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Rigorózní práce

Children and cheating - A field experiment with individuals and teams

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

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Abstract

This thesis presents a field experiment drawing interferences on the lying behavioural patterns among grammar school students. Students were filling in non-related questionnaire for which they were rewarded. They rolled a dice and for a corresponding number on a dice they obtained a certain number of sweets. Students were not controlled therefore they could choose what number to report. The experiment included one treatment for individuals and two treatments for groups. The analysis shows that a certain fraction of students cheated but they often did not exploit the possibility of cheating maximally. Older students cheated more in comparison with younger students and younger students deceived more in groups. Last but not least, dishonesty in groups may also hinge on the family background, namely on the number of siblings. The model of self-concept maintenance explains the cheating patterns observed in our experiment best among all discussed models.

JEL Classification	C71, C93, D03, D71
Keywords	experimental economics, cheating, children, decision making, groups

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Abstrakt

Tato práce prezentuje experiment zkoumající schémata podvádění mezi studenty gymnázií. Studenti vyplnili nesouvisející dotazník, za který byli následně odměněni. Hodili kostkou a za příslušný počet na kostce dostali určitý počet sladkostí. Protože nebyli kontrolováni, mohli se rozhodnout, jaký počet nahlásí. Experiment obsahoval jednu úpravu pro jednotlivce a dvě pro skupiny. Analýza ukázala, že určitá část podváděla, ale často nevyužívala maximální možnost podvádění. Starší studenti podváděli více než mladší studenti a mladší studenti podváděli častěji ve skupinách. V neposlední řadě data ukázala vztah poctivosti ve skupinách na počtu sourozencu. Model udržování vlastního konceptu nejlépe vysvětluje zjištěné znaky podvádění z experimentu ze všech diskutovaných modelu.

Klasifikace JEL	C71, C93, D03, D71
Klíčová slova	experimentální ekonomie, podvádění, děti, rozhodování, skupiny

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Contents

List of Tables

List of Figures

Chapter 1

Introduction

There are many real life situations when lying and cheating lead to higher benefits. People illegally download music from internet, wardrobe[1], evade taxes or cheat in exams. Evidence suggests that typical organization looses an estimated 5% of its annual revenues to occupational fraud, which is $3.5 trillion if translated into global total fraud losses of Certified Fraud Examiners (2012). Dishonesty and cheating became part of our lives, often without being considered as negative. It was found that lying composes 20% to 31% of the whole social interaction (DePaulo *et al.* 1996). However, dishonesty is not seen just on the individual level. Some firms falsify their accounting or manipulate with audits. Big scandals of corruption and frauds are observed in both financial and public sector during the history. Furthermore, corruption is not only a local problem but countries are struggling with this phenomenon worldwide. This has effects on performance of economies and hinders trust in society. Companies such as Enron or Worldcom are examples of how problems of dishonesty and erosion in ethics may lead to massive financial losses due to breaking rules. It was estimated that Enron and WorldCom fraud cost U.S. economy approximately $37 - $42 billion in the first year alone (Graham *et al.* 2006).

The following paragraph helps us to shed light on how economists (since Adam Smith till Gary Becker) understood the process of decision making. Standard economic models, in which perfectly rational homo economicus is perceived as a typical agent participating in all transactions, predict results based on utility maximization. Utility maximization is based on gaining the highest monetary payoff under given restrictions. According to these models economic agents

[1]The purchase, use, and then return of the used clothing Mazar *et al.* (2008); this practice is also used for electronics, tools and others

cheat and break rules every time when gains from cheating exceed possible losses (Becker 1968). Agents take into account three aspects: the expected benefit from this action, the possibility of being caught and the magnitude of punishment if being caught. Therefore honesty is considered to be an outcome of the cost-benefit analysis done by individuals. People are honest up to the level when dishonesty becomes profitable. Nevertheless, in the real life not all people cheat and lie in situations where they can improve their well-being. What are the factors driving them not to cheat? Is it about the size of the incentive? Is it a question of morals, education? Or do they avoid being seen by others as liars and untrustworthy persons? Psychology has been a science which analyzes cheating and dishonesty for the last few decades (Wilson *et al.* 2003; Polak & Harris 1999) but in the last fifteen years economics, mainly experimental economics (Gneezy 2005; Sutter 2009), started to explore this field as well and looked at cheating from different angles than psychology.

Many types of decisions and activities vulnerable to cheating are made in groups. The decision making in firms is based on the group decision making of management, households usually do not make their decisions as single units and military or government procurement go through the process controlled by a group of people. However, other cases of dishonesty need also at least two participating parties. A student cannot copy the exam without the help of another student. The current example of fraudulent actions with interest rate LIBOR shows that there can be multiple party collusion for the sake of obtaining higher benefits.
There is a rich emerging literature on the group decision making which addresses the issue if groups decide differently than individuals. Charness & Sutter (2012) depict a wide survey of economical experiments in their article showing that individuals and groups possess other decision features. They show that groups are more cognitively sophisticated and converge quicker to the game theoretical equilibrium than individuals. Moreover, groups can overcome or minimize cognitive biases and limitations. More importantly, the evidence suggests that groups tend to be more self-interest oriented in the most of settings. On the other hand, there are also counterexamples and this research question needs further investigations. However, groups seem to be more interested in the common welfare within the group whereas individuals are more often concerned about the social welfare of the society as a whole.

The objective of this thesis is to reveal a level of deception by children and adolescents. We present an experiment with more than 500 students of the age 11 – 16 where they filled in non-related questionnaires for which they were rewarded. They were informed to roll a dice which determined their payoff, 1 to 5 sweets for corresponding number on a dice and nothing if they threw 6. Since experimenters were not able to control students when rolling a dice, they themselves decided what number to report. The dice number distribution in a large sample of observations shows the hidden patterns of cheating behaviour among students. Moreover, it reveals differences among various subgroups of children: how lying develops with age, how it differs between genders or if it is influenced by other family characteristics. The experiment was divided into three distinct treatments where one was constructed for individuals and two for groups. The reason behind was to examine disparities in individual and group decision making. Economic literature (Bucciol & Piovesan 2011) researching cheating and honesty of children focused on the lying patterns by individuals whereas we extended experiment for teams. Cheating experiments using coin or dice as an instrument can be found in the economic literature (Fischbacher & Heusi 2008), but this thesis contributes to the topic with a different approach how to examine children's individual and group decision making. Moreover, we are able to explore cheating patterns in a broader, not only in a binary framework.

Our findings can be summarized as follows: Firstly, a certain fraction of students cheat but a substantial part do not exploit the whole possibility of cheating. In other words, they report other numbers than rolled but not the highest reward number. Secondly, older students cheat more often in comparison with younger students when making individual decisions. Thirdly, the finding suggests that younger students deceive more often in groups than individuals. Then, there could be possible influence of family background on cheating. There is a pattern that groups with on average more siblings cheat less than groups with on average fewer siblings. Lastly, younger students did realize the possibility of cheating to smaller extent than older students. Other factors appeared to be insignificant.

The thesis is structured as follows. In chapter 2 is summarized existing literature with main emphasis on theoretical concepts dealing with cheating, experimental literature and literature focusing on children. Chapter 3 sketches the

experimental design. In chapter 4 we describe hypotheses. Chapter 5 presents the methodology and main features of the data processing. Main results are discussed in chapter 6. The overall comparison of results with aforementioned theoretical concepts is included in chapter 7. Chapter 8 concludes.

Chapter 2

Literature review

2.1 Theoretical concepts

For a long time the question of dishonesty and crime had been left unnoticed by economists. Theories predominantly assumed perfectly rational agents who make decisions in order to maximize their utility. Gary Becker was the first author who came up with an idea to employ standard economic theories in other fields. He applied the same logic of utility maximization in decision making to unconventional fields including family or crime. In the influential article (Becker 1968) he presented motivations and factors that affect committing a crime. The same underpinning does not hold only for felonies and illegal acts but also for lie and dishonesty.

The concepts in this paragraph were developed primarily not to explain motivations and reasons for dishonesty. However, they have important implications for decision making including dishonesty and we compare these implications with evidence in chapter 7. The economic theory developed by Becker is not able to explain convincingly some real life phenomena and does not capture the whole range of motivations. Therefore other authors altered original assumptions or formulated new concepts. These concepts mainly incorporate psychological foundations and focus on social preferences, not only on economical reasoning. Fehr, Schmidt, & Rockenbach (1999) pointed out in their paper that self-interest models are refuted in some situations. They proposed a model where a fraction of population cares not only about their self-interest but also about equitable wealth distribution. It has implications for cheating and dishonesty where this behaviour is not a question of pure cost-benefit analysis.

People take into account the distribution and differences in the outcome. The model predicts that people are not dishonest every time it is profitable for them. Bolton & Ockenfels (2000) build their model on a similar idea. They assume a certain threshold where a narrow self-interest is overweighed by a concern of relative standings. Main interest about a pecuniary payoff is not opposed but people take into consideration the relative situation of others. Lastly, the decision making, including honesty and dishonesty, may be driven by reciprocity and social welfare. People sacrifice their own wealth to increase wealth of other subjects, especially the poor ones. Sometimes they devote their wealth and income to foster and preserve fair outcome or punish unfair behaviour. As a consequence people would refrain from cheating in contact with poorer people and in a case of maintaining of fair outcome.

This was an introduction to the leading concepts in behavioural economics which describe human behaviour and try to solve puzzles and anomalies as donations, altruistic actions or revenge and anger. Mazar *et al.* (2008) present the theory of the self-concept maintenance which is focused primarily on dishonesty. It provides reasons why people lie and cheat just to the extent to keep their own integrity. This theory serves us as a main theoretical background. People want to think of themselves as nice and honest persons. On the other hand they can gain financially by cheating. The authors suggest that people balance trade-off between these external and internal forces by finding an equilibrium where they still get some financial profit but keep their self-concept. To keep a self-concept or integrity means that people do not consider a given extent of cheating to be bad and immoral. The theory can be decomposed into two important parts: categorization and attention to standards. Categorization is finding rationalizations for certain types of actions and magnitudes of dishonesty without perceiving them negatively. To illustrate categorization on a real-life example, we use the example mentioned by the authors. Stealing a pen worth 1 euro is easier than stealing 1 euro from friend's wallet because the first possibility offers more explanations compatible with friendship (I gave him a pen the last time or that is what friends do). Attention to standards refers to the fact how often people heed to their own moral standards. The probability of reflecting an action as dishonest increases with the frequency of updating own moral standards.

2.2 Cheating experiments

In this section we discuss main empirical findings in the field of experimental economics which analyse cheating. In the previous section we outlined the theoretical foundations exploring mechanisms influencing dishonesty. The theories set general features of how decision processing ideally works. However, it is impossible to capture all anomalies and behavioural features of the society as a whole. Therefore there is always a trade-off between generality and tractability (simplicity) of a model. Theory is crucial in identifying reasons and motivations, nevertheless it needs to be confronted with evidence to assess how its predictions match with reality. It is a big contribution of experimental economics that makes it possible to test empirically theoretical concepts and predictions. In the last two decades experimental economics moved from periphery of economics into the mainstream. Now it is recognized by policy makers who, thanks to the usage of experiments, implement advices about effects of certain institutions and policy proposals. Experiments typically capture behaviour of people in situations where the most general patterns (altruism, greed or selfishness) are observed but which have a strong explanatory power for real life phenomena (auctions, donations etc). Huge literature about cheating cannot be embraced in detail in this thesis, therefore we concentrate on the literature related to our research.

The researchers choose different ways how to approach cheating and how to quantify its prevalence in the society. Fischbacher & Heusi (2008) came with a very simple but effective design revealing the distribution of lying behaviour among the population. Participants were obliged to throw a dice in order to determine their payoff. They threw anonymously and received reward according to the number reported regardless what they really rolled. Advantage of this setting is that participants uncover their level of cheating without knowing the real purpose of the experiment. We adopt similar approach in our thesis. The crucial point is a minimal, ideally zero, influence on individuals' decision making. In the case of zero influence and unawareness of real purpose of the experiment participants make decisions similar to the real interactions and external validity is maximized. Moreover, the design allows altering of experimental conditions (stakes, consequences, anonymity). They found that 39% of people were honest and maximally 22% of lied completely (Fischbacher & Heusi 2008). The results suggest that a specific fraction of people lied com-

pletely, some incompletely[1] and a certain fraction was honest. Interestingly, a general pattern of some share of liars, semi-liars and honest persons did not changed with altering of external conditions although fractions moved with a change of stake. The authors explain monotonously increasing lying pattern with lie aversion. People have disutility from lying but the level of disutility is heterogeneous among people. It implies that for a given stake only a fraction of people is willing to cheat whereas the rest have higher utility by remaining honest. However, lie aversion fails to explain incomplete cheating. Authors proposed alternative explanation for this behaviour using the theory of self-concept which includes maintaining of personal integrity, honesty and non-greediness. When participants do not want to be considered greedy but rather honest then it motivates them not to say the number with the highest payoff. Number 4 does not have to be assessed as a lie and therefore it could be the reason why some share of participants lied incompletely.

Another piece of literature written by Sutter (2009) incorporates informational asymmetries as another strong incentive for deception. The author presents a cheap-talk experiment where the payoff (different for each player) is paid according to the choice of the receiver. Nonetheless, the sender can send a message influencing the decision of the receiver. The payoffs are constructed in such a manner that motivates senders to deceive the receivers. The rate of deception is rising with payoff disparity. Senders send not only "wrong" messages hoping the receiver will follow their advice but also sophisticated lies. Sophisticated-lie-tellers send a "true" message hoping receiver will not follow advices. Including level-k thinking represented here by sophisticated lies rises deception rate by 20% - 30% points. A significant share of people was able to construct a deceptive strategy to mislead the counterpart. However, the level of deceptive strategy application was dependent on the nominal payoff and its inequality.
Gneezy (2005) uses a very similar approach but brings a deeper insight into motivations of lying. His definition of a lie involves: "A successful or unsuccessful deliberate attempt, without forewarning, to create in another a belief that the communicator considers to be untrue in order to increase the payoff of the communicator at the expense of the other side." On the basis of the results from the cheap-talk experiment he proposes preferences describing deception behaviour. People evaluate benefits of lying with a benchmark behaviour repre-

[1]Incomplete lying means that individuals lie but do not maximize their payoff

sented by "truth telling" outcome. According to the author, people are selfish in terms of maximizing their wealth but sensitive in terms of costs imposed on the other person by lying. Hence, lying hinges on both relative and nominal wealth standing. In the real life interactions people are more likely to lie the wealthier counterparts are because costs caused by lying are less harmful to them. It is in accord with the results of Sutter (2009).

Not only economical reasons can account for cheating. As we mentioned earlier, also sensitivity or lie aversion may play a role. However, Houser *et al.* (2011) referred to a psychological factor - fairness. They proved a higher likelihood of cheating when treated unfairly. Participants took part in a dictator game and then flipped a coin in private. When they felt unjust in the dictator game, they cheated about 15 percent points more in the second unrelated game. They lied about the outcome what they tossed when they received nothing or a very small amount in the dictator game but also when they claimed to have been treated unfairly.
In the previous section we introduced the theory of self-concept maintenance by Mazar *et al.* (2008). They tested the theory empirically, with various alterations examining what crashes personal integrity and influences level of cheating. The general setup of all experiments contained a multiple-question task, in which participants were rewarded according to the number of correctly solved questions, and the experimenters changed only control conditions. With changing the control conditions they were able to determine the power and magnitude of individual parts of their theory, namely attention to moral standards, categorization malleability and opportunity for cheating. Writing the 10 commandments before the test had started suppressed level of cheating almost to zero rate. It means that activating own moral standards make a variation in cheating and could be an important factor in the general decision making. Similar results were observed when participants were forced to sign a honour code forbidding cheating, however, it had a decreasing intensity when the stakes increased. In accord with the predictions, payoff switch from money to tokens declined attention to standards (categorization malleability) which led to a higher level of cheating. To state it simply, stealing a bagel in a cafeteria does not have to be considered as immoral while stealing 3 euro may be. Lastly, a higher possibility of being caught retrenched cheating. It confirms the thesis that deceptive and cheating behaviour is affected by how big the opportunity for such behaviour is. The authors bring convincing evidence that factors not related to pecuniary

components shift the level of dishonest behaviour. Furthermore, even without any control, when no punishment impends, the personal magnitude of cheating is relatively low and individuals adjust the extent of cheating by external factors.

