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The Development of Egalitarianism, Altruism, Spite and Parochialism in Childhood and Adolescence

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Abstract

We study how the distribution of other-regarding preferences develops with age. Based on a set of allocation choices, we can classify each of 717 subjects, aged 8 to 17 years, as either egalitarian, altruistic, or spiteful. Varying the allocation recipient as either an in-group or an out-group member, we can also study how parochialism develops with age. We find a strong decrease in spitefulness with increasing age. Egalitarianism becomes less frequent, and altruism much more prominent, with age. Women are more frequently classified as egalitarian than men, and less often as altruistic. Parochialism first becomes significant in the teenage years.

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Keywords: other-regarding preferences, egalitarianism, altruism, spite, parochialism, experiments with children and adolescents.

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1. Introduction

Other-regarding preferences are a fundamental cornerstone in the human ability to cooperate in large groups of genetic strangers (Bowles, 2004; Boyd and Richerson, 2005). This raises the important question how other-regarding preferences develop in human life, in particular examining the age at which other-regarding behavior sets in. Recent research has focused on the development of the upside of other-regarding preferences by showing that egalitarianism (Fehr, Bernhard and Rockenbach, 2008) and efficiency concerns (Almås et al., 2010) become more prominent as children and teenagers get older. However, theory suggests that other-regarding behavior in groups may co-evolve with parochialism, a potentially harmful downside of other-regarding preferences (Choi and Bowles, 2007). The development of parochialism – implying in-group favoritism and out-group hostility – has received little attention so far (see Bernhard, Fischbacher and Fehr, 2006; Goette, Huffman and Meier, 2006, for studies with adults). The same holds true for the development of spitefulness, a human trait that leads to punishment against cooperative group members. While spitefulness seems to be a robust phenomenon of a non-negligible minority of adult subjects (Falk, Fehr and Fischbacher, 2005; Herrmann, Thöni and Gächter, 2008), nothing is known so far about the relative frequency of spiteful behavior in childhood and adolescence and how it might change with age.

In this paper, we study in a unified framework how both benevolent and malevolent other-regarding preferences develop in a sample of 717 subjects aged 8 to 17 years. We allow each subject to make three simple allocation choices from which we can infer her preference type as either egalitarian, altruistic, or spiteful. Egalitarian types prefer allocations that yield equal payoffs for both parties over those with unequal payoffs. Altruistic types value the other person's payoff positively, and spiteful types put a negative value on the other person's payoff. We also vary whether the recipient of the allocation is an in-group or an out-group member, in order to study parochialism and how it develops with age. We find a strong decrease of spitefulness with increasing age. Egalitarianism becomes less frequent and altruism much more prominent with age, implying that the choice of the pie-maximizing allocation increases with age. Women are more frequently classified as an egalitarian type than men are, and less often as altruistic. Interestingly, parochialism in the form of a worse treatment of out-group members, compared to in-group members, emerges and first becomes significant in the teenage years. Hence, while altruism becomes more important in adolescence, we observe more discrimination against out-group members at the same time.

Studying the benevolent and malevolent aspects of other-regarding preferences is important because knowledge about other-regarding preferences is key in designing institutions and their associated incentives. In particular, egalitarianism (i.e., inequality aversion) and reciprocity are likely to be important in employer-employee relationships in labor markets (Bewley, 1998). Negative other-regarding preferences – like spite – have been found to be influential on behavior as well, for instance by inducing sabotage in tournaments (Harbring and Irlenbusch, 2010). Beyond influencing behavior in small-scale groups, other-regarding preferences may also shape a society decisively by affecting decisions on social welfare, tax evasion (Fortin, Lacroix and Villeval, 2007), or charity (Vesterlund, 2003).

