypothesis 1 we would expect many groups to lie above the 45° line. In fact, many groups lie around the 45° line which suggests a weak or non-existing effect.

Figure 6: Comparison of average of info purchase for both treatments for high cost only, average over groups (N=24)



In Table 2 we can see the proportion of delegation votes, i.e. in how many cases groups decided on one of the alternatives themselves. Note that due to the matching mechanism proportions for both parts in the Endo-Exo-Treatment and the exogenous part in the Exo-Endo-Treatment are the same. For the low cost level almost every decision was taken by the group. The only interesting insight of this table is the difference between the exogenous and endogenous part in the Exo-Endo-Treatment at high cost.

Table 2: Proportion of Group Votes Across Cost Levels, Treatments and Parts (N=768)

	Low Cost Level	High Cost Level	Any Cost Level
Endo-Exo-Treatment	100%	78%	89%
Endogenous Part	100%	78%	89%
Exogenous Part	100%	78%	89%
Exo-Endo-Treatment	100%	81%	90%
Exogenous Part	100%	78%	89%
Endogenous Part	99%	84%	92%
Both Treatments	100%	80%	90%
Exogenous Part	100%	78%	89%
Endogenous Part	100%	81%	90%

6.1 Evidence on Hypothesis 1

The empirical data do not show extensive support for Hypothesis 1. Hypothesis 1 states that self-imposed direct democracy leads to higher participation rates than exogenously imposed direct democracy. Data show that there is a significant difference in the number of freeriders who never buy information. We are also able to extract cost level and belief as the main determinants of an individual's decision on acquiring information. Nevertheless we lack evidence on an overall difference between both treatments as we stated in the hypothesis.

We will start with some descriptive statistics on the participation rate for each part and treatment and performing a simple t-test. Then we will move on by looking at the distribution of the individual information purchase proportion and test for equality among treatments. Finally we will run some regressions on an individual level to examine what influences the purchase decision of the participants.

Table 3 shows the average proportion of individuals purchasing information, with respect to treatment, part and cost level. We see a clear difference in the proportion among cost levels, but the difference

between both parts within a treatment is almost zero for low cost and very small for high cost. The absolute difference at a high cost level for the same part within a treatment is only 4 percent. There is almost no variation for low cost so we will concentrate on high cost.

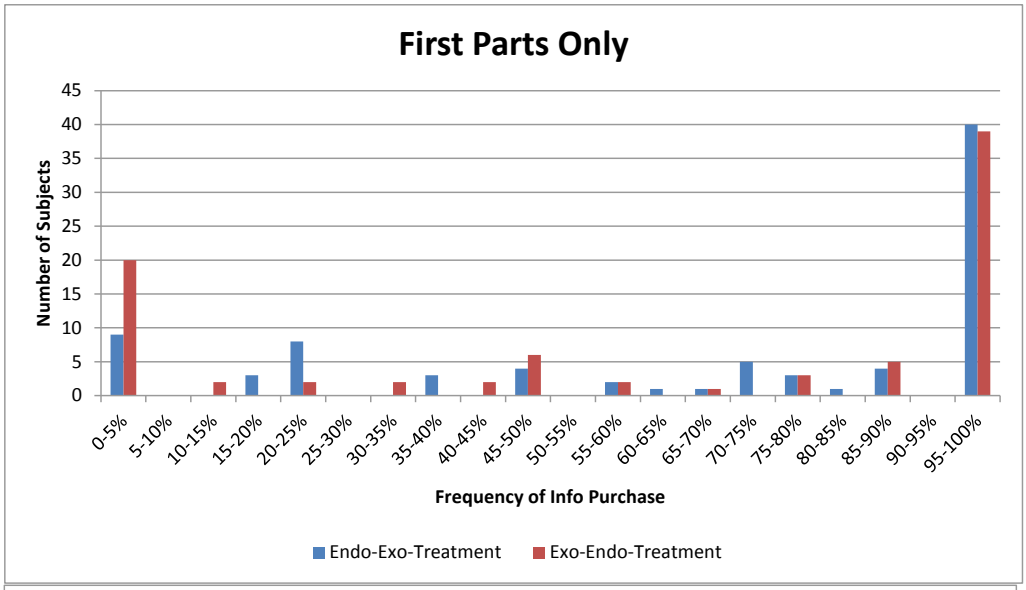
Table 3: Proportion of Informed Voters Across Cost Levels, Treatments and Parts (N=5376)

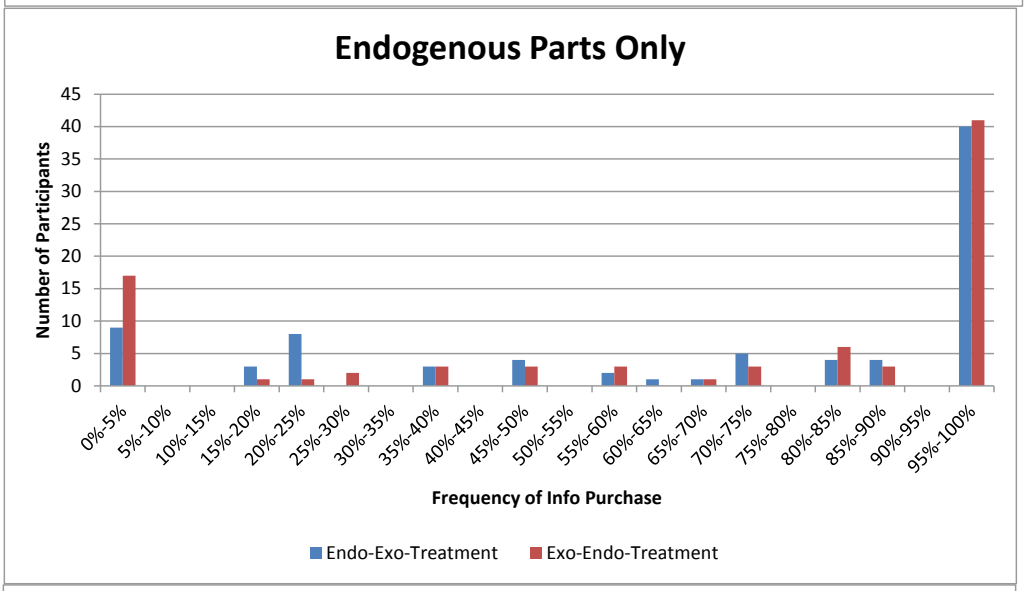
	Low Cost Level	High Cost Level	Any Cost Level
Endo-Exo-Treatment	92%	71%	83%
Endogenous Part	93%	73%	84%
Exogenous Part	92%	69%	82%
Exo-Endo-Treatment	88%	68%	79%
Exogenous Part	89%	66%	79%
Endogenous Part	87%	70%	79%
Both Treatments	90%	69%	81%
Exogenous Part	90%	67%	82%
Endogenous Part	90%	71%	80%

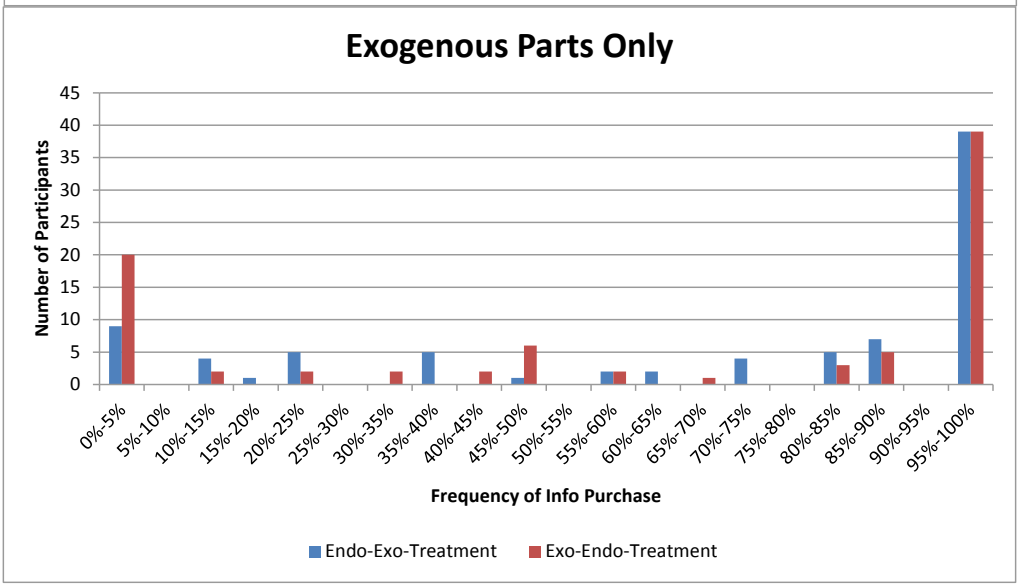
T-tests on the differences between treatments and parts show no significant difference. A test on the first (endogenous) part of the Endo-Exo-Treatment and the first (exogenous) part of the Exo-Endo-Treatment suggests no significant difference in the proportion of informed voters (p-value 0.267). The difference between all endogenous and exogenous parts (p-value 0.625) and the difference between both parts within each treatment is also not significant (p-value for Endo-Exo-Treatment 0.942, for Exo-Endo-Treatment 0.473). Note that we only included data on high cost levels and direct democracy periods.

The top of Figure 7 gives us the distribution of the info purchase frequencies for the first parts of both treatments. We can see almost similar distributions for both treatments. A Kolmogorov-Smirnov-Test for equality of both distributions cannot reject the null hypothesis of equal distributions (corrected p-value 0.214). Though we can see a considerable difference in both treatments at the lower end of the distribution.

Figure 7: Histograms of Frequency of Info Purchase. All figures include only group decision stages, high cost levels only.







When taking a deeper look into the individual info purchase frequencies in the below histograms of Figure 7 we can see that the distributions are quite similar in both parts. There is again a large amount of individuals which bought the information at any possibility. We see a considerable difference at the lower end of the distribution.

A restricted dataset where only individuals are included that purchased information in 0-5 % of the cases can give us more satisfying results. A t-Test suggests a highly significant difference between the two treatments (p-value < 0.01). The difference between the first parts of both treatments is also significant (p-value 0.02). These t-tests look for a difference in the proportion of individuals that purchased never or almost never information. The results suggest that the proportion of individuals that bought no information was significantly higher in the Exo-Endo-Treatment, both for the first part and both parts together. The tests show that very low participation rates are less common in endogenously imposed group votes. This indirectly supports our hypothesis of a higher participation rate in endogenously imposed group votes.