Shariff & Norenzayan (2007) continued in a similar design. They investigated whether religion increases prosocial behaviour. The effect of the God reminders of generosity was according to authors at least as large as reminders of moral institutions. People felt the presence of the supernatural watchers and hence were stimulated to contribute more than with neutral or no reminder. However, Randolph-Seng & Nielsen (2008) criticise their approach from several perspectives. For the purpose of our thesis the criticism of methodological ambiguities is interesting. The hypothesis of felt presence of the God is not empirically supported and the authors propose hypothesis based on their own research. Priming specific representation leads to activation of certain behaviour and standards. Then the mechanism would be very similar to that proposed by Mazar *et al.* (2008). The experiments mentioned in the last two paragraphs show that honesty and cheating can be influenced with the subtle variation of settings and can differ by activating self-concept. Although our goal in the experiment is to keep external conditions constant, we have to be aware what are the factors that can influence the level of cheating.

The last paper addresses a seemingly unrelated research topic of dishonesty in self-report of copies made (Goldstone & Chin 1993). Nevertheless, the relevance of this topic for our research is eminent. In our literature survey it is the only field experiment executed in a completely natural setting. Results indicate systematic underreporting of copies made by employees at University of Michigan. Interesting fact is that employees underestimate the number of copies just partially and do not earn the whole gain even in the absence of external control. It brings us back to the Fischbacher & Heusi (2008) dice experiment where some people cheated just incompletely. The researchers in this experiment suggest that there are strong self-imposed constraints on the level of dishonesty. Possible explanation for this phenomenon could be the maintenance of self-concept.

In this section we presented an overview of current literature dealing with collecting evidence on cheating. The first goal was to provide researches showing manifold motivations for dishonesty. Secondly, results from various studies

show robust patterns of incomplete dishonesty or complete honesty which is inconsistent with standard models. The most important part of literature for our research is the evidence studying level of cheating under standard conditions. Although altering external conditions like activating own moral standards is not a primary target of this thesis, it helps us to understand the bigger picture of the decision making.

2.3 Children and cheating

Study of behaviour of children had been a subject of psychology for a long time. Economics considered it as pointless because children mostly do not participate in markets and economic transactions. Moreover, it was believed that decision making works more or less the same for all people. The view has been changing because of extensive psychological and also economic literature emphasizing that behavioural features including moral standards develop in the early childhood and persist in the adulthood (Talwar & Lee 1999; Polak & Harris 1999). Furthermore, children often violate the basic assumptions of microeconomic rational agent. Harbaugh *et al.* (2001) demonstrated violation of generalized axiom of revealed preferences (GARP) by children which decreases no sooner than at the age of eight. In this section we present an economic experiment with children which goes in line of our research and then we mention psychological researches confirming differences in behaviour of children and adults.

Bucciol & Piovesan (2011) study the relationship between honesty, age and self-control what partially contributed to the specification of our research questions. In our prominent attention is the development of honesty with age. Children of age ranging from 5 to 15 participated in an experiment by tossing a coin in private and then recording which side of the coin they tossed. Due to anonymity at the time of reporting, children could speculate about the side they actually reported. Although the experimenters were unable do distinguish dishonesty at the individual level, they analysed proportions of frequencies of the coin sides of the aggregated data. Children reported winning-side at rates statistically above 50% but below 100%. Cheating was statistically equal across children's characteristics at different ages. It contradicts with the hypothesis of age development of self-control skills. When experimenters instructed children not to cheat, the over-reporting decreased significantly, especially within girls. Furthermore, the effect of the instruction not to cheat tended to remain

constant in boys, in girls it decreased with age. The research reveals that even very young children understand deceptive strategies. On the other side, reporting of the losing side by some children suggests that there may be an internal reward for being honest. This pattern is in accordance with experiments ran with adults.

Two psychological studies measure dishonesty in early childhood (Polak & Harris 1999; Talwar & Lee 1999). The researchers told children in the age of 3 - 7 not to touch a toy or not to look in a box during the time they left the room. The goal was not only to look at what share of pre-school children looked at the toy but mainly to analyse what is the share of children who lied and then feigned ignorance. They found that substantial part of children gave misleading denials of a minor misdemeanor, however they were unskilled in convincingly feign the ignorance. The results suggest a deception rate increase with age where 50% of 3-years old children lied about touching the toy whereas by 5-years old rate grew to 87% (Talwar & Lee 1999).

The thesis of development of moral standards and other-regarding preferences in the early childhood is in contradiction with the results of Talwar & Lee (1999). However, the pattern of such development may have deeper roots. Fehr *et al.* (2008) argue that according to ethnographic evidence there is a strong role of egalitarian instincts in human history. Egalitarian concerns could be favourable features of behaviour from the evolutionary point of view and there may had been cultural or even genetic transmission. The authors assume that human egalitarianism and parochialism should develop strongly between the ages of three and eight. Firstly, children are selfish and then the preference of removing inequality occurs. The predictions were tested empirically and confirmed the predictions about development of inequality aversion in early childhood. The evolutionary aspects have strong implications for dishonesty. The predictions suggest that dishonest and cheating behaviour prevails by the youngest children where they mainly focus on their own benefits whereas older children concern about preferences of others. These predictions are not supported by evidence from the literature dealing with dishonesty but the development of dishonesty with age has been studied just by a few authors and not as their prime research question. Hence, we try to cope with the question of differences between age groups and the results are compared to the evolutionary predictions in our general discussion of results.

2.4 Individual vs. group decision making

Groups are mostly in the theoretical economic literature considered as a single unit. Economists do not distinguish between behaviour of individuals and groups, they assume same patterns. However, differences in the decision process could be neglected by these types of assumptions. From the economical point of view it could be important to study the group decision making because many important decisions like public policy or business strategy hinge on groups. Moreover, an individual interaction is a prerequisite for well functioning social relationships (Alencar *et al.* 2008). We constructed three different treatments to uncover differences in outcomes between individuals and groups in our experiment. Therefore we sketch here a short survey of literature focusing on the group decision making to show the most important issues and findings in this area.

Charness & Sutter (2012) summarize the findings from various authors about what economists have learned about differences between the group and individual decision-making. They focus on three main dimensions of differences. In the first dimension they look at experiments where each player is only concerned with making best selfish decisions. This dimension includes investment and portfolio decisions or tournaments. In the experimental design it is for instance represented by well-known beauty-contest game. The results show the quicker convergence of groups to the predictions of standard models and lower cognitive limitations and biases. The authors conclude it with the statement that groups are more rational decision makers in the sense that economists have defined. In the second dimension they convey that groups can help with the self-control problem and improve productivity. However, it is difficult to study it in experimental labs, therefore field examples were employed. This thesis is supported by microfinance, where regular meetings of group members of borrowers help to repay debts. The third and most relevant dimension for our research stresses, that groups may decrease society welfare because of stronger self-interested preferences. One piece of evidence is from the prisoner's dilemma experiments. Individuals, unlike standard theoretical predictions, often cooperate and achieve higher payoff. The rate of cooperation shrinks substantially when the prisoner's dilemma is played by groups or even when individuals decides on behalf of the group.
The authors suggest three possible sources of the differences between individ-

uals and groups: 1) multiple brains are better at seeking answers; 2) multiple brains are better at anticipating the actions of other parties and thus better at coordinating behaviour with what other parties are likely to do; and 3) groups may be more likely than individuals to emphasize monetary payoffs over alternative concerns, such as fairness or reciprocity towards another player.
Although this field of research is still emerging, the results suggest the hypothesis that groups behave more self-interested than individuals. This possible source of differences is of high interest for our research. We adopt this hypothesis and furthermore we explore additional possible differences among different structures of groups.

To get the complex picture about the group decision making we look into the psychological research. There was studied experimentally how individuals behave in groups and how they build strategies for the sake of influencing a collective decision. Nevertheless, it was typically studied on non-competitive tasks. Psychologists were interested more in the process of learning. On the other hand economics is more concerned about outcomes and if these outcomes are in compliance with the game theoretical predictions. Therefore economists have begun to test how groups' decisions differ from individuals' decisions.

Bosman *et al.* (2006) sum up factors influencing the group decision making in their study. They mention 8 factors: the decision problem (what type of game they play); the decision structure (do individuals decide privately within a group setting or do they sit together and make a joint decision); the nature of the other players (individuals or groups); the size of the group; the communication medium (computer or face-to-face); types of group members; allocation of types of individuals over groups; the decision rule used by the group (majority rule or unanimity). Our emphases lay especially on the nature of other players and types of group members. It means on the factors which are often overlooked from economists.

We mentioned the receiver-sender experiment by Sutter (2009) in the section 2.2. The sender could pass a message to the receiver in this setting which says what possibility to choose to get the higher payoff. According to the decision of the receiver both players were rewarded. However, only the sender knew the distribution of payoffs from the beginning. Therefore, the sender had motivations to deceive the receiver in order to maximize her payoff. Receivers and

senders were in some treatments represented by teams. It allowed to study the decision process in groups and check the robustness of the individual results. Firstly, teams were more sceptical than individuals about the rate of following of sent message by receivers. According to the results receivers indeed followed messages significantly less often than individuals. Both results showed lower truthfulness and credibility of teams than of individuals. The second important finding was that there was a non-negligible percentage of sophisticated liars among teams.[2] Video tapes with the whole experiment and the whole decision process were studied thereafter. It was found that right messages were sent for the sake of confusion of receivers. When the results were adjusted for the sophisticated lies then individuals and teams did not differ in the deception rate.

A change in the decision process can be expected also within groups. A small group of 3 people can have completely different decision process than a large group of 20 people. Alencar *et al.* (2008) investigated a cooperation of children in the school environment. They were concerned about the impact of the group size. Children played a public goods game where they could contribute to a common pot or free-ride. Although they played always individually and just a number of children contributing to the common pot varied, there can be explored deceptive patterns. The group size was the only significant factor influencing the level of contribution. Children cooperated significantly more in small groups than in large groups. It suggests that there is a weak controlling mechanism in large groups therefore it is easier to free-ride without any notice or punishment. Even though we do not deal with the group size in our experimental setting per se, these findings should be kept in mind. To control for the variation in the group size we have groups of 3 individuals in our experiment where cooperation should run relatively smoothly.

Cooper & Kagel (2005) compare groups and individuals in terms of the speed of learning and adjustment. They found faster speed of adjustment by teams. When a task got more difficult, the gap of speed of learning between individuals and teams widened. It says that teams play more strategically and generate positive synergies. However, this type of synergies was revealed only in strategic tasks like puzzles or mazes. When a task is based on a mechanical

[2]the explanation can be found in the subsection 2.2 where notion Sophisticated-lie-teller is explained.

solution the advantage of teams disappears. It is supported with the evidence from psychological and economic experiments. Kocher & Sutter (2005) also found faster learning process of teams in the beauty-contest game. Even there was no difference in the first round, teams outperformed individuals in latter rounds. Although our experiment is kind of one shot game (although hidden), it will be interesting to study if there are synergies and better understanding of deceptive strategies by teams than by individuals. It is crucial to control for these kinds of effects in our experiment to gain the level of deception adjusted for learning and understanding. Therefore the additional variable assessing it is included in our experimental setting.

Chapter 3

Experimental design

3.1 Basic information

Our experiment is a simple one shot game and our goal is to uncover student's cheating behavioural patterns in a natural setting of school. The key element was not to reveal the real purpose of the experiment in order to get unbiased and real behavioural patterns. School environment is ideal to achieve this goal. Students do not feel to be treated differently than usual which is difference to experimental lab. Moreover, questionnaire surveys take place in schools very often, therefore students are not suspicious of a new questionnaire (our experiment was presented as a questionnaire survey). The usage of this approach increases its external validity.[1] More than 500 hundred students from grammar schools in the Czech Republic participated in the experiment. Participants were from grammar schools in Prague and Jihlava. Data collection ran since autumn of 2012 until February 2013.

The experiment is targeted on students in the first and fourth grade of eight-year grammar schools ("prima" and "kvarta" in the Czech educational system). It includes students of the age 11 - 13 and 14 -16. Reasons for the selection of these age categories and the type of school are threefold. The first and the most important is avoiding of selection bias. An exploration of development of cheating patterns with age is possible only on very similar samples of children. If we wanted to study the development of cheating on a larger age scale, we would face the problem that samples on primary schools from the first grade to

[1] External validity is the general validity of results, mostly from experimental studies, in the "real" world.

the ninth grade are not the same because non-negligible part of children moves to grammar schools from the fourth and the sixth grade. The problem of selection bias is avoided when students are taken from the same kind of institution with the dropout rate close to zero. On the other hand, it limits generalization of results on the whole population because grammar school students could be different from other students of the same age. The second reason is the applicability of sweets and candies as a payoff where students were paid for a participation in our experiment with a certain number of sweets. There is a huge literature discussing an advantage of usage of sweets in experiments with children. The advantage is that children are not able to understand precisely the value of money. They understand better the value of sweets. However, the motivation using sweets is favourable only up to a certain age level. It basically sets the higher age bound for our experiment because children up to 15 are well motivated with sweets. The last reason was a high learning factor of grammar school students. That means that we could expect that grammar school students would understand rules of the experiment properly.

In each class, the experiment was conducted during one school lesson (45 minutes). All classes in each school (2 or 4 classes in one school) took part during the same day, in most cases in lessons directly following each other. The reason was to prevent communication between classes about the content of the experiment.

3.2 The experiment

As mentioned earlier, our experiment is a simple one shot game using a dice with a similar approach to Fischbacher & Heusi (2008). However, the whole process of the experiment employs more complicated structure. For the sake of not revealing the real purpose of the experiment, students were told to participate in the questionnaire survey focusing on environmental protection. The questionnaire was composed of two parts, where both parts were anonymous.[2] In the first part students wrote a few personal characteristics (age, gender or education of parents). The second part was focused directly on the environmental protection. Both parts were formulated in a neutral way to avoid framing

[2] The original questionnaire and English translation are attached in Appendix B

effects.[3] Furthermore, all experimental sessions were run by one experimenter for the sake of limiting different treatments of different experimenters.

Firstly, the experimenter read full instructions to students. The important information regarding the real purpose of the experiment (cheating) was about payoffs and timing of all tasks. Students were informed that they would be rewarded for answering the questionnaire. During the experiment they rolled a six sided dice and according to the number they rolled they received number of sweets. Their payoff was equal 1,2,3,4 or 5 sweets for corresponding number on a dice and 0 if they rolled 6. The drop off number 6 as the payoff number was in order to avoid that subjects act according to gambling heuristics (Fischbacher & Heusi 2008). The rewards included various types of sweets with similar monetary value (lollipops, chocolates, candies) to meet different preferences of students and prevent satiation.

After the instruction part students started to fill in questionnaires. Meanwhile, students were asked to go to the back part of a classroom to roll a dice. After rolling a dice, they directly wrote a number they rolled/wanted to report into the box in the questionnaire and came to the experimenter for sweets.