While many studies have examined other-regarding preferences in adults (see Camerer, 2003, for a survey), much less is yet known about how these preferences develop with age, in particular before humans enter working life. Studying the development of other-regarding preferences is interesting for several reasons. First, from a theoretical perspective, it can illuminate how models of economic behavior (e.g., Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Charness and Rabin, 2002) can account for the behavior of children and teenagers. These models were developed on the basis of experimental evidence from adult subjects, but it is unclear whether adult behavior is the consequence of any directional development in the prevalence of other-regarding preferences. The fact that economic decision making "may well change over the long term, with changes in age, education, political and religious beliefs, and other characteristics" (Bolton and Ockenfels, 2000, p. 171) has been well acknowledged. In our paper, we hope to contribute to a more detailed understanding of how age influences distributional preferences. Second, from an applied perspective, knowing more about the different types of other-regarding preferences and their intensity in childhood and adolescence can provide a benchmark against which adult behavior can be measured. A comparison of the intensity of benevolent other-regarding preferences observed in adulthood compared to childhood and adolescence is of great interest. If it is stronger in adulthood, this would imply that socialization in the teenage years should be considered as helpful for promoting efficient interactions in the workplace; if it is weaker, humans would seem to "lose" efficiency-promoting other-regarding preferences in the transition from childhood to adult age. Finally, from a policy perspective, if other-regarding preferences were to be found to be susceptible to policy interventions in education – a question that is still open to thorough investigation – knowing the distribution and the developmental changes of other-regarding preferences during childhood and adolescence would be a prerequisite for any kind of intervention.

The economic decision making of children and adolescents has received increasing attention in recent years. William Harbaugh and Kate Krause pioneered the systematic investigation of how children make economic decisions in a wide array of domains, such as rationality in revealed preferences (Harbaugh, Krause and Berry, 2001), risk taking (Harbaugh, Krause and Vesterlund, 2002), or trust and trustworthiness (Harbaugh et al., 2003b). As far as other-regarding preferences in children and teenagers are concerned, the overall evidence seems to suggest that humans become less selfish as they age (Murnighan and Saxon, 1998; Harbaugh, Krause and Liday, 2003a; Benenson, Pascoe and Radmore, 2007; Sutter and Kocher, 2007; Gummerum et al., 2008, 2010). These studies, however, have concentrated on a binary classification of more or less selfish behavior, preventing the classification of subjects into different types of other-regarding preferences and, hence, leaving the investigation of how the distribution of types changes with age open.

Fehr et al. (2008) took a first step in classifying different types of children's other-regarding preferences by devising three simple allocation tasks from which they can infer a subject's type as egalitarian, altruistic, or spiteful. Their experiment with 229 children aged 3 to 8 shows that egalitarianism (i.e., inequality aversion) develops strongly between the ages of 3 and 8. While selfishness clearly dominates in 3-year-olds, many 7 to 8-year-olds prefer egalitarian allocations. More precisely, about 60% of children aged 7 to 8 can be classified as having egalitarian preferences, while the corresponding share for 3 to 4-year-olds is only 20%. We use the experimental design of Fehr et al. (2008) and extend their analysis to adolescence in order to study how the transition to adulthood shapes subjects' other-regarding preferences. This will allow us to bridge the gap between children (as in Fehr et al., 2008) and adults.

The age span considered in our paper is similar to that investigated in a recent paper by Almås et al. (2010) on the development of inequality acceptance. They ran experiments with 486 subjects, aged 10 to 18, who had to make distributional choices in modified dictator games where the pie to be distributed could depend – in addition to own productivity – on luck and the efficiency of giving away money to the recipient. They found that older children are more willing to accept inequalities when the latter are the consequence of individual achievements; furthermore, they care more about efficiency than younger children do. Overall, their findings imply that children's fairness norms evolve from favoring equality in their youngest cohort of 10-year-olds (similar to 8-year-olds in Fehr et al., 2008) to favoring equity in the older age groups. Compared to Almås et al. (2010), our design also allows us to study the development of spitefulness and, in particular, the influence of parochialism.

Studying both spite and parochialism will shed light on the malevolent side of other-regarding preferences. This is also important from a theoretical point of view, since recent evolutionary theories suggest that prosocial behavior (i.e., the benevolent side) and parochialism (i.e., the malevolent side of other-regarding preferences) evolve jointly (Choi and Bowles, 2007). An examination of common developmental origins of the benevolent and malevolent aspects of other-regarding preferences is therefore of great interest.

The rest of the paper is organized as follows. We introduce the experimental design and procedure in section 2. Section 3 presents the results, and section 4 concludes the paper.