The difference between the first parts of both treatments remains weakly significant if we cluster at a group level (p-value 0.08). Clustering at group level is appropriate since individuals were part of the same group throughout the experiment. The large number of periods requires controlling for correlation within groups.

Another possibility for a restricted sample is to drop individuals that purchased information in 95-100% of the cases and run a Kolmogorov-Smirnov-Test. One out of 2 individuals was in this highest category. A Kolmogorov-Smirnov-Test on this restricted dataset is significant (p-value 0.035). This means there is a slight effect on participation rates if direct democracy is imposed endogenously, but it is dominated by a strong incentive to always purchase information.

Table 4 gives us the results of various OLS-Regressions regarding the individual info purchase decision. Regression (1) and (2) look at session of the Endo-Exo-Treatment, (3) and (4) at sessions of the Exo-Endo-Treatment and (5) and (6) at all sessions. Regressions (1), (3)

and (5) include many explanatory variables whereas (2), (4) and (6) are nested versions of the former ones and are restricted to significant variables.

Table 4: OLS-Regression of Individual Info Purchase Decision onto Various Variables

	Dependent Variable: Info-Buy					
	(1)	(2)	(3)	(4)	(5)	(6)
	Endo-Exo	Endo-Exo	Exo-Endo	Exo-Endo	Both Treatments	Both Treatments
High Cost	-0.430***	-0.405***	-0.137**	-0.100***	-0.262***	-0.250***
	-0.085	-0.093	-0.07	-0.033	-0.073	-0.074
Endo-Part	0.011		-0.019		-0.01	
	-0.017		-0.014		-0.015	
Endo-Exo-Treatment					0.016	
					-0.032	
Endo-Part X Endo-Exo-Tr.					0.015	
					-0.019	
High Cost X Endo-Part	-0.011		0.03		0.009	
	-0.03		-0.021		-0.018	
IQ	0.043		0.049		0.042*	
	-0.028		-0.05		-0.023	
Belief	0.094**	0.044**	0.144**	0.084***	0.116***	0.089***
	-0.037	-0.02	-0.042	-0.014	-0.028	-0.017
IQ X Belief	-0.007		-0.01		-0.008**	-0.004**
	-0.005		-0.006		-0.004	-0.002
High Cost X Belief	0.066***	0.059***	0.004		0.031**	0.030**
	-0.013	-0.015	-0.017		-0.013	-0.014
Cons	0.377*	0.674***	0.14	0.421***	0.259	0.537***
	-0.213	-0.108	-0.309	-0.076	-0.169	-0.071
Wald chi²	842.27	619.13	205.55	151.56	575.61	521.95
Prob > chi²	0.000***	0.000***	0.000***	0.000***	0.000***	0.000*
N	2394	2394	2429	2429	4823	4823
Subjects	84	84	84	84	168	168
Groups	12	12	12	12	24	24

As expected a high cost level has a significant negative effect on the probability to purchase information in all specifications. Interestingly, individuals in the Endo-Exo-Treatments were more aware of high costs than in the Exo-Endo-Treatment. The magnitude of the high cost

variable indicates that the cost level is a main factor for individuals in deciding whether to purchase information or not.

The Endo-Part variable gives us the effect of being in an endogenous period onto the probability of purchasing information. It is not significant in any specification which means there is no support for our Hypothesis 1 out of these OLS-Regressions.

The insignificance of the interaction term High Cost X Endo-Part suggests that high costs are equally important in both the exogenous and endogenous part of each session.

The variable Belief is always significant. Belief indicates the belief of the respective individual about the number of informed group members (excluding the individual itself). An individual that expects many informed group members is also more likely to purchase the information.

We included an interaction term of Belief X High Cost, which has a positive effect and is significant for the Endo-Exo-Treatment and the pooled data set. This means within the Endo-Exo-Treatment there was kind of an extra motivation for individuals to purchase information given the cost level was high and they expected a high number of informed group members. This is not what we would expect: Rational individuals should be less likely to purchase information if costs are high and they believe a large number of group members already purchases the information. We predicted this behavior for rational and self-interested individuals since there are only two equilibria for a high cost scenario: 1 and 3 informed group members.

IQ was never significant, except for an interaction term with belief. This would mean that more intelligent individuals (i.e. individuals that had more answers correct in our IQ-task) have a tendency for not purchasing the information if they believe many others purchase the information. It seems intelligent individuals were able to calculate the equilibria and see that it is better for them to freeride if a lot of the other group members inform themselves. Due to the fact that this interaction term is only significant for the pooled data set, the described effect is not robust and we should not put too much emphasis on it.

We also included the answers of the social capital survey into our regressions, they were never significant. So we do not show any of them in the regression table.

To summarize, we saw almost no evidence that supported our hypothesis. The hypothesis stated that self-imposed direct-democracy leads to higher participation rates. Participation in the vote is restricted to informed individuals. Summary statistics suggested no treatment effect in accordance with our hypothesis. The histograms showed a large proportion of people that always purchased the information. When excluding these people we find a significant difference in the distribution. Regressing the individual purchase decision onto various explanatory variables did not support our hypothesis.

6.2 Evidence on Hypothesis 2

We expect self-imposed direct democracy to lead to higher payoffs than an expert decision. This is the statement of Hypothesis 2. A t-test suggests a significant difference in the payoffs between group and expert decisions. This is also true if we restrict the analysis on endogenous periods only.

Table 5 gives us the average payoffs, separated by delegation decision, treatment and part. These payoffs include the payment of 20 Eurocents for a correct belief in the number of informed group members and the information cost.

Table 5: Average Payoffs For Each Treatment, Part and Delegation Decision (Including 20 Cents for Correct Belief and Information Cost, N=5376)

	Group Decision	Expert Decision	All Decisions
Endo-Exo-Treatment	13.90	9.52	13.43
Endogenous Part	13.72	6.67	12.95
Exogenous Part	14.07	12.38	13.90
Exo-Endo-Treatment	14.18	9.19	13.70
Exogenous Part	14.81	12.39	14.54
Endogenous Part	13.57	5.00	12.85
Both Treatments	14.04	9.37	13.56

The hypothesis concentrates on the difference of self-imposed direct democracy vs. self-imposed expert decisions. A t-test on the difference of payoffs for only the endogenous parts of both treatments suggests a significant difference (p-value 0.02), clustered at group level.

Payoffs are always higher in group decisions compared to the expert decision. This obvious difference is also supported by a highly significant difference in a t-test for the pooled dataset (p-value < 0.01), again clustered on group level.

So we find evidence for our hypothesis that self-imposed direct democracy leads to higher payoffs than an expert decision.

6.3 Evidence on Hypothesis 3

Hypothesis 3 states that groups reach an equilibrium if they are in a decision stage. Remember the Nash-equilibria for low and high cost levels which we derived the theory section:

$$m^* \in \{1, 3, 5, 7\} \qquad \text{for } c = 0.1$$
$$m^* \in \{1, 3\} \qquad \text{for } c = 0.8$$

Table 6 shows how often a certain number of informed voters per group occurred for each cost level. Grey cells indicate equilibrium points. For high costs we cannot see an accumulation at the equilibrium points. Although it seems that for low costs there is an accumulation around the $m^* = 7$ equilibrium, it seems there is just a tendency to always purchase information. We make this conclusion since all other equilibria are not frequent at all.

Table 6: No. of Informed Voters per Group, Separated by Cost Level (N=4823)

No. Of Informed Voters	High Cost	Low Cost	Both Cost Levels
1	7	1	8
2	17	2	19
3	35	5	40
4	84	17	101
5	62	64	126
6	74	104	178
7	55	218	273

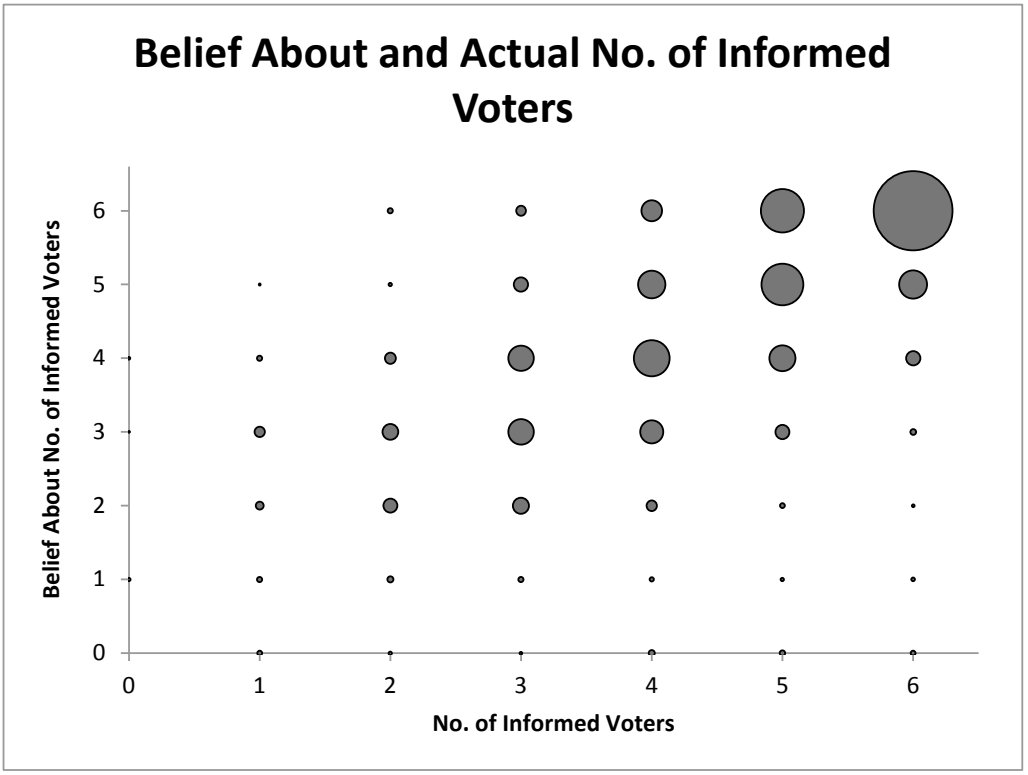
So empirical data do not support our hypothesis that groups tend to move towards equilibria.

6.4 Quality of beliefs

Figure 8 shows a comparison of beliefs and the actual number of informed voters. Beliefs are accurate in 57 % of the cases (2740 out of 4823). We can see in the graph that individuals guessed correct or almost correct in a large proportion of all situations. Remember that individuals were paid an extra 20 Eurocent if they guessed correctly.

The large proportion of correct guesses shows that there is coordination within the group. It is also important to know that we gave feedback at the end of each period, coordination would be much harder without this feedback.