Students were alone in the time of rolling and nobody else could indicate or control what number they actually rolled. They were also informed in instructions that not only questionnaires but also rolling a dice is anonymous and it is impossible to detect retrospectively what an individual rolled. They just had to show the number written in a box to the experimenter in order to get sweets. However, the experimenter could not know and observe if the number written in the questionnaire was the same with the one actually rolled. It was not mentioned that lying is prohibited and therefore cheating imposed no additional costs. In the experiment lying means reporting other number than actually rolled. Although it was impossible to observe lying on the individual level, cheating and lying patterns could be explored from bigger samples with the help of statistical and econometrical tools.

[3]Framing is shifts of preferences or decisions caused by seemingly inconsequential changes in the formulation of choice problems (Tversky & Kahneman 1981).

3.3 Treatments and non-experimental data

The previous section laid down general features of the experiment. However, one of our main research questions was to observe differences between individual and group decision making. In order to fulfil this goal we designed three distinct treatments which differed both in the structure and in the questionnaire: the individual treatment and two group treatments, namely the endogenous treatment and the exogenous treatment.

3.3.1 Individual treatment

The individual treatment studied individual decision-making. Participants did all tasks of the experiment alone and communication between participants was strictly prohibited. The goal was to extract unbiased cheating patterns. Structure of the experiment was identical to that described in the previous part.

3.3.2 Group treatments

Group decision making is subject to different decision processes than individual decision making. We wanted to test empirically how much and in which ways group decision processes about cheating differed from individual decision making and if group processing imposed additional costs and burdens for cheating. Therefore we decided to create additional group treatments. Group decision making depends also on relationships between its members. This means that the decision processes can be different for a group of close friends and for acquaintances. That is why we designed two treatments. Groups were formed either by students in the endogenous treatment, or randomly in the exogenous treatment.

Endogenous treatment

The endogenous treatment is the first group treatment. The first group treatment is called endogenous because students were supposed to build groups of three by themselves. When number of children in a classroom was not divisible by 3, then there was built one or two groups of two. These observations were then removed from the dataset. The structure of the experiment differed in several ways from the general setting. After reading the instructions students

were asked to form groups. Then groups were coming to the experimenter according to their speed (groups which were formed first came first) where they were randomly assigned to a desk in the classroom. It was motivated by splitting of two possible effects. The first possible effect was that the fastest formed groups were groups consisting of close friends. The second possible effect was an effect of time for decision. Groups rolled a dice in the systematic order.[4] Groups going later could discuss a strategy or a possibility of cheating for a longer period of time.
If then the fastest groups had been assigned according to this order, it would have been impossible to separate these two effects. This problem is missing in the individual and in the exogenous treatment because students sit in both treatments in a classroom randomly.[5]

The questionnaire was divided into two parts. Students were filling in the first part individually. Communication and copying was strictly prohibited. After the first part, where students worked individually, the second part focused on the environmental protection followed. Students had to cooperate in groups and had to search for compromises. Rolling of a dice took place during the second part of the questionnaire and the following method was employed. A whole group moved to the back part of a classroom where one chosen member of a group rolled a dice and each member got corresponding number of sweets for the number reported. The only difference between the individual and both group treatments from the procedural part was that an individual rolled alone in the individual treatment whereas the chosen member rolled a dice under the control of other members of a group in both group treatments. The procedure was clearly explained at the beginning of the experiment, therefore all participants knew it in advance. The difference between treatments is that an individual could decide about cheating until the last moment whilst a group had to make a strategy or decision about cheating, therefore there were higher communication and transaction costs of cheating for a group.

[4]It started from the right row in the front to the back, then middle row and left row last (from pupils' view)

[5]In the individual not completely randomly but cross class order is not dependent on exact personal characteristics

Exogenous treatment

In the exogenous treatment students were randomly assigned to groups. It was carried out with a random draw of numbers from a bag. The structure of the experiment was then analogical to the endogenous treatment. There was only a slight difference in the questionnaire which is explained in the 3.3.2

Non-experimental data

We were able to obtain following personal characteristics from all treatments: gender, age, education of parents, number of siblings (also with division to brothers and sisters and older and younger siblings) and if parents live together or separately. The group treatments were extended for questions about group characteristics indicating how close friends are the group members (best friends, friends, do not know each other well). The reason behind it was to get an unbiased relationship network among members and to be able to determine the composition of each group. There was one additional question in the exogenous treatment. Students identified how many members of a group they would change, if they had an opportunity to build another group by themselves.

There was included an additional question after the experiment to 93 individuals or groups (totally 162 students) determining if they knew about the possibility of cheating. No matter if they cheated or not. During the whole experiment the real purpose of the experiment was neither revealed nor explained to students. Therefore it is be expected that not all students would realize the possibility of cheating. This was anticipated more among younger students. Then students who would in other conditions cheat would not cheat in our experiment because they did not realize this opportunity.
The experimenter asked questions to students about the environmental protection after the end of the experiment and students could receive additional sweets if they were able to answer questions correctly. This "game" enhanced feeling of the questionnaire research and gave a feedback to students about their answers. As the last type of a game students were asked to estimate which numbers on a dice were rolled most often in other grammar schools. They were asked to write two most frequent numbers among younger students and two most frequent numbers among older students.[6] We were then able to

[6]Students were not very familiar with the concept of probabilities that is why it was

construct a dummy variable showing who realized possibility of cheating and who did not.

explained to all students that the chance (probability) to roll each number on a dice is the same (1/6)

Chapter 4

Hypotheses

There are two main lines for our hypotheses and furthermore, we mark two benchmarks. The first benchmark behaviour is based on the standard economic models. These models predict cheating every time which is profitable for a subject. There is neither control nor punishment in our experiment which implies that all people should report number five. Number five is the number which maximizes subject's payoff. However, we cannot assume that all students realize possibility of cheating in our real setting. Nevertheless, the share of this high payoff number should be substantial. It should converge to a certain threshold which is equal 100% minus the share of students who did not realize possibility of cheating. The second benchmark is a complete honesty. It is a more hypothetical benchmark. If students had higher utility from telling the truth, they would always report the actual value and the distribution of numbers would converge to the uniform distribution as would sample increase to infinity. We expect results lying between these two extremes. Our research questions are motivated by other experiments and their predictions as well as our research questions. Examination of various influences within different group formations is a completely new approach. Therefore we designed two distinct treatments on the group formation. Except from the general level of cheating we want to determine main drivers which have impact on cheating and dishonesty.

Main hypotheses:

A) The level of cheating

B) Differences between subgroups

1. Age development
2. Differences between individuals and groups
3. Other characteristics and their possible impacts

The level of cheating

Our goal is not to assess the precise level of cheating. The target is just to convey patterns of cheating. We thus study where on the scale between two benchmarks lie our results. We assume that students have a different threshold for cheating depending on their internal characteristics and external conditions. This hypothesis is supported by the experimental evidence. Fischbacher & Heusi (2008) found out that individuals do not exploit the whole possibility of cheating. A certain fraction of participants cheated incompletely and a part of participants were completely honest. Furthermore, the model of self-concept maintenance by Mazar *et al.* (2008) predicts that people cheat up to a point where they do not consider the level of cheating as bad. It corresponds to their empirical findings where the level of cheating is not 100% and varies with exogenous changes.

Age development

Many researchers claim that moral standards and other regarding preferences develop throughout the early childhood. Fehr *et al.* (2008) argue that it can be evolutionary feature. According to the findings of Bauer *et al.* (2012) or Almås *et al.* (2010) children should become less selfish with the age development. This pattern could hold also for cheating. It would suggest that younger students should cheat more. Fehr *et al.* (2008) and Bauer *et al.* (2012) saw the main development in the early childhood until the age of 10, whereas Almås *et al.* (2010) observed stable level of self-interest among primary school children but the perception of fairness differed with age. It means that our sample does not have to capture the age category where the development of other-regarding preferences takes place.

The effect of knowledge of deceptive strategies goes in the opposite direction. It was found by Talwar and Lee (2002) that older children understand better

deceptive strategies. We measure this effect by the variable understood cheating possibility. Then, there are two effects going against each other and the overall effect is unclear. Bucciol & Piovesan (2011) found in their experiment insignificant development of cheating behaviour with age.

Difference between individuals and groups
This has not been studied very often in connection with cheating. There are just a few exceptions as the research done by Sutter (2009) which we discussed in the section 2.2 and above all Charness & Sutter (2012). Sutter (2009) found lower truthfulness and credibility of groups. Charness & Sutter (2012) predict that groups are more self-interested than individuals. Both results suggest that groups can better realize deceptive strategies and should cheat more. However, we argue that also opposite effects are in place in our experimental setting. Our goal was not to reveal the deceptive feature of the experiment, therefore decision processing imposes additional transaction and communication costs and decreases the level of cheating. These costs should be higher for not so well known friends, therefore we expect higher cheating level in the endogenous treatment. To sum it up, the aforementioned effects go in opposite directions and there is not a clear answer for the overall impact.

Other characteristics
Abovementioned hypotheses were the most relevant research questions for our research. However, we control for a variety of variables which includes personal characteristics as well as experimental conditions and exogenous factors. Even if it could not be an exhaustive list by definition, we were able to control for the most fundamental characteristics and fixed effects. We mention predictions of variables where there is a possible influence on the level of cheating.

Difference between genders - There is no theory about differences in cheating between boys and girls. We would have to implicitly assume different moral standards but it is not supported by the evidence. When we look at field experiments, then Bucciol & Piovesan (2011) did not found any significant gender effect on the level of cheating.

Education of parents – There could be a linkage between personal background and honesty. The education of parents could influence moral standards of children. Bauer *et al.* (2012) found that children of less educated parents

are less willing to share in dictator games. The interpretation of these results in the framework of cheating is following: Children of higher educated parents could deceive less likely because their moral standards could be higher than those of lower educated parents.

Number of siblings – The process of decision making and the level of cheating may hinge on the family background, more specifically on the number of siblings. Fehr *et al.* (2008) captured in their experiment that cooperation is influenced by the structure of siblings. They found strong "only child" and "youngest child" effect on sharing. Only children and youngest siblings tend to share less than other siblings. It may have an effect not only on the level of cheating but also on the process of communication and cooperation in groups. Therefore we suspect differences within groups according to the average number of siblings in a group.

Understood possibility of cheating – The differences in cheating levels can be caused not only by deliberate decisions about cheating but also by not realizing possibility to cheat. If a substantial part of students did not understand this possibility, it would contaminate the results. Furthermore, if the distribution of students who did not realize this possibility was not similar across subgroups, the bias would be induced into group comparison. Therefore we control for this effect in order to test if this effect is insignificant and therefore negligible.

Chapter 5

Methodology

5.1 Variables

5.1.1 Dependent variables

Rewards (0 - 5 rewards)
This variable describes number of rewards and also values on a dice reported by students in the experiment. We used a six-sided dice. The dice variable is changed into a set of six dummy variables where each dummy variable represents corresponding number of sweets. Sweets were distributed in the following manner, 1 up to 5 for a corresponding number on a dice and 0 for the number 6.

High rewards
The variable High rewards is a transformed variable from the original variable Rewards. It is a dummy variable which equals to 1 when rewards are 3,4 or 5 and 0 when rewards are 0, 1 or 2. The variable is constructed this way because we want to separate high and low payoff numbers.

5.1.2 Independent variables

General characteristics

Treatments

- **Individual treatment** - As discussed in previous sections, the individual treatment is characterised with the individual work during the whole experiment and especially by rolling a dice.

- **Group treatment** - All treatments where students worked and rolled a dice in a group of 3. This variable is in some regressions further divided into two treatments.
  - **Endogenous treatment** - Groups were chosen endogenously which means that students chose by themselves members of their group.
  - **Exogenous treatment** - Groups were matched randomly.

Class

Each class which participated in the experiment has its unique number and the variable Class is a set of dummy variables where each dummy variable represents one class.

Faster formed groups

This variable is designed specially for the endogenous treatment. As we mentioned in Section 3.3.2, we want to separate the effect of position of a group in a class and the speed of creation. Therefore groups in the endogenous treatment were randomly assigned to desks in a class.

Personal characteristics

Age

The experiment was run in first and fourth grades of eight years' grammar schools. They are called "prima" and "kvarta" in the Czech educational system. It includes students of the age 11-13 and 14-16 years. Both first and fourth grades represent one dummy variable (*Younger; Older*).

Gender

Individuals - It is divided into two dummy variables (*Male* and *Female*).
Groups - The group is denoted as *Female* if there are at least 2 girls in a group.

Education of parents

The variable Education of parents represents the educational attainment of parents. The scale of this variable in the questionnaire was 1-5. Number 1 denoted the lowest educational attainment on the scale (primary education) and number 5 the highest educational attainment (university degree). Then we constructed one dummy variable for both parents. It is equal to one if the

educational attainment of both parents is strictly higher than secondary school education. In case of groups we used the average education of parents for all group members.

Number of siblings

Individuals - We collected number of siblings and their characteristics for each individual (their gender, if they are older or younger).
Groups - We have the same set of information for each member of a group. However, we constructed proxies for analysis of groups - number of siblings is represented by the average number of siblings in a group.

Group composition

Group composition is a set of 4 dummy variables which expresses gender composition of a group where each dummy variable expresses number of girls in a group. The variable *0 female* goes up in value 1 when a group is composed by 3 boys and 0 girls and *3 females* is equal to 1 when a group is composed by 3 girls and 0 boys.

Friends

The friends variable is an index constructed from answers to questions about the relationships within the group. We asked them how good friends with other members of a group they are (best friends, friends, do not know each other well) and how many group members they would change if they were allowed to build a group by themselves in the exogenous treatment. We constructed the index ranging from 1 to 3 where 3 stands for a group composed from very close friends and 1 from members who do not know each other well.

Understood cheating possibility

Variable Understood cheating possibility was measured just for a fraction of the dataset and totally includes 93 observations. As discussed in Section 3.3.2 this variable was collected after the experiment and students were guessing what numbers students in other grammar schools rolled. We then constructed a dummy variable according to the following procedure: If their guess was precise (3,4 or 5 in both categories), the dummy variable equals 1, otherwise it is 0.

5.2 Estimation method

The econometrical analysis uses the bivariate probit model. The bivariate probit model is a non-linear estimation where a dependent variable has only two values - 0 or 1. The non-linearity does not allow the estimation with the usage of the ordinary least squares (OLS) procedure but employs the maximal likelihood (MLE) procedure. The general form of the probit model (Wooldridge 2009) is expressed as:

$$P(y = 1 \mid x) = G(\beta_0 + x\beta)$$

where G is a function with the range: $0 < G(z) < 1 \quad \forall z \in \Re$. Matrix $x\beta$ expresses estimations of all explanatory variables $x\beta = x_1\beta_1 + x_2\beta_2 + \ldots + x_k\beta_k$. G is in the probit regression a standard normal cumulative distribution function, which can be expressed as follows:

$$G(z) = \phi(z) = \int_{-\infty}^{z} \phi(v)dv$$

where $\phi(v)$ is a standard normal probability density:

$$\phi_z = (2\pi)^{-\frac{1}{2}} \exp(\frac{-z^2}{2}).$$

The estimations are of two types. The first type is the regression of a single dependent variable which equals 1 when high reward value was reported and 0 when low value was reported. The second type is a series of six univariate dummy regressions where each regression represents one unit of reward. Each of six dependent variable equals 1 when given payoff value was reported and 0 otherwise.