2. Experimental design and procedure

2.1. Design

Participants in our study had to make decisions in three simple allocation tasks that we will refer to as games below.[1] Each participant was matched with one anonymous partner from the same age cohort, and had to choose between two allocations that assigned money between the two players.

The **prosocial** game offered a choice between the allocation (1,1) – that is, 1 point for the decision maker, 1 point for the recipient – and the allocation (1,0). This game serves as a measure of the most basic form of prosociality, namely the willingness to avoid advantageous inequality for the benefit of the partner. Importantly, prosociality in this game has no costs for the decision maker, enabling various different motives to drive the choice (1,1): an egalitarian preference that avoids inequalities (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), efficiency-seeking (Charness and Rabin, 2002), a desire to maximize the payoff of the worst-off subject (maximin; Rawls, 1974), or even self-interested behavior because a purely self-interested individual would randomly choose between the two allocations as she receives one point regardless of her decision.

In the **envy** game, the decision maker had to choose between allocations (1,1) and (1,2). As in the prosocial game, the decision maker can increase the partner's payoff at no cost to herself, but now this choice results in disadvantageous inequality. Looking at a subject's pattern of choices in both the prosocial and the envy games allows distinguishing inequality

[1] Of course, the allocation tasks are not interactive games, but rather individual decision making tasks. However, for notational convenience, we prefer the term "game" for the three different tasks.

aversion from a motive to be altruistic towards the partner by increasing his payoff, or from a motive of spite that minimizes the partner's payoffs. If an individual wants to avoid inequality, she chooses (1,1) in both games. An altruistic individual who cares for the partner's payoff, however, would choose (1,1) in the prosocial game and (1,2) in the envy game. A spiteful individual, finally, would pick (1,0) in the prosocial game and (1,1) in the envy game.

The **sharing** game let subjects choose between allocations (1,1) and (2,0). Contrary to the previous games, the egalitarian choice of (1,1) is costly for the decision maker and thus indicates a strong form of inequality aversion. Note that the prediction for a selfish decision maker implies unambiguously the choice of (2,0) in this game, while picking the egalitarian option clearly indicates prosocial behavior.

Considering a subject's pattern of choices across all three games allows the classification of different types of other-regarding preferences. In particular, we will classify subjects into five behavioral types. *Strongly egalitarian* subjects pick the egalitarian allocation (1,1) in all three games. *Weakly egalitarian* subjects choose the egalitarian allocation in all games except the sharing game, where egalitarian behavior is costly. *Strongly altruistic* subjects always select the allocation that maximizes the partner's payoff. *Weakly altruistic* subjects opt for the allocation that maximizes the partner's payoff in all games except the sharing game. Finally, *spiteful* subjects always prefer the allocation that minimizes the partner's payoff. Table 1 summarizes the classification of subjects.

Table 1 about here

In order to study the development of parochialism, we implemented an **in-group** and an **out-group** condition across subjects. While the recipient in the in-group condition was known to be from the same class (his or her identity remained secret, of course), the recipient in the out-group condition attended another school, but was in the same grade. This was common knowledge to students (see the instructions in the Appendix). The in-group condition was implemented in two different ways. In the "*in-group all*" condition, all students from a respective class participated once as sender to another in-group member and once as recipient of a transfer from another in-group member in the experiment. In contrast, only half of the students from a respective class participated in the experiment as sender the "*in-group half*" condition, while the remaining students acted as recipients of the senders' transfers and thus

did not make any decisions. We chose the in-group all condition as a method to collect more data from our subject pool.[2]

2.2. Subject pool and procedure

This experiment was part of a 2-year project run in seven schools in Tyrol, which is a federal state in western Austria. The project was approved by the State Board of Education in Tyrol, and the headmasters of participating schools gave permission to conduct several experiments in intervals of two to three months. These experiments were run in class during regular school hours. We randomly selected several classes in the 3rd, 5th, 7th, 9th, and 11th grades at the beginning of the project, and followed them for two school years. Parents were informed about the project, which was described as a scientific project that studies decision making in children and teenagers, but without revealing any details on any of the experiments. All students except five received their parent's permission to participate in the project. Besides asking parents for consent, we also solicited each student's willingness to participate in the experiments. No single student dissented. This whole procedure constitutes a particularly noteworthy feature of our experiment, as it avoids any kind of problems due to self-selection into an experiment. Self-selection is absent in our study, thus distinguishing it from previous experiments with children and teenagers.