Figure 8: Belief About and Actual No. of Informed Voters (N=4823)



7 Conclusion and Ideas

In this experiment we examined if there is a difference in the participation rate between self-imposed and exogenously imposed direct democracy. The data do not suggest a significant difference.

After completing the sessions and analyzing the data we are now able to give some reasons why our experiment design was not able to show the expected effect.

We looked for a difference between endogenously and exogenously implemented direct democracy. It is more appropriate to compare situations where group members wanted to have direct democracy versus situations where they do not. With our endogenous part we are able to distinguish between wanted and not wanted direct democracy, but within the exogenous part we cannot. A technique to overcome this drawback is the overruling technique described by Dal Bo, Foster and Putterman (2010). We can apply this technique onto our design by implanting just one instead of two treatments. In every period participants have to vote in the delegation stage. With a probability of 50 % the group decision is considered and the period goes on according to the group decision. With a 50 % chance either direct democracy or the expert is chosen randomly. As the groups have to vote every period, we know for every period if they want to have direct democracy. With a 25 % chance the group decision is overruled. Then we can compare the results for the periods where the groups wanted direct democracy and got it versus the periods where the groups did not want direct democracy but where forced to vote on the two options.

Another possible shortcoming of this design is the artificial frame. We labeled the options triangle and circle and the participants found themselves in a quite abstract situation. We did this to avoid effects from framing we cannot control for, but maybe participants did not understand the situation very well (Although we used a short quiz before the first period to check their understanding of the experiment).

There are many variations one could try to implement within this design. Varying in group size is one of these possibilities besides just

changing parameters like information quality. Manuel Schwaninger told me about the design of his Master Thesis where he included communication among the group members into the basic design of this experiment. It is an interesting opportunity to see if participants are willing to state commitments on cooperation and follow their own commitments. One can also check the understanding of the instructions and examine further reasons for people's behavior by analyzing the group chats.

8 Literature

BATTAGLINI, M., MORTON, R.B. and PALFREY, T.R. (2009), "The Swing Voter's Curse in the Laboratory", *The Review of Economic Studies*, **77**, 61–89.

CONDORCET, M. (1785). *Essai sur l'Application de l'Analyse a la Probabilite des Decisions Rendues a la Pluralite des Voix* (Paris).

DAL BO, P., FOSTER, A. and PUTTERMAN, L. (2010), "Institutions and Behavior: Experimental Evidence on the Effects of Democracy", *The American Economic Review*, **100**(5), 2205–2229.

DUFFY, J. and TAVITS, M. (2008), "Beliefs and Voting Decisions: A Test on the Pivotal Voter Model", *American Journal of Political Science*, **52**(3), 603–618.

ELBITTAR, A., GOMBERG, A., MARTINELLI, C. and PALFREY, T.R. (2014), "An experiment on voting in committees with costly information acquisition", Working paper.

FEDDERSEN, T.J. and PESENDORFER, W. (1996), „The Swing Voter's Curse", *American Economic Review*, **86**(3), 408–424.

FEDDERSEN, T., and SANDRONI, A. (2006), „Ethical voters and costly information acquisition", *Quarterly Journal of Political Science*, **1**(3), 287–311.

FISCHBACHER, U. (2007), "z-Tree: Zurich toolbox for ready-made economic experiments", *Experimental Economics*, **10**(2), 171–178.

FISCHBACHER, U., GÄCHTER, S., and FEHR, E. (2001), „Are people conditionally cooperative? Evidence from a public goods experiment", *Economics Letters*, **71**(3), 397–404.

GOMEZ, B.T., HANSFORD, T.G., and KRAUSE, G.A. (2007), "The Republicans should pray for rain: Weather, turnout, and voting in US presidential elections", *Journal of Politics*, 69(3), 649–663.

GROSSER, J. and SEEBAUER, M. (2013), "The Curse of Uninformed Voting — An Experimental Study", unpublished paper, Florida State University.

KAMEI, K., PUTTERMAN, L. and TYRAN, J.-R. (2011), "State or Nature? Formal vs. Informal Sanctioning in the Voluntary Provision of Public Goods", Brown University Department of Economics (Working Paper 2011-3).

MILLER, N.R. (1996), "Information, Individual Errors, and Collective Performance: Empirical Evidence on the Condorcet Jury Theorem", *Group Decision and Negotiation,* **5**, 211–228.

PERSICO, N. (2004), "Committee Design with Endogenous Information*", Review of Economic Studies*, **71**, 165–191.

PUTTERMAN, L., TYRAN, J.-R. and KAMEI, K. (2011) "Public Goods and Voting on Formal Sanction Schemes", *Journal of Public Economics,* **95**, 1213–1222.

SEREVILLE, C. and MYERS, B. (1994), *Nøglen til Success I alle IQ-tester [The Key to Success in all IQ Tests (Danish)]* (Viborg: Nørhavn A/S).

THÖNI, C., TYRAN, J.-R., and WENGSTRÖM, E. (2012), "Microfoundations of social capital", *Journal of Public Economics*, **96**(7), 635–643.

9 Appendix

This appendix includes instructions on the various parts of the experiment as well as a robustness check for the OLS-regression on the probability to acquire information. Within this appendix, you will find:

- The instructions the participants were given
- The IQ-test tasks participants faced
- The survey participants had to answer at the end of the experiment
- The z-tree source code
- Screenshots of the experiment
- A Logit-regression on the probability to acquire information

9.1 Instructions

On the following pages you can find the instructions for the first 16 periods of the first part as we presented them to the participants in the experiment (in German).

Instruktionen

Herzlich Willkommen! Sie und die anderen ExperimentteilnehmerInnen werden an einer Entscheidungssituation teilnehmen. In dieser Situation können Sie Geld verdienen, das Ihnen am Ende des Experiments in bar ausgezahlt werden wird. Wie viel Sie verdienen werden, hängt davon ab, welche Entscheidungen Sie und die anderen ExperimentteilnehmerInnen fällen werden.

Diese Instruktionen beschreiben die Entscheidungssituation und sind für alle ExperimentteilnehmerInnen identisch. Es ist wichtig, dass Sie die Instruktionen sorgfältig durchlesen, damit Sie die Entscheidungssituation gut verstehen. Falls Ihnen beim Lesen etwas unklar erscheint oder falls Sie sonstige Fragen haben, so zeigen Sie das bitte per Handzeichen an. Wir werden Ihre Fragen dann einzeln beantworten.

Bitte stellen Sie Ihre Frage(n) auf keinen Fall laut. Es ist Ihnen nicht erlaubt, irgendwelche Informationen an andere Teilnehmer weiterzugeben.

Ebenso ist es während des gesamten Experiments nicht gestattet, mit anderen Teilnehmern zu sprechen. Wann immer Sie eine Frage haben, heben Sie bitte Ihre Hand; und wir werden zu Ihnen kommen und Ihre Frage beantworten. Die Einhaltung dieser Regeln ist für den wissenschaftlichen Wert des Experiments sehr wichtig.

Wenn alle die Instruktionen durchgelesen und keine Fragen mehr haben, werden wir noch ein kurzes Quiz mit Ihnen durchführen. Sie werden dann jeder für sich einige kurze Aufgaben bearbeiten. Wir werden herumgehen, Ihre Antworten kontrollieren und Verständnisprobleme lösen. Das Quiz dient ausschließlich dem Zweck, dass Sie die wichtigen Details der Entscheidungssituation gut verstehen und um zu erfahren, ob die Instruktionen verständlich sind.

Selbstverständlich bleibt Ihre Anonymität gegenüber anderen Teilnehmern während des gesamten Experiments gewahrt. Weder werden Sie die wahre Identität der anderen TeilnehmerInnen erfahren, noch werden die anderen Teilnehmer Ihre Identität herausfinden können.

Allgemeines

Das Experiment besteht aus drei Teilen. Jeder der ersten beiden Teile besteht aus mehreren Runden, in denen Entscheidungen getroffen und Informationen aufgenommen werden müssen. Durch Ihre Entscheidungen können Sie Geld verdienen. Am Ende des gesamten Experiments wird vom Computer zufällig je eine Runde aus dem ersten und dem zweiten Teil gezogen, wobei alle Runden gleich wahrscheinlich sind. Die Beträge, die Sie in den beiden am Schluss gezogenen Runden verdient haben, stellen Ihr Einkommen dar und werden am Ende des Experiments bar ausbezahlt.

Unten finden Sie die Instruktionen zum 1. Teil des Experiments. Ist der erste Teil abgeschlossen, bekommen Sie Instruktionen für den 2. Teil. Nach Abschluss des 2. Teils beantworten Sie in einem kurzen 3. Teil einige Fragen. Anschließend bekommen Sie Ihre Auszahlung und das Experiment endet.

Der genaue Ablauf des 1. Teils des Experiments, die verschiedenen Entscheidungen und die Auszahlungsmodalitäten werden nun genau erklärt.

Erster Teil

Sie werden zufällig in Gruppen zu je 7 Mitgliedern eingeteilt. Die Gruppeneinteilung bleibt während des gesamten Experiments gleich. Der 1. Teil besteht aus 3 Proberunden und 16 auszahlungsrelevanten Runden, wobei die Entscheidungssituation in allen auszahlungsrelevanten Runden im Wesentlichen dieselbe ist. Im Folgenden beschreiben wir zunächst die Entscheidungssituation für eine beliebige auszahlungsrelevante Runde. Anschließend beschreiben wir kurz die Proberunden.

1. Auszahlungsrelevante Runden

1.1 Zwei Alternativen zur Auswahl

In jeder Runde muss für Ihre gesamte Gruppe eine Entscheidung zwischen zwei Alternativen gefällt werden: Alternative **Kreis** und Alternative **Dreieck**. Zu Beginn jeder Runde wird eine von beiden Alternativen zufällig als die richtige Alternative bestimmt, wobei beide Alternativen dieselbe Chance haben, richtig zu sein. Sie können jedoch nicht beobachten, was die richtige Alternative ist. Wird am Ende der Runde die richtige Alternative gewählt, so verdienen Sie und die anderen Teilnehmer in Ihrer Gruppe je 20 Euro. Wird am Ende der Runde hingegen die falsche Alternative gewählt, so verdient niemand in Ihrer Gruppe etwas.