The coefficients are expressed derivatives of the probit function. It can be written as:

$$x_j = \frac{dPr(y_i = 1)}{dx_i j} = \frac{d\phi(x_i^T \beta)}{dx_i j}.$$

These coefficients are interpreted as the changes of probability by the explanatory variable changes by one unit when keeping other variables constant. Dummy variables are interpreted the same.

5.2.1 Robustness check

The robustness check serves as a control of results determined from the bivariate probit estimations. The robustness check regressions use other econometrical method, namely multinomial logit. Multinomial logistic regression is a simple extension of the bivariate logistic regression where dependent variable is allowed to range for more than just two values. Multinomial logistic regression uses maximum likelihood estimation, same as bivariate logistic regression. The logistic coefficient for each independent variable for each category of the dependent variable (except for the base category) expresses the expected amount of change in the logit for each one unit change in the independent variable. The logit is the odds of membership in the category of the dependent variable which has been specified. The closer the coefficient is to zero, the smaller influence the explanatory variable has in predicting the logit. The base categories for the dependent variables are: 0 for the variable High rewards and 3 for the variable Rewards. The coefficients of the multinomial regressions do not allow direct comparison with the bivariate regressions, therefore the aim is not to assess precise differentials of bivariate and multinomial estimations but the aim is the qualitative comparison of the results from both types of models.

5.2.2 Randomization and multicollinearity check

The assumption check consists from two elements. Firstly, we have to determine if observations are randomly distributed across treatments. We compare means of all explanatory variables and we then test the hypothesis that their means in all tretments are the same. The comparison is firstly executed for the individual and the group treatment and means are tested with the t-test. Then the group treatment is split into the endogenous and exogenous treatment and all three treatments are again tested together with a use of the F-test.
The results presented in Appendix One in Table A.9 show that we cannot reject the hypothesis of the same means for the variables - older, female and number of siblings. The only variable assigning bias is the variable education of parents. In that case we can reject the hypothesis that means are equally distributed. However, this variable is a dummy variable which equals 1 when both parents have higher than secondary school education. When we separate education of father and education of mother and let the whole range (1 up to 5), the bias in one case disappears (0.36 and 0.44) and in the other becomes weak (0.04 and 0.11). Therefore we can conclude that even with a weak bias in the variable

education of parents, populations in all treatments are statistically equal.

Secondly, we analyse correlations among explanatory variables. Results can be found in Table A.10 in Appendix One. Correlations among variables appear to be very weak and therefore cannot cause multicollinearity in regressions. We can conclude that assumptions are satisfied and results are not biased.

Chapter 6

Results

In this chapter we present main results obtained from the experiment. The chapter is arranged into four main sections. In the first section we discuss cheating patterns in the two values setting. Firstly, the whole sample is discussed, then the dataset is divided into four subsamples. We compare reported rewards with the random draw which is followed by the econometrical analysis. The second section uses same tools but extends the analysis for all six values of rewards. Section 6.3 presents impacts of additional variables and the robustness check is included in the last section.

6.1 Two values analysis

6.1.1 Whole sample

The dataset involves 226 observations. We omit the differentiation between individuals and groups for this moment and we focus on exploration of behavioural features of the whole sample. Figure 6.1 identifies shares of reported rewards among all participants. The high reward variable is composed from 3, 4 and 5 rewards, where 5 rewards is the maximal number of rewards that could be obtained. The low reward variable includes 0, 1 and 2 rewards. The first chart depicts that almost 70% of all participants reported high reward numbers. Asterisks behind the shares label the significance of shares when they are different from the random draw. The random draw means the uniform distribution of all values. In this case we can observe that both shares differ from 50% on 1% level of significance. It suggests that some fraction of students reported other number than rolled. We can therefore assume that some part

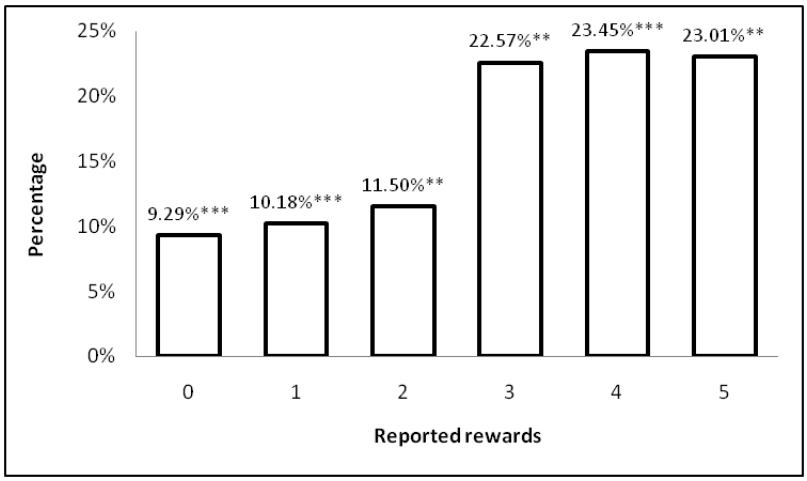
of students cheated.

Figure 6.1: High and low reward distribution

*=10% – level, **=5% – level, ***= 1% – level of significance that share is not equal to the random draw

However, the differentiation from the random draw is only an approximate measure and we utilize the analysis of all six reward values for further details. Figure 6.2 reveals the distribution of rewards in the sample. There is a clear cut between low and high payoffs. In this case the share of 16.67% represents the uniform distribution. Figure indicates that the shares of all levels of

Figure 6.2: Distribution of rewards



*=10% – level, **=5% – level, ***= 1% – level of significance that share is not equal to the random draw

rewards are not equal to the random draw on at least 5% level of significance. In other words, values are skewed to high payoff numbers. It supports the thesis that a certain fraction of students cheated. Second important feature

is that high level payoffs have similar representation and number 4 has even the largest proportion. It suggests that students did not exploit the maximal possibility of cheating.

To sum this section up, the substantial fraction of students cheated. It is supported by the dummy variable analysis as well as by the analysis of the whole range. However, students often did not use the maximal possibility of cheating and reported other number of rewards than rolled but not the maximal.

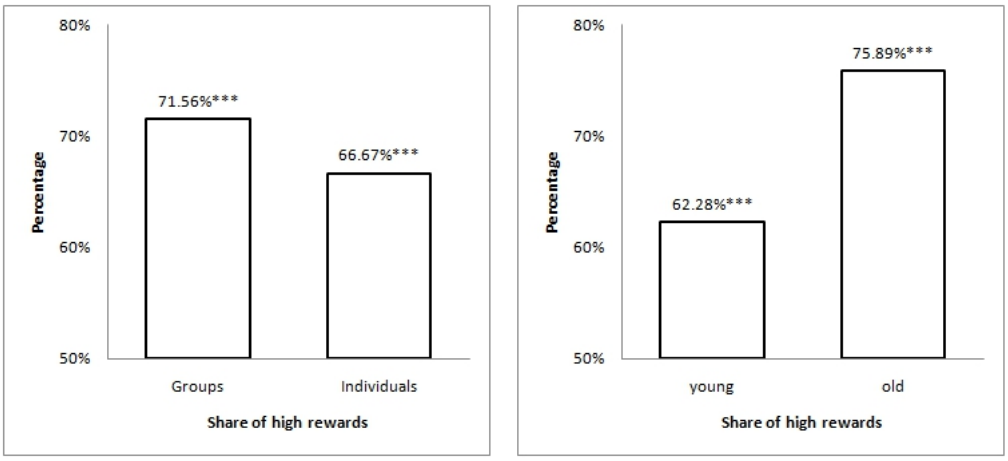
6.1.2 Comparison of subsamples

This section targets on the development with age and on the impact of increasing number of decision makers on the cheating level. Therefore, we separate the dataset into younger and older and into individuals and groups. Afterwards, we go deeper in the analysis and we try to combine abovementioned separations into one. Target groups look as follows: younger individuals, younger groups, older individuals and older groups. It enables us to precisely disentangle the impact of age and group decision making on cheating.

Firstly, we simply look at the dice distribution in two main categories we are interested in. Shares of both individuals and groups are significantly different from 50% on 1% level of significance which can be observed in Figure 6.3. The share is slightly higher for groups but the differential is less than 5%. Bigger differential is between younger and older students. The shares are also significantly different from 50% but the gap between these two groups is almost 14%. It suggests that older students cheat more than younger and that there is not a big difference between individuals and groups. However, this analysis gives just a partial answer to the cheating patterns and could not reveal the differentials within groups. Therefore we extend the analysis into four subsamples - younger individuals, younger groups, older individuals and older groups which enables us to understand better the cheating patterns of each particular subsample.

Table 6.1 reveals average number of rewards in those four categories. The highest average reward is in the category older individuals but other categories do not differ substantially. The only exception is the category younger individuals where the average reward is 2.53 which is by about 0.7 reward lower than by

Figure 6.3: High reward distribution comparison



*=10% – level, **=5% – level, ***= 1% – level of significance that share is not equal to the random draw

other categories.

Table 6.1: Average reward

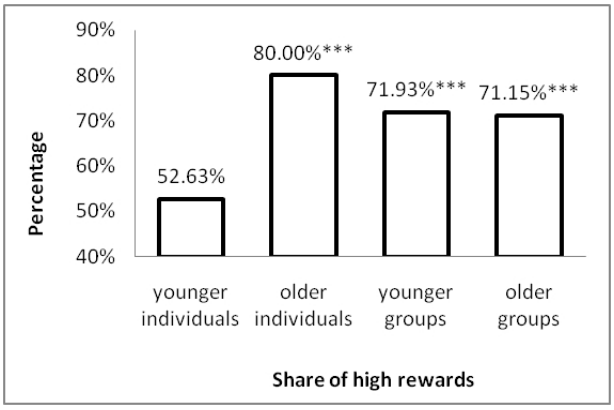
Category	Obs.	Avg. reward
Younger individuals	57	2.53
Younger groups	57	3.32
Older individuals	60	3.32
Older Groups	52	3.23

Obs. - Number of observations

The shares of high rewards are depicted in Figure 6.4. It is supplemented by the two sample test of proportions which can be seen in Table 6.2. The hypothesis that the share is equal to 50% is rejected with the exception for younger individuals. The other subsamples are significantly different from the random draw on the 1% level of significance.

The age development and differentials in the decision making can be read from Figure 6.4. The high payoffs are more frequent in the older category. It would suggest that older students tend to cheat more. Nevertheless, this picture would be too simplified. There is also a strong dissimilarity between the individual and the group decision making, therefore the discrepancies have to be studied in both dimensions. The graph displays that younger students are

Figure 6.4: High reward distribution for subgroups



*=10% – level, **=5% – level, ***= 1% – level of significance that share is not equal to the random draw

not a homogenous group and their level of cheating differs according to the treatment. The first result about cheating patterns is that younger students cheat more likely in groups. The two-sample mean-comparison test for older category shows that the treatment does not have any significant impact on the cheating level.

Table 6.2: Comparison of subgroups

Subgroup comparison	
	p–value
younger individuals vs. older individuals	0.17%***
younger groups vs. older groups	92.85%
younger individuals vs. younger groups	3.35%**
older individuals vs. older groups	38.15%

(*=10%- level, **=5%-level, ***= 1%-level of significance that the subgroups have the same average)

We can generally state that there is a big difference between younger and older individuals whereas there is a similar expected level of cheating for younger and older groups.

6.1.3 Econometrical analysis

The analysis lingers on examination of four different subsamples and the results are presented in Table 6.3. We could detach the effect of age and the effect

of group on the decision making. We focus more on qualitative interpretation of the results than on exact quantification of cheating levels. The probability change in the upper part of Table 6.3 symbolizes the change from younger to older students and in the bottom part the probability change from individuals to groups.

Table 6.3: High reward regression – Age development and impact of groups

	High rewards
	Age development
whole sample	0.293***
	(0.000802)
individual treatment	0.270***
	(0.00290)
group treatment	-0.0472
	(0.603)
	Impact of groups
younger students	0.210**
	(0.0316)
older students	-0.0778
	(0.386)

p-value - *** p< 0.01, ** p< 0.05, * p< 0.1, + p< 0.15
Notes: dependent variable - High rewards, explanatory variables cumulatively for all regressions: Age, gender, treatment, number of siblings, education of parents, number of siblings, education of parents, class fixed effects, group composition, group relationships; coefficients represent probability differentials of high reward - in the upper part between younger and older category and the bottom part between individuals and groups full regressions can be found in Appendix One, Tables A.1, A.2, A.3, A.4,A.5

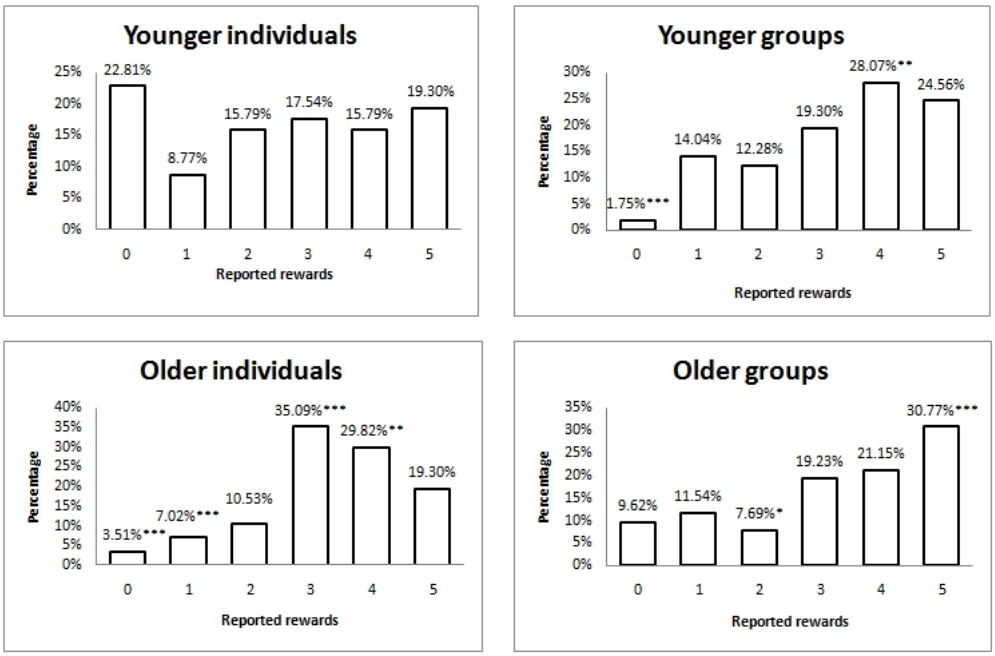
There are similar patterns which were observed from Figures 6.1, 6.2 and 6.4. The overall level of cheating is higher in the older subsample. The probability of high rewards is about 29.3% higher by older students. Although the probability does not represent exactly the level of cheating, we can suppose that substantial part of the difference is directly caused by cheating. More importantly, the evidence verifies higher level of cheating of older than younger individuals and no significance between groups. It resembles with the results from previous parts.

The relationship of number of decision-makers and level of cheating is weaker than it seemed to be in the statistical part. The conclusion from the statistical analysis was that younger students tended to cheat more in groups and older students cheated more likely individually. It is not fully endorsed here. There is about 21% higher probability on the 5% level of significance that younger students cheat more in groups. On the other hand the differential disappears after controlling for fixed effects which could be found in Appendix One, Table A.4 and Table A.5. It could be caused by low number of treatment classes which leads to low variation. Furthermore, the difference among older students is insignificant.

6.2 Six values analysis

We begin our analysis with an inspection of four charts portraying shares of all six rewards. It extends the two values (high and low reward) analysis. Figure 6.5 characterizes the distribution of rewards among students in four subgroups – young individuals, young groups, old individuals and old groups.