This experiment was run in June 2008. It was carefully explained in class, and all participants had to answer two control questions to check their understanding before starting the experiment (see Appendix). We proceed in our analysis with those 717 participants in the role of a decision maker who answered both questions correctly, and exclude 35 other decision makers with incorrect answers from the following analysis (see Table 2).[3]

Table 2 about here

The points earned in the experiment were converted into Euros for payment. The exchange rate was made proportional to the average weekly pocket money within each grade

[2] Separate χ^2-tests for each age group and game reveal that no significant differences between the two in-group conditions could be observed (see Table A1 in the Appendix), allowing us to pool the data from both conditions.

[3] It is important to note that none of the results presented below would change in substance (and significance levels) if the 35 excluded subjects were included in the analysis. It is also noteworthy that in addition to the 752 decision makers, we had 443 subjects as passive recipients of the decision makers' choices. Recall that 309 subjects (out of the 752 decision makers) participated in the in-group all condition where they were both active decision makers and passive receivers.

(see Table 3). This approach was taken to ensure that the marginal incentives were comparable across grades.

Table 3 about here

Finally, we would like to mention that the use of one-shot games under anonymity, as in this study, is a key factor in distinguishing prosocial behavior from purely selfish motives. Selfish motives may also play a role in repeated interaction or face-to-face contacts, meaning that subjects behave prosocially just to benefit in future interactions. This is ruled out in our study.

3. Experimental results

Below we will first analyze behavior in single games, followed by the pattern of other-regarding preferences that emerges when all three decisions of a subject are considered. Within each subsection, we proceed with an analysis that addresses the influence of (i) age, (ii) parochialism, and (iii) gender.

3.1. Behavior in single games

(i) Age. Figure 1 shows the relative frequency of choosing the egalitarian allocation (1,1) in each game across our five different age cohorts. The figure pools data from the in-group and out-group conditions as well as from girls and boys, in order to present the overall pattern of results. Figure 1 reveals important and systematic behavioral changes across age. In the prosocial game, the relative frequency of choosing (1,1) over (1,0) increases monotonically with age. Almost 90% of 16- to 17-year-olds choose the egalitarian allocation, while only 54% of 8- to 9-year-olds do so. An inverse pattern is found for the envy game. Here we note a marked decline of the egalitarian choice from 80% for 8- to 9-year-olds to 40% for 16- to 17-year-olds. Hence, the altruistic allocation of (1,2) is much more frequently chosen at older ages, indicating that tolerance towards disadvantageous inequality increases in older subjects (which is similar to the main finding in Almås et al., 2010). We do not find a monotonic age effect in the sharing game. On average, only around 10% of subjects in each age group choose the (costly) egalitarian allocation (1,1) over (2,0). Hence, when it costs money, the egalitarian

choice is selected much less frequently than when it is not costly. Table 4 presents the results of probit regressions for the three games in which the decision to choose the egalitarian allocation (1,1) is the dependent variable. As independent variables, we consider a dummy for *female* and *in-group*, as well as the ordinal variable *agegroup* for our five age cohorts (with *agegroup* = 0, 1, 2, 3, 4 for grades 3, 5, 7, 9, 11). The results in Table 4 reveal a significantly positive age effect for the prosocial game and a negative one for the envy game.

Figures 1 – 3 and Table 4 about here

(ii) Parochialism. Figure 2 illustrates the effects of parochialism. Panel (a) shows that the egalitarian allocation of (1,1) is chosen more frequently in the in-group than in the out-group from the age of 12 to 13 years onward in the prosocial game. While Table 4 presents a significant main effect of *in-group*, adding an interaction term *in-group*agegroup* to the specification in Table 4 reveals that the in-group effect is significant only from the age of 12 years on ($p < 0.05$). This additional specification is included in Table A2 in the Appendix.[4] Panel (b) reveals that the decline in the relative frequency of choosing (1,1) is much steeper for the in-group than the out-group condition in the envy game. This indicates that as subjects get older, they are relatively more willing to accept disadvantageous inequality in the in-group than in the out-group condition. The in-group effect – while non-significant in the main specification of Table 4 – is weakly significant for the oldest two age groups of 14- to 15- and 16- to 17-year-olds ($p < 0.1$; see Table A2 in the Appendix). In the sharing game in panel (c), we note that sharing is, in general, more frequently observed in the in-group than in the out-group condition. This difference is significant from the age of 10 to 11 years onwards ($p < 0.05$; see Table A2).[5]