1.3 Abstimmung in der Gruppe: Wer soll zwischen den Alternativen entscheiden?

Zu Beginn jeder Runde gibt es in Ihrer Gruppe eine Abstimmung darüber, wer die Entscheidung zwischen den beiden Alternativen treffen soll: ein Außenstehender oder die Gruppe selbst. Sie und die anderen Gruppenmitglieder geben jeder für sich eine Stimme für die **Entscheidung durch den Außenstehenden** oder den **Gruppenentscheid** ab. Wenn die Mehrheit in Ihrer Gruppe dafür gestimmt hat, den Außenstehenden zwischen den Alternativen wählen zu lassen, wird die Entscheidung delegiert und der Außenstehende wählt eine der beiden Alternativen für die Gruppe aus. Wenn hingegen die Mehrheit in Ihrer Gruppe für den Gruppenentscheid gestimmt hat, dann wird es wieder eine Abstimmung in Ihrer Gruppe geben – diesmal darüber, welche der beiden Alternativen für die Gruppe gewählt werden soll. Jeder Teilnehmer in der Gruppe wird darüber informiert, ob die Mehrheit in der Gruppe für die Entscheidung durch den Außenstehenden oder den Gruppenentscheid gestimmt hat.

2.3 Die Entscheidung durch den Außenstehenden

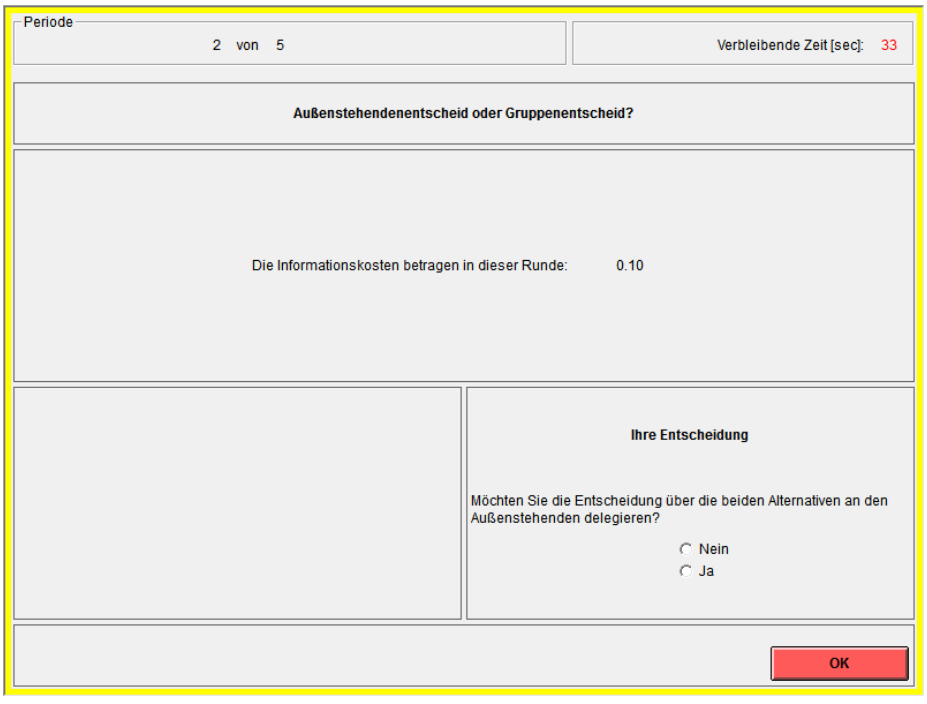
Wenn die Gruppe dafür gestimmt hat, den Außenstehenden zwischen den Alternativen wählen zu lassen: Der Außenstehende wird vom Computer verkörpert. Er besitzt Information darüber, welche der beiden Alternativen Kreis und Dreieck die richtige ist. Diese Information ist in **60 von 100 Fällen** korrekt und in 40 von 100 Fällen falsch. Der Außenstehende folgt immer seiner Information. Das bedeutet, dass er in 60 von 100 Fällen die richtige Alternative und in 40 von 100 Fällen die falsche Alternative wählt. Alle Gruppenmitglieder werden darüber informiert, welche Alternative gewählt wurde und ob sie die richtige ist. Wurde die richtige Alternative gewählt, erhalten Sie für die laufende Runde eine Auszahlung von 20 Euro. Ansonsten erhalten Sie keine Auszahlung für die laufende Runde.

1.4 Der Gruppenentscheid und die Möglichkeit, sich vorher zu informieren

Wenn die Gruppe dafür gestimmt hat, dass sie selbst mithilfe einer Abstimmung zwischen den Alternativen wählt: . Es wird die Alternative gewählt, die die Mehrheit der Stimmen in der Abstimmung erhält. Bei Stimmengleichheit wird eine der beiden Alternativen zufällig ausgewählt. An der Abstimmung zur Wahl der Alternative dürfen Sie aber nur dann teilnehmen, wenn Sie sich vorher Information darüber besorgen, welche Alternative die richtige ist. Diese Information ist genauso gut wie die des Außenstehenden, nämlich in 60 von 100 Fällen korrekt und in 40 von 100 Fällen falsch. Sie entscheiden sich individuell dafür, ob Sie die Information haben und an der Abstimmung teilnehmen wollen oder nicht. Wenn Sie teilnehmen wollen, müssen Sie einen bestimmten Betrag an Informationskosten bezahlen. Dieser Betrag ist je nach Runde entweder **0.10 oder 0.80** Euro und für alle Gruppenmitglieder identisch. Sie werden darüber informiert, wie hoch die Informationskosten in der betreffenden Runde sind.

Wenn sich keiner in der Gruppe informiert und die Abstimmung somit nicht stattfinden kann, wird eine der beiden Alternativen zufällig ausgewählt, wobei beide Alternativen gleich wahrscheinlich sind. Wenn sich einer oder mehr informieren, findet die Abstimmung statt. Wenn sich genau einer in der Gruppe informiert, dann ist die Chance, dass die richtige Alternative gewählt wird, genauso hoch wie bei der Entscheidung durch den Außenstehenden, nämlich 60%. Sobald sich mehr als zwei Gruppenmitglieder informieren, ist die durchschnittliche Trefferquote beim Gruppenentscheid höher als bei der Entscheidung durch den Außenstehenden. Am höchsten ist die Trefferquote, wenn sich alle sieben Gruppenmitglieder informieren. Sie liegt dann bei ca. 71%. Wenn sich hinreichend **viele** Gruppenmitglieder informieren, lohnt es sich also für alle Gruppenmitglieder, wenn die Wahl zwischen den beiden Alternativen durch Abstimmung in der Gruppe getroffen wird. Wenn hingegen hinreichend **wenige** Gruppenmitglieder sich informieren, dann lohnt sich die Entscheidung durch den Außenstehenden mehr. Sie werden in jeder Runde gebeten, eine Schätzung darüber abzugeben, wie viele andere in Ihrer Gruppe sich informieren. Für eine richtige Schätzung erhalten Sie 0.20 Euro als zusätzliche Auszahlung für die laufende Runde.

Hat sich die Gruppe für die richtige Alternative entschieden (die Chance, dass das passiert, hängt wie oben beschrieben davon ab, wie viele in der Gruppe sich informiert haben), bekommen Sie eine Auszahlung von 20, abzüglich der Informationskosten (wenn Sie sich informiert haben). Sie bekommen außerdem mitgeteilt, wie hoch die Anzahl der informierten Gruppenmitglieder tatsächlich ist. Die folgende Abbildung zeigt beispielhaft, wie die Abstimmung Ihrer Gruppe darüber, ob der Außenstehende oder die Gruppe selbst eine der beiden Alternativen auswählen soll, am Bildschirm dargestellt wird.



1. Proberunden

Es gibt vor den 16 auszahlungsrelevanten Runden drei Proberunden, in denen Sie sich mit dem Experiment vertraut machen. Diese Proberunden werden nicht ausgezahlt. In den Proberunden **entscheidet immer Ihre Gruppe** durch eine Abstimmung zwischen den Alternativen Kreis und Dreieck, nie der Außenstehende. Dies ist der einzige Unterschied zum Ablauf einer auszahlungsrelevanten Runde.

2. Ihre Auszahlung

Zum Schluss des Experiments wird aus dem 1. Teil zufällig eine auszahlungsrelevante Runde für die Auszahlung ausgewählt. Im Rest des Experiments können Sie noch weitere Einkommen erzielen. Dazu später mehr.

3. Zusammenfassung

- Sie stimmen ab, ob die Auswahl zwischen Alternative Kreis und Alternative Dreieck an den Außenstehenden delegiert werden soll oder die Gruppe selbst über die Alternative abstimmen soll. Die Mehrheit der Gruppe entscheidet.
- Wird die Auswahl der Alternative an den Außenstehenden delegiert, entscheidet sich der Außenstehende in Übereinstimmung mit seiner Information, also in 60 von 100 Fällen, für die richtige Alternative. In diesem Fall ist Ihr Verdienst in dieser Runde 20 Euro. Wird die falsche Alternative ausgewählt, ist Ihr Verdienst in dieser Runde 0.
- Hat die Gruppe dafür gestimmt, dass die Gruppe selbst über die auszuwählende Alternative abstimmt, können Sie und alle anderen Gruppenmitglieder Information kaufen, die in 60 von 100 Fällen richtig ist. Nur Informierte dürfen an der Abstimmung teilnehmen. Außerdem schätzen Sie ab, wie viele der anderen Gruppenmitglieder sich informieren.
    - Alle informierten Gruppenmitglieder stimmen für eine der beiden Alternativen.
    - Die Gruppe wählt die Alternative, die mehr Stimmen erhalten hat. Bei Gleichstand, oder wenn sich niemand informiert hat, wird eine der beiden Alternativen zufällig ausgewählt, wobei beide gleich wahrscheinlich sind. Hat die Gruppe die richtige Alternative gewählt, erhalten Sie 20, abzüglich etwaiger Informationskosten. Ihnen wird mitgeteilt, welche Alternative die Gruppe gewählt hat und welche die richtige ist. Für eine richtige Schätzung der Zahl der informierten Gruppenmitglieder erhalten Sie zusätzlich 0.20 Euro.
- Am Ende wird eine Runde aus dem 1. Teil zufällig zur Bezahlung ausgewählt.

Im Anschluss an die 16 Runden des 1. Teils beginnt der 2. Teil des Experiments, in dem Sie weitere Beträge verdienen können.

Before the experiment started, participants had to answer questions regarding the instructions they just read:

Fragen zum Verständnis

Markieren Sie bitte die Ihrer Meinung nach richtigen Antworten.

Welche zwei der folgenden Aussagen sind wahr?