Figure 6.5: Reward distribution in four subgroups



Younger individuals

The subgroup of younger individuals is the most specific subgroup. The distribution of rewards is not significantly different from the random draw. All other subgroups have at least one value with disproportionate representation. It is interpreted in the way that younger individuals probably did not cheated in a significant way. Surprisingly, the largest share has 0 rewards which supports the hypothesis of honesty of this category.

Younger groups

The distribution of rewards is skewed towards high reward values. 0 rewards value is represented by only 1.75% share. Higher values are spread into more values. The most frequent among high value numbers and the only significantly different from the random draw is value representing 4 rewards (28.07%). It suggests that younger students cheat but do not exploit whole possibility of cheating. It exhibits similar patterns as in the two value setting.

Older individuals

Values vary significantly from the random draw. The largest share have number 3 (35.09%) and then 4 (29.82%). There are only two insignificant values - 2 and 5. High level of cheating and relatively low representation of maximal reward (19.30%) shows aversion of being perceived as liar. Nevertheless, it again indicates the tendency for incomplete cheating.

Older groups

Although the distribution pattern in the two values setting was very similar for older and younger groups, the situation changes in the six values setting. Older groups have the largest share of maximal reward number 5 (30.77%). It is the only value different from random draw on 1% level of significance. It is worth noting that older groups exploit predominantly maximal possibility of cheating. It distinguishes older and younger groups from each other. Even though both subgroups seemed very similar in two values setting, the extended analysis brought new insight and detected important dissimilarities. Younger groups used probably more often incomplete cheating whereas older groups cheated more likely maximally.

6.2.1 Econometrical analysis

The econometrical analysis keeps same setting as employed in subsection 6.1.3 but it is extended to six values in Table 6.4.

Table 6.4: Six reward regression – Age development and impact of groups

0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
Age development					
whole sample					
-0.150***	-0.0369	-0.0587	0.141*	0.134+	0.0144
(0.00272)	(0.534)	(0.296)	(0.0698)	(0.105)	(0.861)
individual treatment					
-0.179***	-0.0151	-0.0671	0.158*	0.113	-0.00381
(0.00413)	(0.761)	(0.296)	(0.0582)	(0.157)	(0.958)
group treatment					
0.0783**	-0.0102	-0.0676	0.0277	-0.0977	0.0471
(0.0444)	(0.895)	(0.390)	(0.726)	(0.245)	(0.590)
Impact of groups					
younger students					
-0.231***	0.0693	-0.0247	0.0436	0.100	0.0480
(0.000922)	(0.273)	(0.701)	(0.569)	(0.212)	(0.558)
older students					
0.0639	0.0325	-0.0334	-0.154+	-0.00699	0.0772
(0.203)	(0.529)	(0.580)	(0.101)	(0.940)	(0.387)

p-value - *** p< 0.01, ** p< 0.05, * p< 0.1, + p< 0.15

Notes: dependent variable - Rewards, explanatory variables cumulatively for all regressions: Age, gender,treatment, number of siblings, education of parents, number of siblings, education of parents, class fixed effects, group composition, group relationships; coefficients represent probability differentials of given rewards - in the upper part between younger and older category and the bottom part between individuals and groups, full regressions can be found in Appendix One,Tables A.1, A.2, A.3, A.4, A.5

The results confirm the hypotheses stated in the previous part. The composition of values between younger and older students shows higher cheating patterns in the older category. Older have 15% lower probability of reporting 0 rewards and 13-14% higher probability of reporting 3 or 4.

Higher level of cheating of older than of younger individuals is verified in the second line of Table 6.4. On the other hand, the gap between both treatments in the two values setting was wider. The group treatment results testify that younger and older groups are not the same and their composition of shares is dissimilar, but the overall level of cheating is similar in both categories.

The emphases were put more on an exploration of younger category. The results are in the bottom part of Table 6.4. It shows similar patterns as two values econometrical analysis. There is a higher probability of 0 rewards, at level reaching 23%, for older individuals, nevertheless other values are insignificant. It can be expected that cheating in groups probably prevailed from 0 rewards to higher number of rewards. Furthermore, the difference disappears in the fixed effects regression. As we discussed previously, the dismissal of significance can be caused by low number of classes in both treatments.

6.3 Further results

Further investigation is targeted on hypotheses mentioned in Chapter 4. They described possible impacts of other characteristics as family background, external influences and others. Then the effect of understanding possibility of cheating is investigated. This inquiry is of high relevance because it helps us to shed light on motivations behind cheating.

Difference between endogenous and exogenous treatment

Even though the decision making of individuals and groups was broadly addressed in the previous section, one part was omitted. The group treatment was formed from two distinct treatments – endogenous and exogenous treatment. It was motivated by the expectation that cooperation between members of exogenous groups would be impeded in comparison within endogenous groups. It is supposed that exogenously built groups in a class have weaker connections. The results show the opposite. The way of building of groups has no influence

Table 6.5: Differences between Exogenous and Endogenous treatment

High rewards	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
-0.121	0.0434	0.0245	0.0712	-0.134	0.00964	0.0375
(0.302)	(0.283)	(0.797)	(0.537)	(0.175)	(0.926)	(0.728)

p-value - *** p< 0.01, ** p< 0.05, * p< 0.1, + p< 0.15

Notes: dependent variable - High rewards and Rewards, explanatory variables: Age, Group composition, number of siblings, education of parents, group relationships, class fixed effects; coefficients represent probability regressions of given reward between endogenous and exogenous treatment, full regressions can be found in Appendix One,Table A.3

on the decision making about cheating. It is also supported by the variable Friends representing the interconnections within a group which proved to be

insignificant. It means that neither way of building group nor inner relationships within groups had a substantial impact on cheating decision of students.

Final remark focuses on the endogenous treatment. Data collected on this treatment includes more specific variables about relationships within a group. Other treatments did not allow controlling for the speed of formation and the proximity of relationships. However, both effects turned to be insignificant. Proximity of relationship had a minor impact on decisions about reported numbers which is not robust and furthermore disappears when we control for fixed effects. The regressions with coefficients are involved in Table A.6 in Appendix One.

Differences between genders

Even though there is no complex theory describing the cheating patterns of males and females, we analyze gender differentials in our experiment. The whole sample regression uses a proxy for groups. The variable equals one whenever two or more girls are in a group. The group regression analyses the whole gender composition as a series of dummy variables.

Weak relationship between gender and level of cheating occurs in the whole sample regression. There is 7% higher probability that girls report one reward and 8% lower probability of two rewards. Nevertheless, there is a lack of robustness of gender disproportions and significant results go in opposite directions. Therefore we can state that gender did not have considerable impact.

Education of parents

Although experimental economics has brought large evidence that children of highly educated parents behave differently than children of less educated parents and that there could be a linkage between education and honesty, the data indicate the opposite. There is no robust correlation and therefore the overall level of honesty does not depend on the consequence if a student comes from high or low educated family background.

Number of siblings

Number of siblings could possibly form the willingness for cooperation during childhood. Fehr *et al.* (2008) found that only children share their resources less than children with siblings. There is a suspicion that the size of the family could have an impact on level of honesty.

Table 6.6: Impact of number of siblings

High rewards	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
			Whole sample			
-0.0687+	0.0124	0.0197	0.0280	0.00941	-0.00353	-0.0832*
(0.121)	(0.576)	(0.478)	(0.328)	(0.802)	(0.927)	(0.0562)
			Individual treatment			
0.00363	-0.0103	-0.0167	0.0195	-0.00308	0.0371	-0.0450
(0.949)	(0.769)	(0.604)	(0.608)	(0.948)	(0.392)	(0.326)
			Group treatment			
-0.241***	0.0415*	0.103+	0.0957	0.0432	-0.155*	-0.175*
(0.00399)	(0.0892)	(0.111)	(0.182)	(0.516)	(0.0714)	(0.0653)

p-value - *** p< 0.01, ** p< 0.05, * p< 0.1, + p< 0.15

Notes: dependent variable - High rewards and Rewards, explanatory variables cumulatively for all regressions: Age, gender,treatment, number of siblings, education of parents, number of siblings, education of parents, class fixed effects, group composition, group relationships; coefficients represent probability coefficients represent probability change of given reward with additional one sibling, full regressions an be found in Appendix One,Table A.1, A.2 and A.3

Table 6.6 gives the coefficients for the impact of number of siblings on the shares of dice numbers which is also a good proxy for level of cheating. There is a small visible influence in the whole sample but this influence disappears in the individual treatment. However, the group treatment exhibits consistent and significant results that groups with on average more siblings cheat less. There is approximately 18% lower probability that a group reports maximal amount of rewards when each member of group has on average one more sibling. In the two value setting it makes even 24% lower probability on the 1% significance level. Nevertheless, we deal with the interpretation more in the following chapter.

Understood the cheating possibility

The main question needed to answer is whether some subgroup of students knew better about the possibility of cheating and whether it caused significant differences in the results. It would mean that it was not just honesty which

played a role in the decision making about reporting other number than rolled. This variable was collected only from a fraction of students participating in the experiment. Low number of observations enabled only two values regression – high and low reward. The results from this part are included in Appendix One, Table A.7.

The variable is significant in the whole sample on the level 5-10%. It shows 20% higher probability that students who understood the cheating possibility reported high reward numbers more. When we split the sample into subgroups it turns out that the variable is significant in the younger subsample. The difference in probabilities is substantial; around 30% higher for students understood the cheating possibility.

The second step is to address if the control for the cheating possibility variable results in the change of magnitudes of other variables. The regression was executed only on the part of the whole sample, therefore we cannot simply generalize the results but we can expect similar behavioural patterns. There is an anticipation of similar qualitative impacts in the general setting. The comparison shows interesting patterns. The regressions uncover persisting differential in the level of cheating between younger and older students even when controlled for the understanding of cheating possibility. The differentials decreased but just mildly, in the whole sample and in the individual sample just about a few percent. It means that a certain fraction did not realize possibility of cheating, on the other hand there is still robust difference between honesty of younger and older students. The second important finding is a disappearance of differential between younger individuals and groups. The results suggest that younger individuals were more unable to detect the cheating opportunity. The controlled regression reveals that cheating patterns and level of honesty among younger students does not have to differ between individuals and groups. We are very cautious in generalization for the whole sample, however there is a probability that the same patterns may hold for the whole dataset.

In the last step we regressed the variable understood possibility of cheating on the other explanatory variable. The results can be found in Appendix One, Table A.8. We found that only age is the significant predictor for the understanding of cheating. Older student probably learned more during their lifespan deceptive strategies and are more able to detect them in the real life

situations. Neither family background, nor external factors have a significant impact on understanding of cheating possibility.

6.4 Robustness check

The last part of this chapter involves the robustness check which, as the name suggests, examines the power and the robustness of the results. The variation of an estimation method should not lead to significantly different results from the original method. Tables summarizing the results from the multinomial logit estimations can be found in Appendix One, Tables A.11, A.12, A.13, A.14 and A.15.

The whole sample regressions resemble in most parts with the bivariate probit estimations. We focus on the two values analysis first. The significant variables are the same in both regressions – Older, Female, Group treatment and Number of siblings; and the coefficients have qualitatively same signs. What is more, the relative magnitudes of the coefficients in the multinomial logistic regression correspond to the original results. Extension of the analysis for all six values comes to similar patterns from both estimations. The strongest impact of explanatory variables is on the 0 reward level.

The division of the dataset into four subsamples does not lead to a diverse conclusion. The only explanatory variable with the significant impact on the dice distribution in the individual treatment is the age and the number of siblings for the group treatment. The two setting regressions for the younger category preserve the significance of the difference between individuals and groups, boys and girls and last but not least number of siblings. The dice distribution in the older category is not affected by the explanatory variables as well as in the bivariate regressions.

To sum it up, the results from the robustness check are very similar to those obtained in the bivariate probit regressions. This statement is confirmed not only by significance and signs but also by the relative magnitudes of the coefficients. Therefore the results are robust and estimation method do not influence findings from the experiment. We can assume that impacts of the explanatory variables on the cheating levels are independent of estimation method.

Chapter 7

Discussion – Links to theories

This chapter addresses the nature of cheating and discusses why people sometimes abstain from lying. The empirical analysis is focused on grammar school students, therefore the generalization on larger population is at least problematic. We employ several models from previous sections including standard economic theory, maintaining of self-concept emphasised by Mazar *et al.* (2008) or Fischbacher & Heusi (2008) or lie aversion proclaimed also by Fischbacher & Heusi (2008). In the next section alternative explanations are analysed and differences between individuals and groups are incorporated.

In order to further explore robust cheating patterns obtained from the experiment we conclude main empirical results first. There are four major empirical findings. Firstly, a certain fraction of students cheated but did not exploit the whole possibility of cheating. In other words, they cheated incompletely. Secondly, younger students cheated more likely in groups. The hypothesis that older students cheated more likely individually was not approved. Thirdly, older students cheated more often than younger students. However, the biggest difference is caused by low level of cheating of younger individuals. There is a robust pattern that groups with on average more siblings behaved more honestly than groups which had on average lower number of siblings. Fourthly, younger students did realize the possibility of cheating in smaller extend than their older counterparts. Therefore there is a possibility that variation among younger students is caused by not realizing the cheating opportunity.

7.1 Standard economic theory and complete honesty

At the beginning of Chapter 4, two benchmark scenarios were set, namely total dishonesty and maximal honesty. The first scenario is the prediction of the standard economic theory where individuals maximize their payoff in the setting of no control and no punishment. This pure economic theory is however rejected in our experiment. According to the predictions of this scenario the vast majority should cheat maximally. However, the dice distribution in the whole sample and also in other subsamples rejects these predictions. Furthermore, the distribution of the subsample of young individuals is not significantly different from the random draw.

The other scenario is a more theoretical benchmark. Complete honesty is condemned with the results both on the whole sample level and on subsample levels. The only exception is the subsample younger individuals where the hypothesis of random distribution of reward values was not rejected. Therefore the non-cheating hypothesis cannot be repudiated.
This type of models cannot clarify the observed cheating patterns including incomplete cheating. Therefore, we turn to a different line of explanations and arguments. Next step is to face empirical results with predictions of the self-concept theory.

7.2 Maintaining a favourable self-concept

The model of self-concept maintenance is built on the idea that people want to be perceived as moral and generous. It is not only the will of people to be perceived from others as good and honest but also by themselves. It suggests that people will cheat up to the level to keep their self-concept and integrity. It could be rephrased that people will cheat just up to the level which is not considered by themselves and others as immoral. What traits of the model are relevant for our experiment and what are the predictions?

Individuals want to avoid being seen in their eyes as greedy or dishonest when considering cheating. The external influences were in our experimental setting diminished whereas mainly the internal influences were in the force. In order to

keep their self-concept subjects can decide to report other number than rolled but not the maximal reward number. They can report 3 or 4 instead of 2 without regarding it as bad. This is a very important element of the model because it explains incomplete cheating. Even though the external influences were suppressed by the experimenters, they could possibly play a minor role. Students had to show the reported number to the experimenter. Moreover, students could possibly see number of rewards of their classmates. Therefore, if a student reports 4 instead of 5, there is a lower probability to be seen as a liar by other classmates. Individuals could incorporate this element into their decision process about cheating. It could also contribute to the incomplete cheating phenomenon. It has to be noted that our empirical findings support the predictions of self-concept at least on the individual level. Moreover, the results are in accordance with the results of Fischbacher & Heusi (2008) who found similar patterns of incomplete cheating which the authors attributed mainly to the self-concept maintenance.