(iii) Gender. Figure 3 presents the behavior of girls and boys in the three games. While there is no clear cut pattern of gender differences at the aggregate level in the prosocial game in panel (a), girls are always more likely to choose the egalitarian allocation (1,1) in the envy game in panel (b). Table 4 illustrates that the gender effect is significant, and an extended model that includes an interaction term of *female*agegroup* shows that the gender effect is

[4] We do not present the extended models with interaction terms in the main body of the text for reasons of succinctness. It is noteworthy that the extended models shown in the appendix have a worse fit – according to AIC (Akaike information criterion) and BIC (Bayesian information criterion) – than the models shown in Table 4.

[5] Note that panel (c) of Figure 2 cannot perfectly convey this significant in-group effect in the sharing game, especially for 14- to 15-year-old teenagers, since the multiple regression model can control more appropriately for the variation in the data than the figure can.

present and significant in each single age group ($p < 0.05$; see Table A3 in the appendix). Girls are also more likely to choose (1,1) in the sharing game in each age group, except in the oldest one, as can be seen in panel (c) of Figure 3. We note from Table A3 that the gender difference is significant for the three youngest age groups, i.e., up to the age of 12 to 13 years.

3.2. Distribution of other-regarding preference types – Behavior across all three games

Recall from Table 1 the classification of other-regarding preference types from a subject's pattern of choices across all three games. While the three games allow for 8 different choice patterns, it is reassuring to note that the five types listed in Table 1 cover the vast majority of subjects. In the data presented in figures 4 to 6, between 91% and 100% of subjects belong to one of these 5 types. Note also that strongly egalitarian and strongly altruistic types are rare, meaning that three types (spiteful, weakly altruistic, and weakly egalitarian) characterize the large majority (of at least 76%) of subjects. The infrequency of strong types (versus weak types) leads us to pool strongly and weakly egalitarian types, or strongly and weakly altruistic types, in the regressions reported in Table 5.

Figures 4 – 6 and Table 5 about here

(i) Age. Figure 4 shows that the relative frequency of egalitarian and spiteful types decreases typically with age, while altruistic types become more frequent with age. The modal type is the spiteful one for 8- to 9-year-olds, while it is the weakly altruistic type for the 16- to 17-year-olds. Table 5 presents probit regressions for each type, confirming a significantly positive effect of age on altruism, and a significantly negative effect on spitefulness and egalitarianism ($p < 0.01$ in each case).

(ii) Parochialism. Comparing the upper and lower panels in Figure 5 reveals that spiteful types are always more frequent in the out-group condition than in the in-group condition. An extended probit regression (shown in Table A4 in the appendix) shows that parochialism becomes significant from the age of 10 to 11 years onwards ($p < 0.051$ for each age group in this range). For altruistic types, we find significant parochialism in 14- to 15- and 16- to 17-year-olds ($p < 0.055$ for both age groups; see Table A4). Egalitarian types are the only group for which we do not observe any significant difference between the in-group and out-group conditions.

(iii) Gender. Figure 6 shows marked gender differences. We note a larger fraction of egalitarian types and a smaller fraction of altruistic types in girls than in boys for each single age group. These main effects of gender are documented in Table 5 and also in Table A5, with the latter showing that these gender differences in altruism and egalitarianism prevail in all age groups except the 8- to 9-year olds ($p < 0.05$). The only group that fails to show any significant gender differences is that of spiteful types.