- Die Wahrscheinlichkeit, dass der Außenstehende die richtige Alternative wählt, beträgt 60 Prozent.
- Der Außenstehende ist weder besser noch schlechter als ein informiertes Gruppenmitglied, wenn es darum geht, die richtige Alternative zu wählen.
- Der Außenstehende ist besser als ein informiertes Gruppenmitglied, wenn es darum geht, die richtige Alternative zu wählen.

Welche zwei der folgenden Aussagen sind wahr?

- Wenn sich genau einer in der Gruppe informiert, dann hat die Gruppe bereits eine größere Chance als der Außenstehende, die richtige Alternative zu wählen.
- Wenn sich mehr als zwei Leute in der Gruppe informieren, dann hat die Gruppe eine größere Chance als der Außenstehende, die richtige Alternative zu wählen.
- Die größte Chance, dass die richtige Alternative gewählt wird, hat die Gruppe, wenn sie selbst abstimmt und alle sieben Leute sich informieren.

Welche zwei der folgenden Aussagen sind wahr?

- Auch wenn man selbst nicht vorhat, Information zu kaufen, kann es sich trotzdem lohnen, für den Gruppenentscheid zu stimmen.
- Wenn man selbst zwar bereit wäre, Information zu kaufen, aber niemand sonst, dann lohnt es sich trotzdem, für den Gruppenentscheid zu stimmen.
- Wenn man selbst zwar bereit wäre, Information zu kaufen, aber niemand sonst, dann lohnt es sich nicht, für den Gruppenentscheid zu stimmen.

Welche der folgenden Aussagen ist wahr?

- Man kann auch dann an der Abstimmung teilnehmen, wenn man keine Information gekauft hat.
- Man darf nur an der Abstimmung teilnehmen, wenn man Information gekauft hat.
- Auch wenn man keine Information gekauft hat, hat man eine größere Chance als der Zufall, die richtige Alternative zu wählen.

Die folgenden drei Aussagen beziehen sich alle auf den ersten Teil des Experiments. Welche ist wahr?

- Es werden alle Runden ausgezahlt.
- Es wird eine Runde ausgezahlt.
- Es werden sieben Runden ausgezahlt.

Welche der folgenden Aussagen ist wahr?

- Die Gruppengröße liegt bei sieben Leuten.
- Die Gruppengröße liegt bei drei Leuten.
- Die Gruppengröße liegt bei zehn Leuten.

Here you can see the instructions for the next 16 periods of the first part:

Zweiter Teil

Sie sind Mitglied derselben Gruppe wie im ersten Teil des Experiments. Der zweite Teil besteht wie der erste Teil aus 16 Runden. Der **einzige Unterschied zum ersten Teil** besteht darin, dass im zweiten nicht Ihre Gruppe selbst, sondern der Computer bestimmt, ob es einen Gruppenentscheid (d.h. eine Abstimmung) oder eine Entscheidung durch den Außenstehenden zwischen Alternative Kreis und Alternative Dreieck gibt. Wieder gibt es vor den 16 auszahlungsrelevanten Runden drei Proberunden, die nicht ausgezahlt werden. In den Proberunden **entscheidet immer Ihre Gruppe** durch eine Abstimmung zwischen den Alternativen Kreis und Dreieck, nie der Außenstehende. Dies ist der einzige Unterschied zum Ablauf einer auszahlungsrelevanten Runde.

Zur Erinnerung erhalten Sie hier noch einmal einen Überblick über den Ablauf einer Runde:

Zusammenfassung:

- Ihnen wird mitgeteilt, ob in der laufenden Runde Ihre Gruppe selbst oder der Außenstehende zwischen Alternative Dreieck und Alternative Kreis auswählt. Für Ihre Gruppe gilt diese Entscheidung für diese Runde.
- Wird die Auswahl der Alternative an den Außenstehenden delegiert, entscheidet sich der Außenstehende in Übereinstimmung mit seiner Information, also in 60 von 100 Fällen, für die richtige Alternative. In diesem Fall ist Ihr Verdienst in dieser Runde 20. Wird die falsche Alternative ausgewählt, ist Ihr Verdienst in dieser Runde 0.
- Hat die Gruppe dafür gestimmt, dass die Gruppe selbst über die auszuwählende Alternative abstimmt, können Sie und alle anderen Gruppenmitglieder Information kaufen, die in 60 von 100 Fällen richtig ist. Nur Informierte dürfen an der Abstimmung teilnehmen. Außerdem schätzen Sie ab, wie viele der anderen Gruppenmitglieder sich informieren.
    - Alle informierten Gruppenmitglieder stimmen für eine der beiden Alternativen.
    - Die Gruppe wählt die Alternative, die mehr Stimmen erhalten hat. Bei Gleichstand, oder wenn sich niemand informiert hat, wird eine der beiden Alternativen zufällig ausgewählt, wobei beide gleich wahrscheinlich sind. Hat die Gruppe die richtige Alternative gewählt, erhalten Sie 20, abzüglich etwaiger Informationskosten. Ihnen wird mitgeteilt, welche Alternative die Gruppe gewählt hat und welche die richtige ist. Für eine richtige Schätzung der Zahl der informierten Gruppenmitglieder erhalten Sie zusätzlich 0.20 Euro.

Am Ende wird eine Runde aus dem zweiten Teil zufällig zur Bezahlung ausgewählt. Ihr Verdienst aus dieser ausgewählten Runde geht vollständig in Ihre Auszahlung aus dem gesamten Experiment ein.

Im Anschluss an die 16 Runden des zweiten Teils bekommen Sie Instruktionen für den dritten Teil, in dem Sie einige Fragen beantworten.

Here are the instructions for the second part (the IQ-test):

Dritter Teil

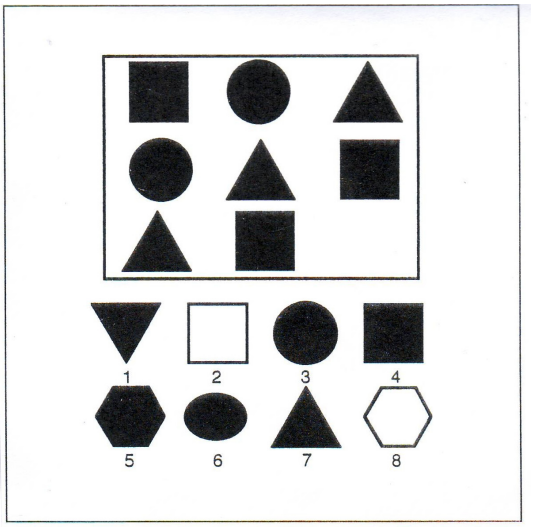
In diesem Teil lösen Sie 15 Aufgaben. Bei jeder Aufgabe werden Ihnen 3 Reihen mit Symbolen gezeigt. In der dritten Reihe fehlt das letzte Symbol. Sie müssen herausfinden, welches Symbol hier fehlt. Für richtige Antworten erhalten Sie 0.50 Euro, für falsche oder fehlende Antworten werden Ihnen 0.10 Euro abgezogen.

Bei jeder Aufgabe können Sie aus 8 möglichen Symbolen auswählen. Wenn Sie sich für ein Symbol entschieden haben, welches die dritte Reihe Ihrer Meinung nach vervollständigt, geben Sie die Nummer des betreffenden Symbols ein und klicken auf „OK“. Sie kommen dann zur nächsten Aufgabe und können nicht mehr zu dieser Aufgabe zurückkehren.

Sie haben für jede Aufgabe 40 Sekunden Zeit, um eine Antwort zu geben. Haben Sie nach 40 Sekunden keine Nummer eingegeben und auf „OK“ geklickt, wird die Aufgabe als falsch beantwortet gewertet. Achten Sie daher auf die Zeit, sie ist in der rechten oberen Ecke ersichtlich.

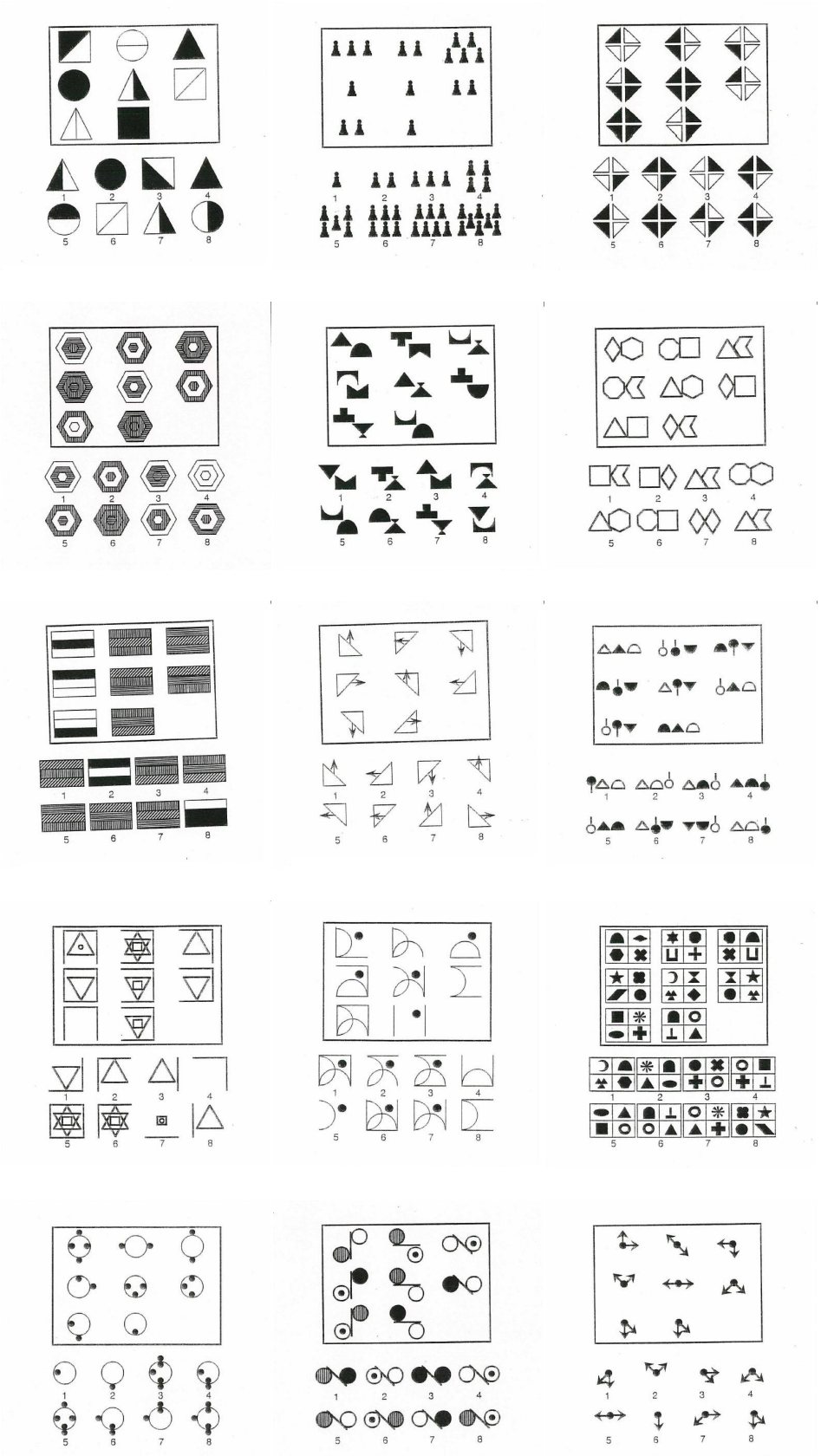
Beispiel-Aufgabe

In dieser Aufgabe ist Symbol 3 die richtige Antwort. In jeder Reihe befinden sich ein schwarzes Quadrat, ein schwarzer Kreis und ein schwarzes Dreieck. In der dritten Reihe befinden sich bereits ein schwarzes Dreieck und ein schwarzes Quadrat, daher ist Antwort 3 die richtige Antwort.