The maintenance of self-concept considers subjects as individual units. It is not constructed for groups and it lacks the motivation within the framework of more complex decision process. Even though, the model has no extension for group decision making, we try to build upon it to determine possible predictions. Interactions with other members of a team may increase the burden for cheating because they want to be seen by other members as nice and honest. Therefore it could lead to disguising of cheating strategies and lower level of cheating groups. This line of argumentation leads to the same implications as the argument that group decision process imposes additional costs on communication. The results do not support these predictions. Groups cheat slightly more in the whole sample or similarly when controlling for understanding of cheating possibility. However, the variation in the whole sample is mainly driven by the differential between younger individuals and younger groups.
Another way of understanding the model could be that students may cheat more in groups because they do not feel responsible for the decision of a group and therefore they would not harm their self-concept by cheating. It would imply opposite directions, namely higher level of cheating in groups. These two directions could offset each other, therefore the overall effect is not totally clear.
We are aware that group predictions are our interpretation of the model which do not necessarily represent the interpretation of the authors. The important

fact is that there seems to be non-negligible difference between individual and group decision processes. Although the model explains the data well on the individual level, it fails on the group level. The extension of the model for group underpinnings would probably help to reveal motivations and nature of lies in the more complex decision setting.

7.3 Lie aversion

The main assumption of the model as mentioned in Fischbacher & Heusi (2008) is a disutility from lying. Basically, people want to stay honest. However, the level and magnitude of disutility differs across individuals. Dishonesty or cheating then depends on the result of cost-benefit analysis in which an individual compares the utility from cheating and the disutility from lying. Various utility and disutility functions mean that for a certain fraction of people is cheating beneficial and the rest profits from remaining honest. It entails monotonously lying patterns with stakes. The model lacks explanation of incomplete cheating. There are always just two parts of population - one cheats completely and the other is honest.

The results do not support the theoretical predictions. As observed from Figure 6.5 and Table 6.4, there is a robust fraction of so called incomplete liars. The nature of lying has therefore probably other explanation than expressed in the lie aversion model. This model basically does not fit the data from our experiment, the major dissimilarity is the inability to predict incomplete lying.

7.4 Development of other-regarding preferences

Alternative line of argumentation uses findings from experimental economics and evolutionary theories. Bauer *et al.* (2012), Almås *et al.* (2010) or Fehr *et al.* (2008) argue that other-regarding preferences develop during the childhood. There could not be just a linkage between age development and selfishness but also between age development and honesty. It would imply that children learn not to cheat and not to be selfish during their childhood. It would result in higher cheating patterns in younger categories. Second, Fehr *et al.* (2008) found the development of parochialism in the childhood. It means that children in

groups should be more concerned about the payoff of their own group. The level of cheating should be then higher for older groups with comparison of younger groups and also to older individuals.

The empirical findings reveal contradictory patterns. There is an increasing level of cheating with the age and it sustains even after the control for the variation connected with understanding of cheating possibility. Moreover, the level of cheating of older groups is not significantly higher than younger groups or older individuals. The detailed results are depicted in Appendix One, Tables A.1, A.2 and A.3. The reason which was also discussed in Section 2.3 could be the usage of age categories. We ran our experiment on students of the age 11–15 whereas the authors assume the major part of the development of other-regarding preferences in the range of 3–10. This condition does not enable us to reject their propositions. The future extension of the experiment should go in the direction of widening age groups in order to capture development of other-regarding preferences.

7.5 Groups and cheating

The evidence from various authors suggests disparity in decisions and motivations when compared individuals with groups. Charness & Sutter (2012) quote that groups are more sophisticated decision makers and are more self-interested. The reasons may include better common knowledge within a group or that group members are concerned not only about their payoff but also about the payoff of their counterparts which decreases concerns about payoffs of subjects outside a group. These findings are highly relevant for our experiment because they predict higher level of cheating for groups.

The impacts of groups on the level of cheating are dubious. There is clearly a higher cheating pattern for groups in the younger category as seen in Table A.4. However, this pattern vanishes when we control for understanding of cheating possibility. Therefore, we cannot completely reject the hypothesis that the variation between these two subgroups is caused by unfamiliarity of younger individuals. The older category indicates insignificance of difference between individuals and groups. However, there is a higher proportion of maximal number rewards by older groups. Older individuals exhibit higher share of

number 3 and 4. It suggests that groups could be more self-interested than individuals, nevertheless the effect is not strong enough to be totally convincing. On the other hand, a broader difference is observed in motivations of individuals and groups. The importance of the age is lower and number of siblings may play a bigger role in the group treatment. It suggests differences in the decision process between individuals and groups.

The last result, which has not been discussed yet, is the impact of number of siblings on the level of cheating within groups. It has not been explored in the cheating experiments yet. The only evidence by Fehr *et al.* (2008) suggest a significant "only child" and "youngest child" effect on sharing. Our analysis revealed that groups with on average higher number of siblings cheat less. The explanation of this finding is not discussed in the literature, therefore we propose our clarification. Students with higher number of siblings are more often faced with interactions with more subjects (siblings) and may be more aware about benefits of honest behaviour. However, the counterargument is that they are probably more skilled in detection and creation of deceptive strategies, therefore they should cheat more. These two opposite effects give no clear explanation for the discovered empirical pattern.

Our results support the classical predictions of group experiments just in the limited scale. Nevertheless, the experiments has been never done in the field of cheating before. The decision making about cheating seems to come under different processes and motivations that is why the research in this field needs further theoretical and empirical exploration.

The conclusion of this chapter investigating interpretation of the results can be divided into two main parts. Firstly, the model of maintenance of self-concept fits the data best. It involves a fraction of incomplete liars which is supported by the results. Subjects then cheat up to the level to keep their self-concept in order to remain nice and honest people in their eyes and also in the eyes of others. However, this model lacks of the differentiation between individuals and groups which curtails the generalization for the whole sample. The second conclusion is that further theoretical research of the differences of cheating patterns between individuals and groups is needed to better understand and capture motivations and sources of decisions.

Chapter 8

Conclusion

Cheating and deception are widespread phenomena and children's behaviour is not the exception. Then we have to ask about the extent and motivations. How much do children cheat? If they cheat more in groups or individually or if older children deceive more frequently and are more skilled in deceptive strategies than their younger counterparts? These questions are also relevant with respect to economic theory. The standard economic theory predicts dishonesty in every situation profitable for an individual. If we determine other empirical patterns we have to discuss other models describing behaviour of children.

We presented the simple experiment with children in the age category 11 – 16 years. They rolled a dice as an instrument of payoff for time spent filling in not related questionnaire and were rewarded with number of sweets for corresponding number on a dice. Because of no control setting they could report whatever number they wanted. We were then able to assess cheating patterns of different subgroups and the impact of various external factors and family background. The main focus was on the development of dishonesty features with age and on differences between individual and group decision making. Summing up the experiment revealed following patterns: 1) A certain fraction of students cheated but a substantial part did not use the whole possibility of cheating; 2) Younger students cheated more likely in groups than as individuals; 3) Older students cheated more frequently than younger students, however some part of differential could be explained by higher knowledge of deceptive strategies of older students; 4) There is a non-negligible effect that groups with on average more sibling behaved more honestly than groups with on average fewer siblings.

The empirical findings contradict the predictions of the standard economic theory. The standard theory cannot explain a fraction of incomplete liars who cheat but instead of maximal reward 5 report 4 or 3. Furthermore, the cost benefit analysis under no control and no punishment indicates that dishonesty should be profitable therefore the predictions suggest that the cheating level should be 100% or very close to it. Maintaining a favourable self-concept describes obtained cheating patterns more precisely. It assumes that people want to stay honest in their eyes and in the eyes of others like classmates or experimenters. Therefore a certain portion of students may forgone cheating or cheat incompletely. It fits to the data. However, this model is not extended for group decision making, that is why it has problem in explaining differences between individuals and groups. Last but not least, studies distinguishing individuals and groups as decision units found that groups subordinate to diverse processes than individuals. Literature argues that groups learn faster and are concerned about welfare within a group more than of outer people. It corresponds with our findings just partly. Younger students cheat more often in groups but the differential between older individuals and groups is insignificant. The overall effect is still substantial and significant. Therefore further research is needed in order to explore individual and group decision making dissimilarities.

The experiment presented here came with an approach how to measure natural level of cheating with special focus on group decision making. However, there are still additional problems worth exploring. Firstly, even though the theory is able to explain motivations of incomplete liars, there is absent concise theory of group decision making and its implications for cheating. Then, some authors argue that other-regarding preferences develop in the early childhood. It would be interesting to increase age scale in order to include children of the age under 10 where the development of these preferences is supposed to be the most significant. Lastly, further research could focus on cross-cultural and cross-countries differences. We consider relevant to look at the interference of general level of dishonesty and corruption in a given culture or country and determine some linkages in a cross country experiment.

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Appendix A

Title of Appendix One

Table A.1: Whole sample regression

Dependent variable	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
Sample								Whole sample						
Older	0.293***	-0.150***	-0.0369	-0.0587	0.141*	0.134+	0.0144	0.271	-0.233**	-0.0772	-0.787***	-0.216	0.364*	0.0426
	(0.000802)	(0.00272)	(0.534)	(0.296)	(0.0698)	(0.105)	(0.861)	(0.266)	(0.0321)	(0.206)	(7.45e-09)	(0.316)	(0.0781)	(0.822)
Female	0.0336	-0.0225	0.0701*	-0.0846**	0.0316	0.0298	-0.0306	0.0557	-0.0215	0.0567*	-0.0884**	0.0295	0.0701	-0.0323
	(0.594)	(0.472)	(0.0810)	(0.0480)	(0.576)	(0.601)	(0.588)	(0.401)	(0.637)	(0.0961)	(0.0234)	(0.638)	(0.242)	(0.588)
Group treatment	0.197**	-0.198***	0.0455	-0.0307	0.0305	0.131+	0.0513	0.157	-0.113	-0.0129	0.0111	0.128	0.199	0.0474
	(0.0222)	(0.00103)	(0.410)	(0.587)	(0.714)	(0.116)	(0.527)	(0.471)	(0.194)	(0.876)	(0.917)	(0.426)	(0.200)	(0.759)
Older∗Group treatment	-0.334**	0.474***	0.0305	0.00151	-0.118	-0.170*	0.0262		0.301	-0.238				
	(0.0146)	(0.00136)	(0.719)	(0.986)	(0.258)	(0.0897)	(0.819)		(0.190)					
Number of siblings	-0.0687+	0.0124	0.0197	0.0280	0.00941	-0.00353	-0.0832*	-0.0649	0.0119	0.0103	0.0254	0.00384	0.00339	-0.0825*
	(0.121)	(0.576)	(0.478)	(0.328)	(0.802)	(0.927)	(0.0562)	(0.153)	(0.717)	(0.651)	(0.296)	(0.924)	(0.930)	(0.0604)
Education of parents	-0.0406	0.0512+	-0.0304	-0.00735	-0.0665	-0.00569	0.0403	-0.0547	0.0753+	-0.0150	-0.00562	-0.0687	-0.0205	0.0369
	(0.608)	(0.131)	(0.571)	(0.886)	(0.354)	(0.938)	(0.578)	(0.489)	(0.136)	(0.721)	(0.896)	(0.359)	(0.783)	(0.614)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	226	226	226	226	226	226	226	226	174	199	199	209	226	226

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.2: Individual treatment regression

Dependent variable	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
Sample								Individual treatment						
Older	0.270***	-0.179***	-0.0151	-0.0671	0.158*	0.113	-0.00381	0.303**	-0.183**	-0.0509	-0.0542	0.125	0.217*	-0.0388
	(0.00290)	(0.00413)	(0.761)	(0.296)	(0.0582)	(0.157)	(0.958)	(0.0180)	(0.0355)	(0.410)	(0.577)	(0.270)	(0.0600)	(0.706)
Female	0.0332	-0.0472	0.0121	0.00705	0.00702	0.122+	-0.0935	0.0413	-0.0485	0.0240	-0.00876	0.0148	0.125+	-0.0941
	(0.710)	(0.342)	(0.804)	(0.910)	(0.932)	(0.114)	(0.201)	(0.649)	(0.333)	(0.613)	(0.889)	(0.857)	(0.108)	(0.204)
Number of siblings	0.00363	-0.0103	-0.0167	0.0195	-0.00308	0.0371	-0.0450	0.00775	-0.0108	-0.0175	0.0166	-0.00317	0.0429	-0.0457
	(0.949)	(0.769)	(0.604)	(0.608)	(0.948)	(0.392)	(0.326)	(0.892)	(0.760)	(0.573)	(0.656)	(0.946)	(0.326)	(0.319)
Education of parents	-0.0783	0.104**	-0.0288	-0.0210	-0.0271	-0.0455	0.00968	-0.0801	0.104**	-0.0187	-0.0250	-0.0265	-0.0609	0.0140
	(0.397)	(0.0470)	(0.577)	(0.745)	(0.749)	(0.573)	(0.896)	(0.388)	(0.0479)	(0.705)	(0.696)	(0.755)	(0.455)	(0.852)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	117	117	117	117	117	117	117	117	117	117	117	117	117	117

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.3: Group treatment regression

Dependent variable	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
Sample	Group treatment													
Older	-0.0472	0.0783**	-0.0102	-0.0676	0.0277	-0.0977	0.0471	0.150	0.0550	-0.865***	0.0155	-0.215	0.228	0.105
	(0.603)	(0.0444)	(0.895)	(0.390)	(0.726)	(0.245)	(0.590)	(0.548)	(0.621)	(2.11e-06)	(0.786)	(0.322)	(0.325)	(0.627)
1 female	0.0459	0.00441	0.138		0.0514	0.0238	-0.0464	0.0806	0.0226	0.130		0.0920	0.0525	-0.0498
	(0.676)	(0.901)	(0.161)		(0.608)	(0.822)	(0.679)	(0.476)	(0.822)	(0.252)		(0.442)	(0.631)	(0.660)
2 females	0.00973	0.0548	0.117	-0.150	-0.0285	-0.0337	0.0788	0.0440	0.257	0.103	-0.0915*	0.00920	0.0112	0.0259
	(0.949)	(0.397)	(0.416)	(0.177)	(0.822)	(0.822)	(0.586)	(0.791)	(0.210)	(0.569)	(0.0671)	(0.956)	(0.946)	(0.865)
3 females	0.00434	0.110		-0.00415	-0.0741	0.0955	-0.0229	0.000309	0.156		-0.0135	0.0697	0.0307	-0.0867
	(0.979)	(0.284)		(0.972)	(0.545)	(0.543)	(0.873)	(0.999)	(0.459)		(0.814)	(0.700)	(0.852)	(0.548)
Endogenous treatment	-0.121	0.0434	0.0245	0.0712	-0.134	0.00964	0.0375	-0.243	-0.00533	-0.0721	0.974***	0.190	-0.244	0.186
	(0.302)	(0.283)	(0.797)	(0.537)	(0.175)	(0.926)	(0.728)	(0.332)	(0.972)	(0.759)	(0)	(0.392)	(0.260)	(0.360)
Number of siblings	-0.241***	0.0415*	0.103+	0.0957	0.0432	-0.155*	-0.175*	-0.252***	0.119+	0.108+	0.0397	0.0375	-0.153*	-0.196*
	(0.00399)	(0.0892)	(0.111)	(0.182)	(0.516)	(0.0714)	(0.0653)	(0.00497)	(0.138)	(0.150)	(0.167)	(0.652)	(0.0928)	(0.0504)
Education of parents	0.127	-0.0864	-0.0196	-0.0374	-0.287*	0.167	0.162	0.0824	-0.339+	-0.0209	-0.00573	-0.274+	0.159	0.160
	(0.473)	(0.286)	(0.893)	(0.800)	(0.0977)	(0.219)	(0.325)	(0.647)	(0.149)	(0.891)	(0.927)	(0.144)	(0.251)	(0.354)
Friends	-0.0692	-0.0139	0.00639	0.102	0.0473	-0.182*	0.0867	-0.0528	-0.0357	0.0274	0.0224	0.0114	-0.175+	0.142
	(0.526)	(0.658)	(0.946)	(0.248)	(0.614)	(0.0750)	(0.397)	(0.651)	(0.683)	(0.793)	(0.579)	(0.919)	(0.109)	(0.183)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	109	109	90	77	109	109	109	109	57	67	60	92	109	109