4. Conclusion

We studied how egalitarianism, altruism, spitefulness and parochialism change in late childhood and adolescence. Using a sample of 717 students, and avoiding any kind of self-selection into the experiment, we find significant changes in the distribution of other-regarding preferences from the age of 8 to 9 years until the age of 16 to 17 years. While previous studies have found that egalitarianism increases sharply in 3- to 8-year-old children (Fehr et al., 2008), this motive loses its dominance in adolescence when the altruistic type becomes prevalent. This strong development of altruism in adolescence contributes to an increase in overall efficiency, which is an important prerequisite for smooth interactions later on as adults in the workplace. The tendency to accept disadvantageous inequality more often later on in adolescence is a mirror finding and confirmation of the recently published work of Almås et al. (2010). The relatively strong decline in egalitarian motives is an important qualification of the earlier results by Fehr et al. (2008) for 3- to 8-year-old children, where egalitarianism is the overarching motive for 8-year-olds. Our study shows that egalitarianism peaks around the age of 8-11 years. Inequality aversion in dictator games may thus be a more influential motive relatively early on in life, i.e., in late childhood, while altruistic motives become more important in adolescence. In our design, altruism is associated with the motive of maximizing the sum of payoffs, a concern that the theory of Charness and Rabin (2002) stresses. Our evidence suggests that their theory becomes relatively more suitable as an explanation for human behavior when subjects reach their later teenage years.

We find that the frequency of spiteful behavior decreases strongly with age. The incidence of spiteful behavior among the oldest adolescents in our study is fairly similar to that observed in adults (Falk et al., 2005; Herrmann et al., 2008), indicating that the significant changes in the prevalence of spite occur in adolescence and have been captured in our study.

With respect to gender differences, we found that girls are significantly more likely to have egalitarian preferences than boys. In the age group of 16- to 17-year-olds, roughly one-third of women can be classified as egalitarian, while this is true for less than 20% of men. This gender difference with respect to egalitarianism fits with the data of Almås et al. (2010) for teenagers, but also with Güth, Schmidt and Sutter (2007) who have shown in a large-scale newspaper experiment with several thousand adult participants that women care more for egalitarian distributions of a pie than men. In our experiment, it is important to note, however, that the preference for egalitarian allocations becomes weaker in both men and women as they get older. The share of altruistic types increases with age, and it is always significantly higher for men than women. No gender differences have been found with respect to the fraction of spiteful types.

A particularly noteworthy finding of our study is the fact that parochialism – i.e., the differential treatment of in-group and out-group members – emerges in adolescence. While the age in which parochialism becomes significant varies slightly across single games (see Table A2), the general pattern emerging from our experiment suggests that the distinction between in-group and out-group members becomes behaviorally relevant in the course of socialization in adolescence. Concerning the different types of other-regarding preferences, we observe significant in-group favoritism of altruistic types starting at the age of 14 years, and spitefulness is significantly stronger towards out-group members from the age of 10 years onwards (see Table A4). One explanation could be that the increasing exposure to and membership in new social groups (e.g., in school, clubs, or peer groups) makes the difference between in-group and out-group members salient in the later teenage years, thus causing different behaviors across in-groups and out-groups.

Perhaps the most important finding in our study – from an evolutionary perspective – is the joint development of altruism and parochialism. The evolutionary model developed by Choi and Bowles (2007) postulates that altruism towards fellow group members and parochialism in the form of hostile acts against out-group members may have evolved jointly in the history of humankind. This evolutionary theory is attractive for explaining why altruistic behavior and spiteful behavior can co-exist simultaneously within the same individual. The theory is generally hard to test with field data from the historic development of societies, however, because it is practically impossible to quantify the level of generosity or parochialism in ancient societies. Our experiment can shed light on how the levels of altruistic behavior and parochialism change in childhood and adolescence. While our results should not

be viewed as a literal test of the evolutionary theory of parochial altruism, it is telling that altruism and parochialism develop during the same time period, namely adolescence.

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Tables and Figures

Table 1. Definition of other-regarding preference types

Type	Prosocial game	Envy game	Sharing game
Strongly egalitarian	(1/1)	(1/1)	(1/1)
Weakly egalitarian	(1/1)	(1/1)	(2/0)
Strongly altruistic	(1/1)	(1/2)	(1/1)
Weakly altruistic	(1/1)	(1/2)	(2/0)
Spiteful	(1/0)	(1/1)	(2/0)

Table 2. Sample size

Age group	Control question correct	Control question wrong	Total
8/9 years	71	17	88
10/11 years	207	13	220
12/13 years	172	3	175
14/15 years	135	2	137
16/17 years	132	0	132
	717	**35**	**752**

Table 3. Exchange rate and weekly average pocket money

Age group	Exchange rate of 1 point	Increase*	Weekly pocket money (average)	Increase
8/9 years	0.5 €		2.9 €	
10/11 years	0.75 €	+ 50%	4.7 €	+ 62%
12/13 years	1 €	+ 33%	6.5 €	+ 38%
14/15 years	2 €	+ 100%	13.4 €	+ 106%
16/17 years	3 €	+ 50%	23.7 €	+ 77%

* measures the relative increase in pocket money by age group in row *x* over age group in row *x*–1.