9.2 IQ-Test Tasks:

Participants had to give an answer to the following tasks:



9.3 Survey

The last part of the experiment was a survey participants had to fill in.

1. Ihr Einfluss auf den Ausgang der Abstimmungen:
    a. Erinnern Sie sich bitte (ungefähr), in wie vielen der insgesamt 30 Runden des Experiments es eine Abstimmung gab. Ihre Antwort: In _____ von insgesamt 30 Runden gab es eine Abstimmung.
    b. Was glauben Sie, in wie vielen Abstimmungen war Ihre Entscheidung zwischen Alternative Kreis, Alternative Dreieck und Enthaltung entscheidend für den Ausgang der Abstimmung, d.h. wie oft wäre das Ergebnis der Abstimmung anders ausgefallen, wenn Sie sich anders entschieden hätten? Ihre Antwort: In _____ Abstimmungen wäre das Ergebnis der Abstimmung anders ausgefallen, wenn ich mich anders entschieden hätte.
2. Wie sehr stimmen Sie folgender Aussage zu: In einer Demokratie hat man die Pflicht, sich zu den relevanten politischen Fragen zu informieren, bevor man zur Wahl geht. (Ich stimme völlig zu / eher zu / eher nicht zu / gar nicht zu.)
3. Wie sehr stimmen Sie folgender Aussage zu: In einer Demokratie hat man die Pflicht, zur Wahl zu gehen. (Ich stimme völlig zu / eher zu / eher nicht zu / gar nicht zu.)
4. Wie sehr stimmen Sie folgender Aussage zu: Experten und nicht Regierungen sollten darüber entscheiden, was für das Land das Beste ist. (Ich stimme völlig zu / eher zu / eher nicht zu / gar nicht zu.)
5. Wie sehr stimmen Sie folgender Aussage zu: Experten und nicht die Mehrheit der Wähler sollte darüber entscheiden, was für das Land das Beste ist. (Ich stimme völlig zu / eher zu / eher nicht zu / gar nicht zu.)
6. Wie sehr stimmen Sie folgender Aussage zu: Die Mehrheit der Wähler sollte in einem Referendum darüber entscheiden, was für das Land das Beste ist, anstatt dass die Regierung entscheidet. (Ich stimme völlig zu / eher zu / eher nicht zu / gar nicht zu.)
7. Einige Leute meinen, dass sie völlig freie Wahl bei der Gestaltung ihres Lebens haben; andere meinen, dass sie keine Wahl dabei haben, wie ihr Leben verläuft. Wie sehen Sie das für sich selbst, wie viel freie Wahl haben Sie bei der Gestaltung Ihres Lebens? Antworten Sie anhand dieser Skala. 1 bedeutet, Sie haben überhaupt keine freie Wahl, 10 bedeutet Sie haben völlig freie Wahl in der Gestaltung ihres Lebens. (Skala von 1 bis 10)
8. Wie sehr vertrauen Sie Menschen, denen Sie zum ersten Mal begegnen? (Völlig/ ziemlich/ kaum/ gar nicht)
9. Wie würden Sie Ihre Bereitschaft einschätzen, einem Menschen, dem Sie zum ersten Mal begegnet sind und der Ihnen einen Gefallen tut, auch einen Gefallen zu tun? Antworten Sie anhand dieser Skala. 1 bedeutet, dass Sie nicht dazu bereit sind, dem Fremden auch einen Gefallen zu tun, und 10 bedeutet, dass Sie vollkommen dazu bereit sind, dem Fremden auch einen Gefallen zu tun. (Skala von 1 bis 10)

9.4 Z-Tree Source Code

Below you can find the source code of the program z-tree for the Endo-Exo-Treatment:

```
Background
  globals
  subjects
  DelegationVoting
  summary
  contracts
  session
  logfile
  Payoffs
  globals.do { ... }
      ProbExpert=0.6;
      ProbInfo=0.6;
      Payment=20;

      //One alternative is randomly assigned the correct alternative
      CorrAlternative= if (random()<0.5,1,2);

      //Expert chooses correct alternative with a certain probability
      ExpertAlternative=if(random()<ProbExpert,CorrAlternative,if(CorrAlternative==1,2,1));

      //In case of a tie, one alternative is randomly chosen.
      TieBreaking=if(random()<0.5,1,2);

      ExoDelegation=if(random()<0.5,1,2);
      Cost=0;

      //Showup is added to total profit in the first period.
      Showup=3;

      SecondPart=20;
      TrialPeriods=3;
  subjects.do { ... }

      array selected[2];

      //To also have the correct alternative in the subjects table at the end of the experiment.
      CorrectAlternative=CorrAlternative;

      //Showup is only added to total profit in period 1.
      Profit=if(Period==1,Showup,0);


      PayoffSum=0;

      //Payoffs of each round are stored in the Payoffs-Table. We need this table so that we can randomly choose two periods at the end.
      if(Period>1){
      Payoffs.new{
      Period=:Period-1;
      Subject=:Subject;
      PayoffSum=OLDsubjects.find(same(Subject),PayoffSum);
      }
      }

      DV=0;

      //Delegation Decisions of the group are also stored each period in the DelegationVoting-Table, so that we can refer to it in the second part of the experiment (in the exogenous part).
      if(Period>1){
      DelegationVoting.new{
      Period=:Period-1;
      Subject=:Subject;
      DV=OLDsubjects.find(same(Subject),DV);
      }
      }
  Active screen
    Header
  Waitingscreen
    Text
      Bitte warten Sie, bis das Experiment weitergeht.
waiting16 =|= (-1)N
  subjects.do { ... }
      //Waiting Stage is only active at the end of the first part = the beginning of the second part.
      Participate=if(Period==SecondPart,1,0);
  Active screen
    Text
      Bitte warten Sie, bis das Experiment weitergeht.
  Waitingscreen
instructions_read =|= (-1)N
  subjects.do { ... }
      Participate=if(Period==SecondPart,1,0);
  Active screen
    Text
      Wenn Sie die Instruktionen durchgelesen und verstanden haben, klicken Sie bitte auf "OK".
      OK
  Waitingscreen
Endogenous_Delegation =|= (40)
  subjects.do { ... }
```

```
        //Subjects are in the endogenous part only in the first 16 periods.
        Participate = if(Period<SecondPart, if(Period>TrialPeriods, 1,0),0);
    subjects.do { ... }
        //Cost is normalized to a payoff of 1, so we have to multiply them by the payment.

        CostLevel=Cost*Payment;
        GroupMembers=count(same(Group));
        DelegationVoting=0;
        BoxRandomize=if(random()<0.5,1,2);
    Active screen
        OK
            OK
        Title
            {\rtf \b Außenstehendenentscheid oder Gruppenentscheid? \b0 }
        Info
            Die Informationskosten betragen in dieser Runde:: OUT( CostLevel )
        Belief
        Decision1
            {\rtf \b Ihre Entscheidung \b0 }

            Möchten Sie die Entscheidung über die beiden Alternativen an den Außenstehenden delegieren?
            : IN( DelegationVoting )
        Decision2
            {\rtf \b Ihre Entscheidung \b0 }

            Möchten Sie die Entscheidung über die beiden Alternativen an den Außenstehenden delegieren?
            : IN( DelegationVoting )
    Waitingscreen
Exogenous_Delegation -= (20)
    subjects.do { ... }
        Participate = if(Period>=SecondPart, 1,if(Period<=TrialPeriods,1,0));
    subjects.do { ... }
        CostLevel=Cost*Payment;
        GroupMembers=count(same(Group));

        BoxRandomize=if(random()<0.5,1,2);

        //This is the group matching for the delegation decisions in the exogenous part. This is for 3 groups
        ReferencePerson=if(Subject>14,1,if(Subject>7,15,8));
        //Activate the line below for just one group
        //ReferencePerson=1;
        //Activate the line below for 2 groups.
        //ReferencePerson=if(Subject>7,1,8);

        //if we are in the exogenous part, we load the delegation decision of the reference group in the first part.
        DV2=if(Period>NumPeriods/2,DelegationVoting.find(Subject==:ReferencePerson&Period==:Period-(NumPeriods-TrialPeriods)/2,DV),0);
        DV=if(Participate==1,DV2,DV);

        //In the trial periods the group always decides.
        DelegationVoting=if(Participate==1,if(Period<=TrialPeriods,1,DV),DelegationVoting);

        //Variable to control the screens the participants see.
        ShowDelegationScreen=if(Period>TrialPeriods,if(DelegationVoting==2,1,2),0);
    Active screen
        OK
            OK
        Title
        Info_Delegation
            {\rtf \b Der Computer hat bestimmt, dass die Entscheidung in dieser Runde an den Außenstehenden delegiert wird. \b0 }
        Info_NoDelegation
            {\rtf \b Der Computer hat bestimmt, dass die Entscheidung in dieser Runde nicht delegiert wird. Die Gruppe entscheidet also selbst über die beiden Alternativen. \b0 }
        Info_Trial
            {\rtf \b In dieser Proberunde entscheidet die Gruppe selbst über die beiden Alternativen. \b0 }
        Belief
        Decision1
    Waitingscreen
ExpertDecisionWaiting =|= (20)A
    subjects.do { ... }
        Participate=if(average(same(Group),DelegationVoting)>1.5,1,0);
    Active screen
        OK
        Title
            {\rtf \b Außenstehender entscheidet sich \b0}
        Info
            Die Mehrheit dieser Gruppe möchte die Entscheidung an den Außenstehenden delegieren.

            Der Außenstehende benötigt für seine Entscheidung etwas Zeit. Sie sehen die verbleibende Zeit bis zu einer Entscheidung in der rechten oberen Ecke.
        Belief

        Decision1

    Waitingscreen
ExpertDecision -= (30)
    subjects.do { ... }
        Participate=if(average(same(Group),DelegationVoting)>1.5,1,0);
```

```
        //If the expert decides, this result is stored to be used in the exogenous part:
        DV=if(Participate==1,2,DV);
    subjects.do { ... }
        ProfitExpert=if(Participate==1,if(ExpertAlternative==CorrAlternative,Payment,0),0);
    Active screen
        OK
            OK
        Title
            {\rtf \b Außenstehender hat entschieden \b0}
        Info
            
            Der Außenstehende hat sich für diese Alternative entschieden:: OUT( ExpertAlternative )
            Die richtige Alternative ist:: OUT( CorrAlternative )
            
            Ihre Auszahlung aus dieser Periode ist daher:: OUT( ProfitExpert )
        Belief
            
        Decision1
            
    Waitingscreen
GroupInfo -= (40)
    subjects.do { ... }
        Participate=if(average(same(Group),DelegationVoting)<1.5,1,0);

        //if the group decides, this result is stored for the exogenous part:
        DV=if(Participate==1,1,DV);
    subjects.do { ... }
        Belief=0;
        InfoBuy=0;
        BoxRandomize2=if(random()<0.5,1,2);
        IndividualVote=0;
        IndividualVote_New=if(average(same(Group),DelegationVoting)<1.5,0,-1);
    Active screen
        OK
            OK
        Title
            {\rtf \b Informationskauf \b0 }
        Info
            Diese Gruppe hat sich gegen eine Delegation an den Außenstehenden entschieden.
            
            Die Information kostet in dieser Runde:: OUT( CostLevel )
        Belief
        Belief
            {\rtf \b Ihre Erwartung \b0 }
            
            Wie viele der anderen Mitglieder Ihrer Gruppe werden sich informieren?: IN( Belief )
        Decision1
            {\rtf \b Ihre Entscheidung \b0 }
            
            Möchten Sie die Information kaufen?
            : IN( InfoBuy )
        Decision2
            {\rtf \b Ihre Entscheidung \b0 }
            
            Möchten Sie die Information kaufen?
            : IN( InfoBuy )
    Waitingscreen
IndiVote -= (40)
    subjects.do { ... }
        Participate=if(average(same(Group),DelegationVoting)<1.5,if(InfoBuy==1,1,0),0);
    subjects.do { ... }
        //The Information is generated and is equal the correct alternative with a probability that is stated in the globals table.
        InfoAlternative=if(random()<ProbInfo,CorrAlternative,if(CorrAlternative==1,2,1));


        BoxRandomize3=if(random()<0.5,1,2);
    Active screen
        OK
            OK
        Title_Info
            {\rtf \b Abstimmung \b0 }
        Title_NoInfo
            {\rtf \b Abstimmung \b0 }
        Info_Info
            Sie haben die Information gekauft.
            
            Diese Alternative ist in 60 von 100 Fällen richtig:: OUT( InfoAlternative )
        Info_NoInfo
            Sie haben die Information nicht gekauft.
        Belief
        Decision1
            {\rtf \b Ihre Entscheidung \b0 }
            
            Für welche der Alternativen stimmen Sie?
            : IN( IndividualVote )
```