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.4: Younger regression

Dependent variable	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
Sample								Younger						
Group treatment	0.210**	-0.231***	0.0693	-0.0247	0.0436	0.100	0.0480	0.160	-0.169	0.0645	-0.0581	0.143	-0.149	0.0468
	(0.0316)	(0.000922)	(0.273)	(0.701)	(0.569)	(0.212)	(0.558)	(0.407)	(0.189)	(0.568)	(0.641)	(0.315)	(0.386)	(0.769)
Female	0.173*	-0.0303	0.0319	-0.163**	0.0581	0.0573	0.0578	0.213**	-0.0409	0.0347	-0.201***	0.0280	0.106	0.0953
	(0.0661)	(0.524)	(0.583)	(0.0138)	(0.427)	(0.459)	(0.461)	(0.0356)	(0.680)	(0.589)	(0.00583)	(0.730)	(0.192)	(0.250)
Number of siblings	-0.122+	0.00950	0.0469	0.0575	0.0463	-0.0913	-0.0734	-0.133*	0.00950	0.0557	0.0546	0.0453	-0.0997+	-0.0770
	(0.123)	(0.799)	(0.348)	(0.266)	(0.450)	(0.172)	(0.281)	(0.0988)	(0.903)	(0.293)	(0.272)	(0.488)	(0.142)	(0.257)
Education of parents	0.00717	0.0726*	-0.114	-0.0545	-0.170*	0.144+	0.0394	-0.00765	0.168+	-0.0917	-0.0558	-0.177*	0.142+	0.0255
	(0.952)	(0.0944)	(0.179)	(0.492)	(0.0891)	(0.149)	(0.696)	(0.949)	(0.104)	(0.288)	(0.480)	(0.0881)	(0.140)	(0.803)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	114	114	114	114	114	114	114	114	68	103	114	106	114	114

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.5: Older regression

Dependent variable	High reward	0 reward	1 rewards	3 rewards	4 rewards	5 rewards	0 rewards	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
Sample								Older						
Group treatment	-0.0778	0.0639	0.0325	-0.0334	-0.154+	-0.00699	0.0772	0.0794	0.0769	-0.496***	-0.410***	-0.258	0.203	0.0604
	(0.386)	(0.203)	(0.529)	(0.580)	(0.101)	(0.940)	(0.387)	(0.678)	(0.433)	(0)	(0)	(0.210)	(0.203)	(0.699)
Female	-0.115	-0.0164	0.114**	0.00116	0.0125	-0.0206	-0.121+	-0.104	-0.0119	0.0657**	-0.000395	0.0372	0.0146	-0.160*
	(0.167)	(0.708)	(0.0358)	(0.983)	(0.884)	(0.806)	(0.136)	(0.226)	(0.805)	(0.0409)	(0.992)	(0.693)	(0.867)	(0.0596)
Number of siblings	-0.0188	0.0141	0.00153	0.00266	-0.00874	0.0406	-0.0804	-0.00594	0.0121	-0.00786	0.00365	-0.0203	0.0553	-0.0752
	(0.714)	(0.602)	(0.959)	(0.936)	(0.863)	(0.407)	(0.165)	(0.912)	(0.690)	(0.631)	(0.862)	(0.707)	(0.269)	(0.201)
Education of parents	-0.0915	0.0149	0.0493	0.0339	0.0334	-0.141	0.0398	-0.100	0.0169	0.0226	0.0200	0.0381	-0.176+	0.0488
	(0.372)	(0.794)	(0.425)	(0.602)	(0.748)	(0.191)	(0.703)	(0.321)	(0.781)	(0.442)	(0.612)	(0.727)	(0.116)	(0.639)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	112	112	112	112	112	112	112	112	106	96	85	103	112	112

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.6: Endogenous treatment regression

Dependent variable	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 reward	1 rewards	2 rewards	3 rewards	4 rewards	5 rewards
Sample	Endogenous treatment													
Older	-0.0220	0.0549	0.00255	-0.0490	0.173+	-0.245*	0.128	-0.263		0.124	0.226	0.291+	-0.175	-0.284
	(0.873)	(0.465)	(0.980)	(0.760)	(0.130)	(0.0601)	(0.321)	(0.291)		(0.568)	(0.498)	(0.145)	(0.397)	(0.159)
1 female	0.132	-0.00891	0.124		0.189*	-0.0108	-0.0376	0.192	-0.0160	0.136		0.318**	-0.00951	-0.0151
	(0.322)	(0.895)	(0.230)		(0.0698)	(0.933)	(0.767)	(0.171)	(0.884)	(0.375)		(0.0273)	(0.941)	(0.905)
2 females	0.173	0.181				0.0674	0.183	0.214	0.217				0.0216	0.141
	(0.490)	(0.286)				(0.799)	(0.485)	(0.382)	(0.334)				(0.937)	(0.594)
Number of siblings	-0.0425	0.0134	-0.0328	0.117	0.0715	-0.161	0.0306	-0.0504	-0.00403	-0.0632	0.0784	0.0816	-0.202+	0.0105
	(0.762)	(0.855)	(0.754)	(0.536)	(0.423)	(0.213)	(0.808)	(0.740)	(0.973)	(0.726)	(0.749)	(0.177)	(0.136)	(0.936)
Education of parents	0.0887	-0.102	-0.000288	-0.0156	-0.155	0.148	0.109	0.0634	-0.238	0.0160	-0.0673	-0.0953	0.128	0.115
	(0.658)	(0.383)	(0.998)	(0.943)	(0.337)	(0.380)	(0.568)	(0.755)	(0.278)	(0.939)	(0.853)	(0.379)	(0.462)	(0.549)
Friends	-0.132	-0.0323	0.00653	0.328+	-0.155+	0.0119	0.0317	-0.164	-0.0356	0.0382	0.398	-0.143**	0.0668	0.0606
	(0.405)	(0.660)	(0.955)	(0.112)	(0.110)	(0.934)	(0.814)	(0.354)	(0.781)	(0.832)	(0.211)	(0.0392)	(0.672)	(0.668)
Faster formed group	0.0950	-0.0142	-0.0742	-0.0547	-0.165*	0.0640	0.193+	0.119	-0.0222	-0.162	-0.136	-0.145*	0.0735	0.209*
	(0.469)	(0.828)	(0.465)	(0.733)	(0.0776)	(0.593)	(0.104)	(0.382)	(0.835)	(0.322)	(0.572)	(0.0621)	(0.542)	(0.0749)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	56	56	52	30	52	59	59	56	38	34	21	45	59	59

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.7: Understood cheating possibility regressions

Dependent variable	High reward	High reward	High reward	High reward	High reward	High reward	High reward	High reward	High reward	High reward
Sample	Whole sample		Individuals		Groups		Younger		Older	
Older	0.260**	0.260**	0.254**	0.254**	0.144	0.414				
	(0.0416)	(0.0415)	(0.0485)	(0.0485)	(0.464)	(0.252)				
Female	-0.0115	-0.00376	0.0428	0.0428			0.116	0.137	-0.123	-0.124
	(0.909)	(0.971)	(0.753)	(0.753)			(0.460)	(0.409)	(0.333)	(0.330)
Group	0.121	0.156					0.179	0.125	-0.131	-0.189
	(0.393)	(0.391)					(0.281)	(0.568)	(0.357)	(0.327)
Older∗Group treatment	-0.273	-0.345								
	(0.219)	(0.246)								
Number of siblings	0.00585	0.00928	0.0725	0.0725	-0.142	-0.184	-0.133	-0.125	0.0643	0.0740
	(0.936)	(0.901)	(0.436)	(0.436)	(0.344)	(0.245)	(0.331)	(0.363)	(0.466)	(0.418)
Education of parents	0.113	0.117	0.0348	0.0348	0.647**	0.622*	0.0140	0.0204	0.139	0.151
	(0.359)	(0.344)	(0.794)	(0.794)	(0.0498)	(0.0666)	(0.940)	(0.913)	(0.390)	(0.361)
Endogenous treatment					0.183	0.456				
					(0.433)	(0.232)				
Friends					0.201	0.265				
					(0.319)	(0.221)				
Understood possibility of cheating	0.234**	0.226*	0.183	0.183	0.273	0.249	0.310*	0.292+	0.200	0.193
	(0.0436)	(0.0547)	(0.259)	(0.259)	(0.189)	(0.238)	(0.0785)	(0.111)	(0.246)	(0.262)
Class fixed effects	yes	no	yes	no	yes	no	yes	no	yes	no
Observations	93	93	57	57	36	36	46	46	47	47

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.8: Regressions of Understood cheating possibility on explanatory variables

Dependent variable	Understood cheating possibility									
Sample	Whole sample		Individuals		Groups		Younger		Older	
Older	0.221*	0.216*	0.195+	0.195+	-0.276	-0.444+				
	(0.0925)	(0.0997)	(0.105)	(0.105)	(0.180)	(0.103)				
Female	0.127	0.151+	0.316***	0.316***			0.206+	0.286**	0.0253	0.0218
	(0.190)	(0.131)	(0.00738)	(0.00738)			(0.131)	(0.0492)	(0.857)	(0.878)
Group	0.141	0.00339					0.0443	-0.185	-0.329**	-0.349*
	(0.306)	(0.984)					(0.768)	(0.345)	(0.0300)	(0.0668)
Older∗Group treatment	-0.507**	-0.423+								
	(0.0197)	(0.118)								
Number of siblings	-0.0925	-0.0805	-0.0389	-0.0389	-0.0441	-0.0800	0.139	0.161+	-0.224**	-0.221**
	(0.176)	(0.246)	(0.602)	(0.602)	(0.799)	(0.657)	(0.217)	(0.147)	(0.0140)	(0.0172)
Education of parents	-0.121	-0.109	-0.0475	-0.0475			0.0216	0.0455	-0.240	-0.237
	(0.287)	(0.345)	(0.675)	(0.675)			(0.896)	(0.785)	(0.150)	(0.162)
1 Female					-0.407*	-0.387+				
					(0.0986)	(0.131)				
2 Females					-0.159	0.0470				
					(0.627)	(0.899)				
3 Females					-0.241	-0.152				
					(0.496)	(0.676)				
Endogenous treatment					0.289	0.154				
					(0.249)	(0.594)				
Friends					0.293	0.373+				
					(0.219)	(0.149)				
Class fixed effects	yes	no	yes	no	yes	no	yes	no	yes	no
Observations	93	93	57	57	33	33	46	46	47	47

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.9: Randomization check

	Individual treatment	Group treatment	t-test p-value	Endogenous treatment	Exogenous treatment	F-stat p-value
Older	0.51	0.48	0.59	0.49	0.46	0.82
	(0.50)	(0.50)		(0.50)	(0.50)	
Female	0.53	0.50	0.70	0.46	0.56	0.53
	(0.50)	(0.50)		(0.50)	(0.50)	
Number of siblings	1.48	1.33	0.12	1.32	1.34	0.30
	(0.87)	(0.56)		(0.49)	(0.64)	
Education of parents	0.63	0.93	0.00	0.88	0.98	0.00
	(0.48)	(0.26)		(0.33)	(0.14)	
Education of father	4.50	4.27	0.04	4.24	4.31	0.11
	(0.93)	(0.74)		(0.82)	(0.65)	
Education of mother	4.38	4.28	0.36	4.21	4.35	0.44
	(0.93)	(0.65)		(0.71)	(0.56)	
Observations	117	109		59	50	

Table A.10: Correlation check

Variable	Older	Female	Number of siblings	Education of parents	Understood p. of cheating	Group
Older	1.0000					
Female	-0.0882	1.0000				
Number of siblings	0.1070	0.0586	1.0000			
Education of parents	-0.0365	0.0721	-0.0572	1.0000		
Understood pos. of cheating	-0.0168	0.1180	-0.1112	-0.1065	1.0000	
Group	-0.0357	-0.0253	-0.1027	0.3516*	-0.1239	1.0000

p-value – *** p<0.01, ** p<0.05, * p<0.1

Table A.11: Robustness check – Whole sample regression

Dependent variable	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards
Sample	Whole sample													
Older	1.445***	-2.638***	-1.015	-1.239*		-0.0342	-0.555	1.564**	-2.482**	-1.225	-1.089		0.574	-0.656
	(0.00104)	(0.00293)	(0.210)	(0.0700)		(0.953)	(0.347)	(0.0136)	(0.0423)	(0.229)	(0.311)		(0.499)	(0.416)
Female	0.168	-0.457	0.611	-0.926*		-0.0307	-0.264	0.267	-0.353	0.659	-1.083**		0.153	-0.245
	(0.576)	(0.412)	(0.263)	(0.0693)		(0.939)	(0.519)	(0.402)	(0.546)	(0.261)	(0.0475)		(0.725)	(0.585)
Group treatment	0.926**	-2.967***	0.341	-0.428		0.420	0.0795	0.640	-17.87	-0.233	-0.223		-0.528	-0.451
	(0.0247)	(0.00951)	(0.648)	(0.543)		(0.499)	(0.897)	(0.439)	(0.996)	(0.843)	(0.874)		(0.702)	(0.686)
Older∗Group treatment	-1.499**	4.279***	0.932	0.678		-0.262	0.676	-0.155	19.84	-14.21	-14.55		2.023	1.831
	(0.0158)	(0.00401)	(0.387)	(0.514)		(0.753)	(0.414)	(0.915)	(0.996)	(0.997)	(0.997)		(0.273)	(0.285)
Number of siblings	-0.329+	0.137	0.200	0.227		-0.0395	-0.418	-0.317+	0.139	0.143	0.282		0.0160	-0.397
	(0.117)	(0.736)	(0.562)	(0.496)		(0.880)	(0.162)	(0.142)	(0.739)	(0.696)	(0.408)		(0.953)	(0.201)
Education of parents	-0.186	1.225+	-0.0272	0.210		0.224	0.482	-0.265	1.204+	0.0537	0.234		0.160	0.464
	(0.632)	(0.105)	(0.967)	(0.723)		(0.645)	(0.356)	(0.503)	(0.114)	(0.938)	(0.702)		(0.748)	(0.388)
Constant	0.556	-0.525	-1.335+	-0.0884		-0.174	0.435	0.590	-0.797	-0.996	-0.808		-0.877	0.330
	(0.244)	(0.566)	(0.124)	(0.906)		(0.793)	(0.521)	(0.278)	(0.416)	(0.289)	(0.376)		(0.305)	(0.670)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	226	226	226	226	226	226	226	226	226	226	226	226	226	226

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.12: Robustness check – Individual treatment regression