Table 4. Probit regressions with egalitarian choice as dependent variable

Independent variables	Prosocial game	Envy game	Sharing game
female	0.027	0.173***	0.053**
age group[#]	0.073***	-0.117***	-0.007
in-group	0.096***	-0.055	0.071***
BIC[§]	812.7	920.8	449.6
# observations	717	717	717

The table shows marginal effects.

*** (**) [*] denotes significance at the 1% (5%) [10%] level.

[#] ordinal variable for the five different age groups (Grade 3 = 0, Grade 5 = 1, Grade 7 = 2, Grade 9 = 3, Grade 11 = 4)

[§] Bayesian information criterion

Table 5. Probit regressions with other-regarding preference type as dependent variable

Independent variables	Egalitarian type	Altruistic type	Spiteful type
female	0.173***	-0.152***	-0.023
age group[#]	-0.047***	0.122***	-0.058***
in-group	0.048	0.046	-0.117***
BIC[§]	916.8	906.0	762.5
# observations	717	717	717

The table shows marginal effects.

*** (**) [*] denotes significance at the 1% (5%) [10%] level.

[#] ordinal variable for the five different age groups (Grade 3 = 0, Grade 5 = 1, Grade 7 = 2, Grade 9 = 3, Grade 11 = 4)

[§] Bayesian information criterion

Figure 1. The relative frequency of egalitarian choices across games and age groups