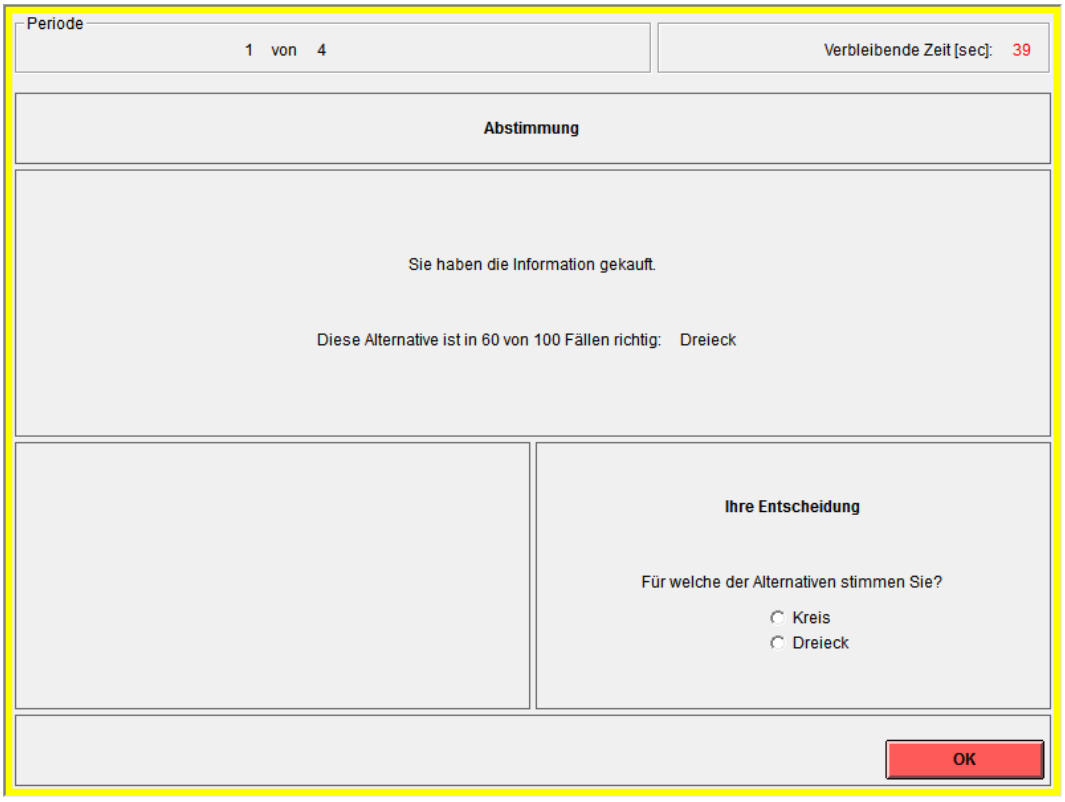
```
Decision2
{\rtf \b Ihre Entscheidung \b0 }

Für welche der Alternativen stimmen Sie?
: IN( IndividualVote )
Waitingscreen
GroupVote =|= (40)
subjects.do { ... }
Participate=if(average(same(Group),DelegationVoting)<1.5,1,0);
subjects.do { ... }
//same as IndividualVote, but in case of expert decision this variable is -1.
IndividualVote_New=if(average(same(Group),DelegationVoting)<1.5,IndividualVote,IndividualVote_New);

//Counting Votes for Alternative 1=Circle and 2=Triangle.
Votes1=count(same(Group)&IndividualVote==1);
Votes2=count(same(Group)&IndividualVote==2);
InformedVoters=count(same(Group)&InfoBuy==1)-InfoBuy;

//the alternative with the majority of votes is chosen as the group alternative. In case of a tie, one is randomly chosen.
GroupAlternative=if(Participate==1,if(Votes1>Votes2,1,if(Votes2>Votes1,2,TieBreaking)),0);

//Payoff out of group decision (without considering information costs or belief payment)
PayoffG=if(GroupAlternative==CorrAlternative,Payment,0);

//Cost for the subject in this round for buying information (clearly 0 if the subject did not buy information)
IndCostLevel=CostLevel*InfoBuy;

//If the subject guessed the number of informed voters correctly, it gets an additional payoff of 0.01 times the payment.
PayoffBelief=if(Participate==1,if(Belief==InformedVoters,0.01*Payment,0),0);

//Total Payoff of this round
PayoffSum=PayoffG+PayoffBelief-IndCostLevel+ProfitExpert;
Active screen
OK
OK
Title
{\rtf \b Ergebnis \b0 }
Info
Die Gruppe hat sich entschieden für:: OUT( GroupAlternative )
Die richtige Alternative ist:: OUT( CorrAlternative )
Ihre Schätzung der Anzahl informierter Wähler (ohne Sie):: OUT( Belief )
Tatsächlich haben sich so viele Gruppenmitglieder informiert (ohne Sie):: OUT( InformedVoters )
Sie haben die Information gekauft:: OUT( InfoBuy )
Die von der Gruppe gewählte Alternative bringt Ihnen eine Auszahlung von:: OUT( PayoffG )
Ihre Informationskosten für diese Periode betragen:: OUT( IndCostLevel )
Ihre Schätzung der Anzahl der informierten Gruppenmitglieder bringt Ihnen einen Prämie von:: OUT( PayoffBelief )
Ihre gesamte Auszahlung in dieser Runde ist:: OUT( PayoffSum )
Belief
Decision1
Waitingscreen
Auszahlung =|= (1)
subjects.do { ... }
//in this stage, total profits for the exogenous and endogenous part are calculated. This is only done in the last period.
Participate=if(Period==NumPeriods,1,0);

//The results of the delegationvote and the payoffs of this round are stored in the relevant tables:
if(Participate==1){
DelegationVoting.new{
Period=:Period;
Subject=:Subject;
DV=:DV;
}
}

if(Participate==1){
Payoffs.new{
Period=:Period;
Subject=:Subject;
PayoffSum=:PayoffSum;
}

//we randomly select one period out of the first and second part to be payoff-relevant:
selected[1]=roundup((NumPeriods-TrialPeriods)/2*random(),1)+TrialPeriods;
selected[2]=(roundup((NumPeriods-TrialPeriods)/2*random(),1)+(NumPeriods-TrialPeriods)/2+TrialPeriods);

//these are the payoffs of the 2 chosen periods:
Betrag1=Payoffs.find(Subject==:Subject&Period==:selected[1],PayoffSum);
Betrag2=Payoffs.find(Subject==:Subject&Period==:selected[2],PayoffSum);

//and here these two payoffs are added to the Profit-variable:
iterator(i,2).do{
:Profit=:Profit+Payoffs.find(Subject==::Subject&Period==::selected[i],PayoffSum);
}
}
Active screen
Waitingscreen
```