Dependent variable	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards
Sample	Individual treatment													
Older	1.268***	-2.569***	-0.852	-1.173*		-0.121	-0.663	1.454**	-2.480**	-1.145	-0.965		0.590	-0.713
	(0.00341)	(0.00350)	(0.281)	(0.0845)		(0.837)	(0.261)	(0.0208)	(0.0430)	(0.260)	(0.363)		(0.489)	(0.378)
Female	0.189	-0.655	-0.581	0.0646		-0.0669	0.493	0.221	-0.716	0.146	-0.200		0.480	-0.615
	(0.649)	(0.350)	(0.317)	(0.934)		(0.918)	(0.375)	(0.599)	(0.314)	(0.853)	(0.763)		(0.397)	(0.296)
Number of siblings	0.0130	-0.159	-0.192	0.164		0.182	-0.247	0.0271	-0.163	-0.233	0.156		0.223	-0.248
	(0.961)	(0.744)	(0.693)	(0.673)		(0.543)	(0.487)	(0.918)	(0.738)	(0.642)	(0.687)		(0.467)	(0.486)
Education of parents	-0.357	1.561*	-0.211	0.00444		-0.126	0.232	-0.376	1.563*	-0.161	-0.0234		-0.188	0.255
	(0.416)	(0.0793)	(0.788)	(0.995)		(0.819)	(0.696)	(0.395)	(0.0803)	(0.839)	(0.972)		(0.736)	(0.671)
Constant	0.225	-0.365	-0.368	-0.284		-0.576	0.558	0.236	-0.569	-0.0927	-0.796		-1.171	0.444
	(0.685)	(0.734)	(0.715)	(0.740)		(0.448)	(0.463)	(0.694)	(0.611)	(0.931)	(0.418)		(0.207)	(0.594)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	117	117	117	117	117	117	117	117	117	117	117	117	117	117

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.13: Robustness check – Group treatment regression

Dependent variable	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards
Sample	Group treatment													
Older	-0.219	2.218*	-0.0850	-0.632		-0.619	-0.0111	0.809	20.66	-14.25	-16.87		2.148	1.639
	(0.637)	(0.0878)	(0.911)	(0.470)		(0.342)	(0.986)	(0.567)	(0.997)	(0.997)	(0.997)		(0.233)	(0.329)
1 female	0.259	0.0867	0.597	-16.48		-0.273	-0.490	0.413	0.000376	0.680	-18.32		-0.188	-0.465
	(0.648)	(0.947)	(0.516)	(0.990)		(0.730)	(0.537)	(0.495)	(1.000)	(0.515)	(0.994)		(0.828)	(0.610)
2 females	0.0733	1.318	0.913	-1.479		-0.0487	0.432	0.234	2.237	1.281	-2.696		0.336	0.501
	(0.924)	(0.429)	(0.472)	(0.350)		(0.966)	(0.669)	(0.789)	(0.221)	(0.438)	(0.153)		(0.799)	(0.689)
3 females	0.0952	2.111	-14.60	0.357		0.740	0.308	0.0934	1.175	-16.91	-0.794		-0.252	-0.538
	(0.908)	(0.293)	(0.992)	(0.785)		(0.498)	(0.772)	(0.919)	(0.568)	(0.995)	(0.674)		(0.839)	(0.667)
Endogenous treatment	-0.571	1.777	0.737	1.344		0.714	0.886	-1.075	-1.257	15.76	0.266		-1.993	0.445
	(0.338)	(0.211)	(0.413)	(0.254)		(0.367)	(0.251)	(0.436)	(0.583)	(0.997)	(1.000)		(0.291)	(0.793)
Number of siblings	-1.198***	1.083	0.456	0.433		-1.028+	-1.024+	-1.282***	1.396	0.407	0.354		-1.300*	-1.389*
	(0.00436)	(0.204)	(0.460)	(0.580)		(0.102)	(0.103)	(0.00526)	(0.199)	(0.578)	(0.699)		(0.0754)	(0.0631)
Education of parents	0.594	-0.524	1.043	0.857		2.252*	1.951+	0.418	-1.506	1.318	0.674		2.199+	2.004+
	(0.466)	(0.733)	(0.429)	(0.540)		(0.0783)	(0.126)	(0.637)	(0.378)	(0.390)	(0.682)		(0.102)	(0.145)
Friends	-0.337	-0.759	-0.276	0.560		-1.111	0.0156	-0.278	-0.574	0.215	0.712		-0.813	0.608
	(0.535)	(0.503)	(0.760)	(0.567)		(0.157)	(0.983)	(0.633)	(0.656)	(0.835)	(0.583)		(0.348)	(0.466)
Constant	2.523**	-5.243**	-2.620+	-2.111		-0.131	-0.578	2.344+	-21.14	-3.520	-1.261		-0.877	-1.325
	(0.0315)	(0.0475)	(0.143)	(0.329)		(0.937)	(0.726)	(0.127)	(0.997)	(0.163)	(0.661)		(0.690)	(0.527)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	109	109	109	109	109	109	109	109	109	109	109	109	109	109

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.14: Robustness check – Younger regression

Dependent variable	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards
Sample								Younger						
Group treatment	0.907**	-3.132***	0.379	-0.517		0.156	-0.0728	0.418	-16.21	-0.165	-0.139		-1.083	-0.908
	(0.0358)	(0.00713)	(0.632)	(0.496)		(0.815)	(0.911)	(0.630)	(0.991)	(0.896)	(0.926)		(0.451)	(0.440)
Female	0.743*	-0.734	-0.0142	-1.607**		-0.0537	-0.0242	0.917**	-0.392	0.248	-1.571*		0.479	0.440
	(0.0689)	(0.333)	(0.985)	(0.0299)		(0.933)	(0.969)	(0.0395)	(0.623)	(0.762)	(0.0514)		(0.505)	(0.531)
Number of siblings	-0.515+	-0.249	0.190	0.195		-0.739	-0.652	-0.573+	-0.272	0.261	0.230		-0.811	-0.648
	(0.134)	(0.690)	(0.757)	(0.737)		(0.170)	(0.221)	(0.106)	(0.673)	(0.686)	(0.707)		(0.160)	(0.249)
Education of parents	0.0433	1.986**	-0.0754	0.469		1.757*	1.058	-0.0312	1.947**	0.0744	0.378		1.849*	1.005
	(0.933)	(0.0383)	(0.929)	(0.567)		(0.0564)	(0.172)	(0.953)	(0.0432)	(0.935)	(0.657)		(0.0508)	(0.209)
Constant	0.329	-0.349	-0.910	0.0611		-0.349	0.283	0.485	-0.698	-0.932	-0.728		-1.141	0.0514
	(0.611)	(0.772)	(0.425)	(0.954)		(0.753)	(0.774)	(0.493)	(0.576)	(0.458)	(0.536)		(0.368)	(0.962)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	114	114	114	114	114	114	114	114	114	114	114	114	114	114

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Table A.15: Robustness check – Older regression

Dependent variable	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards	High reward	0 rewards	1 reward	2 rewards	3 rewards	4 rewards	5 rewards
Sample								Older						
Group treatment	-0.428	1.741+	1.062	0.223		0.573	0.889+	0.461	2.434	-13.54	-14.14		1.924+	1.364
	(0.396)	(0.101)	(0.206)	(0.786)		(0.355)	(0.145)	(0.703)	(0.192)	(0.995)	(0.995)		(0.129)	(0.303)
Female	-0.639	-0.237	1.443+	0.00208		-0.150	-0.548	-0.606	-0.177	1.485+	-0.303		-0.139	-0.858
	(0.166)	(0.789)	(0.104)	(0.998)		(0.782)	(0.332)	(0.212)	(0.850)	(0.124)	(0.698)		(0.809)	(0.168)
Number of siblings	-0.121	0.320	0.0944	0.0543		0.204	-0.341	0.322	-0.0531	-0.159	0.140		0.290	-0.292
	(0.663)	(0.566)	(0.837)	(0.901)		(0.506)	(0.370)	(0.855)	(0.582)	(0.757)	(0.756)		(0.361)	(0.465)
Education of parents	-0.574	0.0353	0.673	0.298		-0.616	0.0890	-0.644	0.0442	0.622	0.404		-0.755	0.185
	(0.377)	(0.978)	(0.584)	(0.753)		(0.326)	(0.901)	(0.323)	(0.973)	(0.612)	(0.674)		(0.243)	(0.803)
Constant	2.326***	-2.783*	-3.246**	-1.493		-0.104	0.106	2.398***	-2.779+	-2.820*	-1.992+		-0.0563	-0.0770
	(0.00268)	(0.0693)	(0.0295)	(0.182)		(0.888)	(0.895)	(0.00462)	(0.104)	(0.0607)	(0.123)		(0.944)	(0.934)
Class fixed effects	no	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes	yes
Observations	112	112	112	112	112	112	112	112	112	112	112	112	112	112

p-value – *** p<0.01, ** p<0.05, * p<0.1, + p<0.15

Appendix B

Questionnaires - English translation

Institute of Economic Studies – Charles University

Environment and you?

All of the information will be used anonymously and for the research purposes only

Please, fill in the questionnaire carefully!

Circle the correct answer!

a. Your age _____

b. Boy / girl

c. Father's highest education level - university / college / secondary school / vocational school / primary school

d. Mother's highest education level - university / college / secondary school / vocational school / primary school

e. Number of siblings _____

Number of older sisters _____ Number of younger sisters _____

Number of older brothers _____ Number of younger brothers _____

f. Parents live: together / separated

1. Are you interested in environmental protection?
    a. Yes.
    b. Yes, a little.
    c. Not so much.
    d. No.
    e. I do not know.

2. Do you know what exactly does environment mean?
    a. Environment is a place where I live.
    b. The complex of physical, chemical, and biotic factors (as climate, soil, and living things) that acts upon an organism or an ecological community and ultimately determine its form and survival.
    c. Environment is a complex of all external components both animate and inanimate – that surround us.
    d. Other - _____

    _____

    _____

3. Assign importance to the following choices according to your preferences:

a. Economic performance	1. _____
b. Environmental protection	2. _____
c. Search for alternative sources of energy	3. _____
d. Protection of human rights	4. _____
e. Global peace	5._____

4. Are you satisfied with the environmental conditions of your place of residence?
    a. Yes
    b. No

5. If not, choose or describe the environmental problems of your place of residence?
    a. Air pollution (e.g. smog)
    b. Too many cars
    c. Lack of green vegetation
    d. Noise
    e. Dirty streets
    f. other: _____

6. What does the term "recycling" stand for?
    a. Recycling is the process of re-using a given product.
    b. Recycling is the place where oversized waste can be taken
    c. Recycling is the complex of animate organisms.
    d. Recycling is lowering of the impacts of nature devastation caused by the humankind.

7. Assign a colour of waste container to a specific type of waste.

a. Blue	1. Plastic
b. Green	2. Clear glass
c. Yellow	3. Hazardous waste
d. Red	4. Paper
e. White	5. Coloured glass

8. Which waste do you sort?

a. Plastic	b. Glass	c. Paper
d. Batteries	e. Chemicals (e.g. drugs)	f. Eggshells
g. Juice & milk packages	h. Metals	i. Bio-waste

9. How many kilograms of waste does an average person in the Czech Republic produce?
    a. 150-200kg
    b. 200-250kg
    c. More than 250kg

10. How to recycle a light bulb?
    a. Bring it back to an electronics store or to a civic amenity site.
    b. Throw it to a green garbage bin for glass.
    c. Throw it to a composite waste bin.
    d. Throw it to either a green garbage bin for glass or a composite waste bin.

11. Do you consider sorting of waste to be important?
    a. Yes.
    b. No.
    c. I do not know.

12. Write 3 reasons why sorting of waste is or is not important.

    _____

    _____

    _____

13. Is environmental education at your school sufficient?
    a. Yes.
    b. No.

14. Do you consider environmental education important?
    a. Yes.
    b. No.

15. Estimate how many litres of water are used by an average person in the Czech Republic per day.
    a. around 50 l
    b. around 130 l
    c. around 300 l

16. Which country in the EU uses renewable energy sources the most?
    a. Sweden
    b. Denmark
    c. Austria

17. Estimate how many litres of water are needed to produce 0.2 l of orange juice?
    a. 15 litres
    b. 1 litre
    c. 50 litres
    d. 170 litres

What number did you throw on a dice? _____

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Environment and you?

All of the information will be used anonymously and for the research purposes only

Please, fill in the questionnaire carefully!

Circle the correct answer!

a. Your age _____

b. Boy / girl

c. Father's highest education level - university / college / secondary school /

vocational school / primary school

d. Mother's highest education level - university / college / secondary school /

vocational school / primary school

e. Number of siblings _____

Number of older sisters _____ Number of younger sisters _____

Number of older brothers _____ Number of younger brothers _____

f. Parents live: together / separated

g. In this group you have (Total count has to be equal to the number of group members):

- Best friend 0 / 1 / 2
- Friend 0 / 1 / 2
- Classmate, we do not know each other very well 0 / 1 / 2

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Environment and you?

All of the information will be used anonymously and for the research purposes only

Please, fill in the questionnaire carefully!

Circle the correct answer!

a. Your age _____

b. Boy / girl

c. Father's highest education level - university / college / secondary school /

vocational school / primary school

d. Mother's highest education level - university / college / secondary school /

vocational school / primary school

e. Number of siblings _____

Number of older sisters _____ Number of younger sisters _____

Number of older brothers _____ Number of younger brothers _____

f. Parents live: together / separated

7. If you could choose group members, would you choose the same members or others?

a) I would choose one other group member
b) I would choose two other group members
c) I would not change it

g. In this group you have (Total count has to be equal to the number of group members):

- Best friend 0 / 1 / 2
- Friend 0 / 1 / 2
- Classmate, we do not know each other very well 0 / 1 / 2

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Environment and you?

All of the information will be used anonymously and for the research purposes only

Please, fill in the questionnaire carefully!

Circle the correct answer!

1. Are you interested in environmental protection?
    a. Yes.
    b. Yes, a little.
    c. Not so much.
    d. No.
    e. I do not know.

2. Do you know what exactly does environment mean?
    a. Environment is a place where I live.
    b. The complex of physical, chemical, and biotic factors (as climate, soil, and living things) that acts upon an organism or an ecological community and ultimately determine its form and survival.
    c. Environment is a complex of all external components both animate and inanimate – that surround us.
    d. Other - _____

    _____

    _____

3. Assign importance to the following choices according to your preferences:

a. Economic performance	1. _____
b. Environmental protection	2. _____
c. Search for alternative sources of energy	3. _____
d. Protection of human rights	4. _____
e. Global peace	5._____

4. Assign a colour of waste container to a specific type of waste.

a. Blue	1. Plastic
b. Green	2. Clear glass
c. Yellow	3. Hazardous waste
d. Red	4. Paper
e. White	5. Coloured glass

5. Which waste do you sort?

a. Plastic	b. Glass	c. Paper
d. Batteries	e. Chemicals (e.g. drugs)	f. Eggshells
g. Juice & milk packages	h. Metals	i. Bio-waste

6. How many kilograms of waste does an average person in the Czech Republic produce?
    a. 150-200kg
    b. 200-250kg
    c. More than 250kg

7. How to recycle a light bulb?
    a. Bring it back to an electronics store or to a civic amenity site.
    b. Throw it to a green garbage bin for glass.
    c. Throw it to a composite waste bin.
    d. Throw it to either a green garbage bin for glass or a composite waste bin.

8. Do you consider sorting of waste to be important?
    a. Yes.
    b. No.
    c. I do not know.

9. Write 3 reasons why sorting of waste is or is not important.

_____

_____

_____

_____

10. Is environmental education at your school sufficient?
    a. Yes.
    b. No.
    c. We do not know

11. Do you consider environmental education important?
    a. Yes.
    b. No.
    c. We do not know

12. Estimate how many litres of water are used by an average person in the Czech Republic per day.
    a. around 50 l
    b. around 130 l
    c. around 300 l

13. Which country in the EU uses renewable energy sources the most?
    a. Sweden
    b. Denmark
    c. Austria
    d. Netherlands

14. Estimate how many litres of water are needed to produce 0.2 l of orange juice?
    a. 15 litres
    b. 1 litre
    c. 50 litres
    d. 170 litres

What number did you throw on a dice? _____