9.5 Screenshots of the Experiment

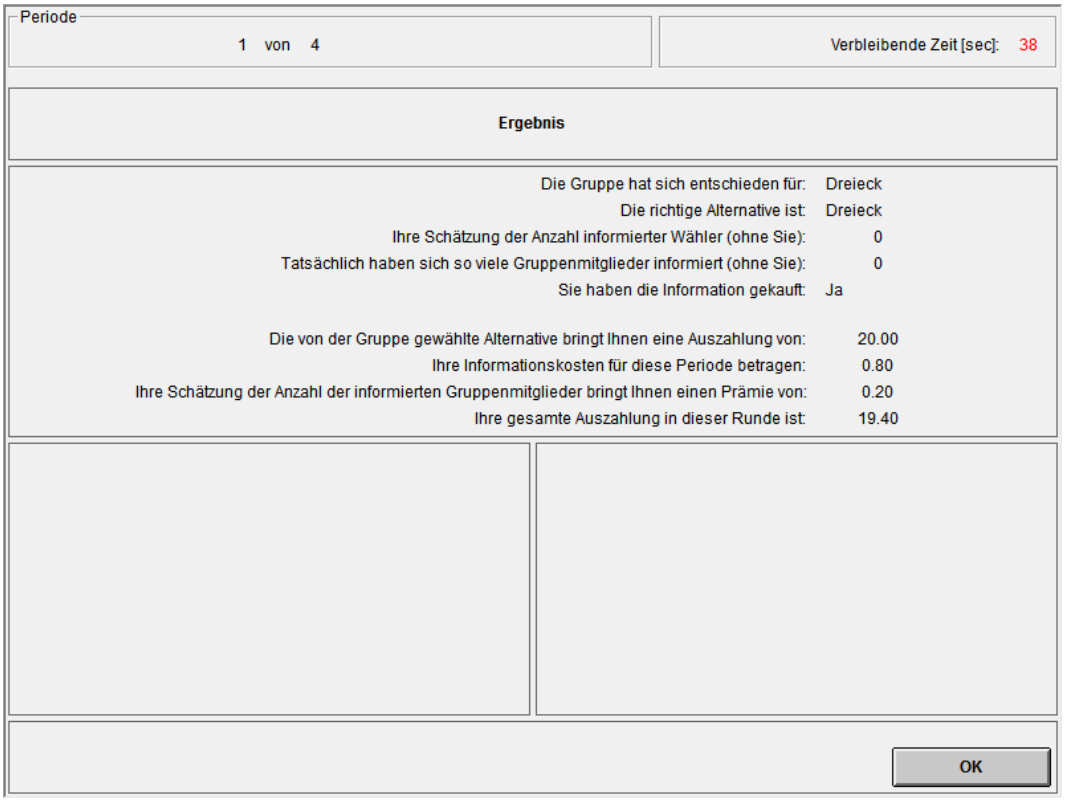
In the beginning of each round of the first part, which was the endogenous part, subjects were told the information cost and had to indicate if they want to delegate the decision or not.

If the majority of the group refused to delegate, subjects had to estimate the number of informed voters and had the possibility to buy information.

If they bought the information, they had to vote on one of the alternatives and were given the signal.

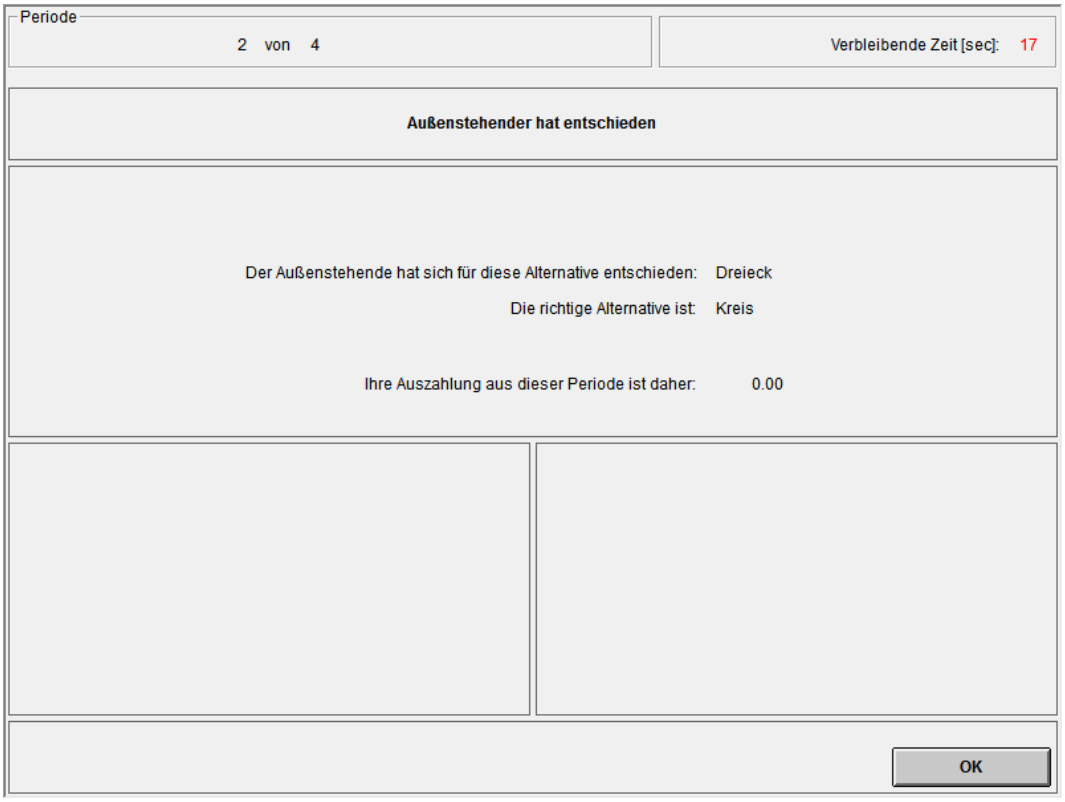


After this stage, they were told their payoffs.



If the group delegated the decision, the expert needed 20 seconds to decide for one alternative.

After this waiting time, subjects were again told their payoffs.



In the second part, the exogenous part, groups did not vote on if they want to delegate. This decision was taken from the decisions of another group in the first part. Subjects were just told if the group or the expert will decide on one of the two alternatives. Everything else was similar to the first part.

9.6 LOGIT-Regression

This is a Logit-regression similar to the OLS-regression in the results section. It is clustered on a group level and a random effects model.

	Dependent Variable: Info-Buy				
	(1)	(2)	(3)	(4)	(5)
	Endo-Exo	Endo-Exo	Exo-Endo	Exo-Endo	Both Treatments
High Cost	-2.916***	-1.612***	0.116	-1.591***	-1.493
	1.030	0.306	1.300	0.425	0.954
Endo-Part	0.214		-0.308		-0.105
	0.477		0.406		0.278
Endo-Exo-Treatment					0.140
					0.573
Endo-Part X Endo-Exo-Tr.					0.120
					0.221
High Cost X Endo-Part	-0.220		0.505		0.124
	0.543		0.411		0.284
IQ	0.261		0.434		0.291
	0.164		0.413		0.212
Belief	0.771***	0.729**	1.490	0.868	1.042**
	0.278	0.324	1.087	0.530	0.440
IQ X Belief	-0.033		-0.056		-0.035
	0.041		0.066		0.042
High Cost X Belief	0.293		-0.424		-0.034
	0.200		0.352		0.203
Cons	-0.499	0.421	-4.031	-0.126	-1.882
	1.051	1.201	4.678	1.857	1.652
Wald chi²	254.51	250.41	244.93	248.7	501.77
Prob > chi²	0.000***	0.000***	0.000***	0.000***	0.000***
N	2394	2394	2429	2429	4823
Subjects	84	84	84	84	168
Groups	12	12	12	12	24

Abstract (Deutsch)

Mithilfe eines Experiments testen wir, ob es einen statistisch signifikanten Unterschied bei der Beteiligung an einer Abstimmung gibt, abhängig davon, ob die Abstimmung endogen oder exogen eingeführt wird. Teilnehmer werden entweder mit einer exogenen Entscheidung bezüglich einer Gruppenabstimmung zu zwei Alternativen konfrontiert oder können in einer vorhergehenden Abstimmung entscheiden, ob es zu einer Gruppenabstimmung kommen soll oder ein Außenstehender eine der beiden Alternativen wählen soll. Die empirischen Daten des Experiments zeigen keine signifikanten Ergebnisse, die unsere Hypothese unterstützen. Weitere Experimente mit einem Überstimmungs-Mechanismus sind nötig, um die Hypothese genauer zu testen.

Curriculum Vitae

Persönliche Daten:

Familienname:	Krapfenbauer
Vorname:	Mario
Geburtsdatum:	27. Juni 1990
Anschrift:	Schlachthausgasse 41/1/16, 1030 Wien
Telefonnummer:	0664/1567789
E-Mail:	mario.krapfenbauer@gmail.com

Schulbildung und Studien:

seit 11/2012	Magisterstudium Volkswirtschaftslehre Universität Wien
09/2013-01/2014	Auslandssemester im Studium Volkswirtschaftslehre Universität Kopenhagen, Dänemark
seit 10/2011	Bachelorstudium Psychologie Universität Wien
10/2009-11/2012	Bakkalaureatsstudium Volkswirtschaftslehre Universität Wien verliehener Grad: Bakk. rer. soc. oec. mit Auszeichnung abgeschlossen Mitglied der Class of Excellence
09/2004-06/2009	Bundeshandelsakademie Horn mit Auszeichnung abgeschlossen

Praktika und Berufserfahrung:

seit 03/2015	EC Logistics Austria GmbH, Wien Controller Zentral und Flächencontroller Ostregion
02/2014-02/2015	TPS Technik Personal Service, Wien Leihangestellter im Controlling der EC Logistics Austria GmbH, Wien
03/2013-06/2013	Universität Wien, Wien Tutor für die Lehrveranstaltung „Money & Banking“
03/2012-06/2013	Universität Wien, Wien Studienassistent für die Lehrveranstaltung „Formale Modellbildung in der Ökonomie“
10/2010-07/2013	Rail Cargo Austria AG, Wien Mitarbeiter im Controlling

Besondere Kenntnisse:

Fremdsprachen:	Englisch in Wort und Schrift Französisch – Grundkenntnisse Dänisch – Grundkenntnisse
Software/EDV:	MS Office, SAP, STATA, LaTeX, VBA, Derive

Zusatzqualifikationen:

BEC (Business English Certificate)

ECDL (European Computer Driving License) Core

ECDL Advanced in Excel, Word und Powerpoint

SAP TERP_10 Zertifikat

Interessen:

Reisen, fremde Kulturen, Literatur, Sport (auch in Verbindung mit Vereinstätigkeit – Volleyballverein), Kochen und Backen, Wirtschaft, Psychologie