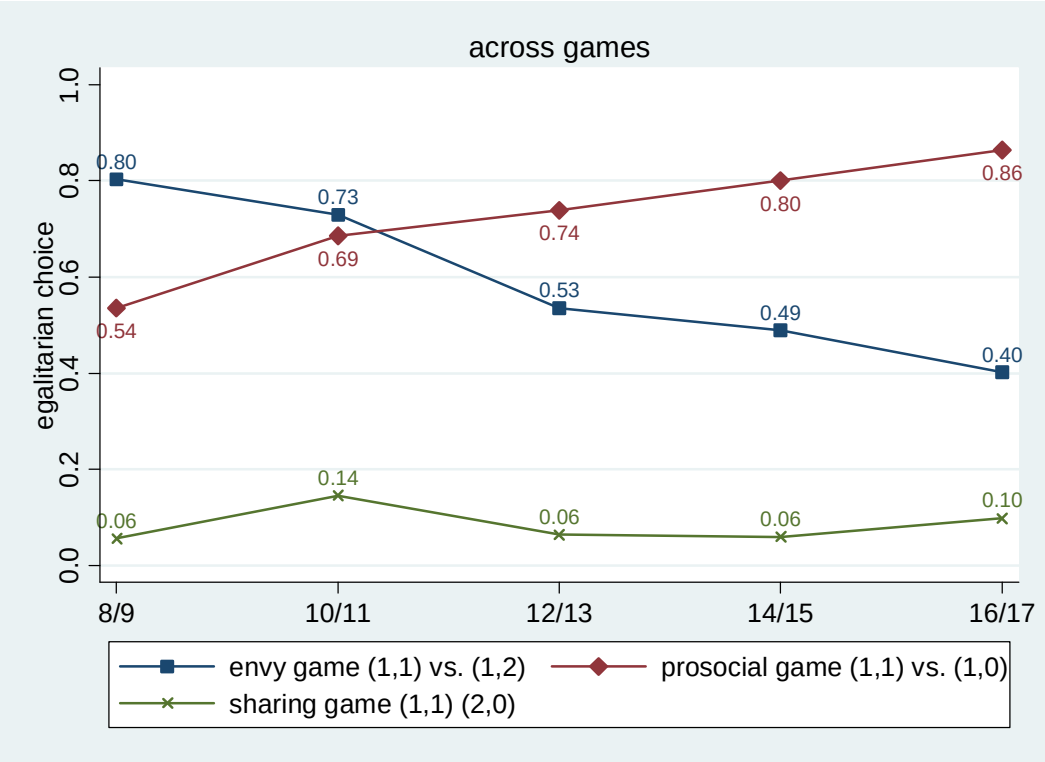
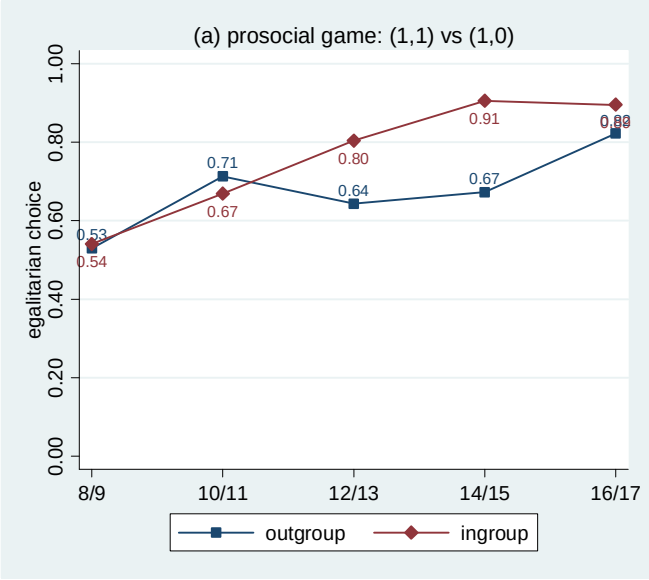
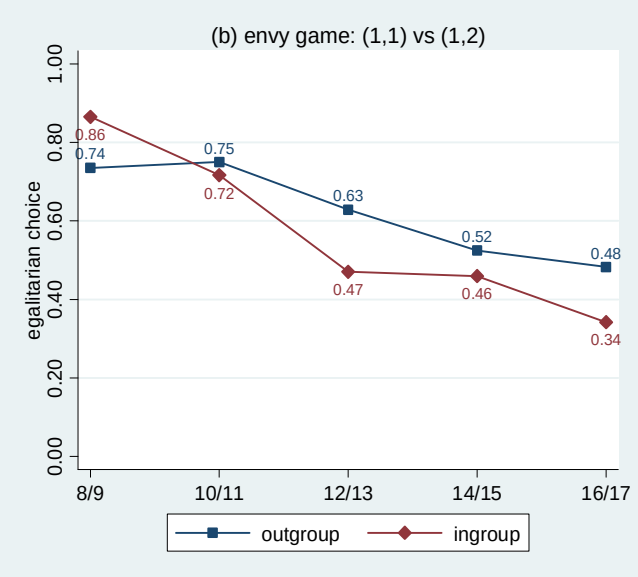


Figure 2. The relative frequency of egalitarian choices in in-group and out-group condition





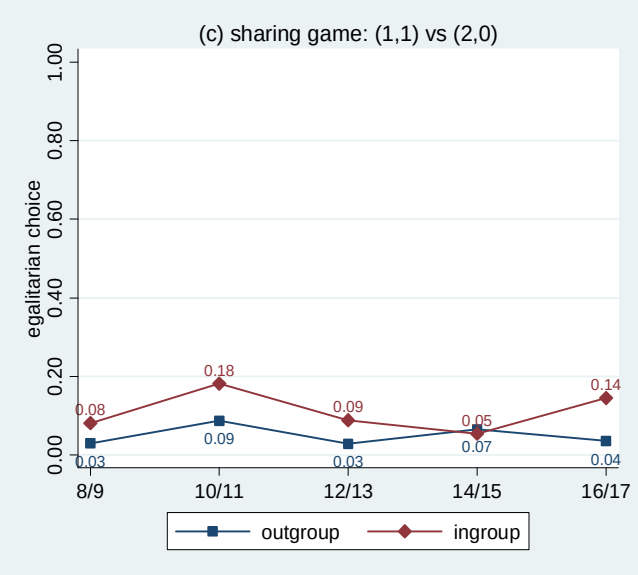
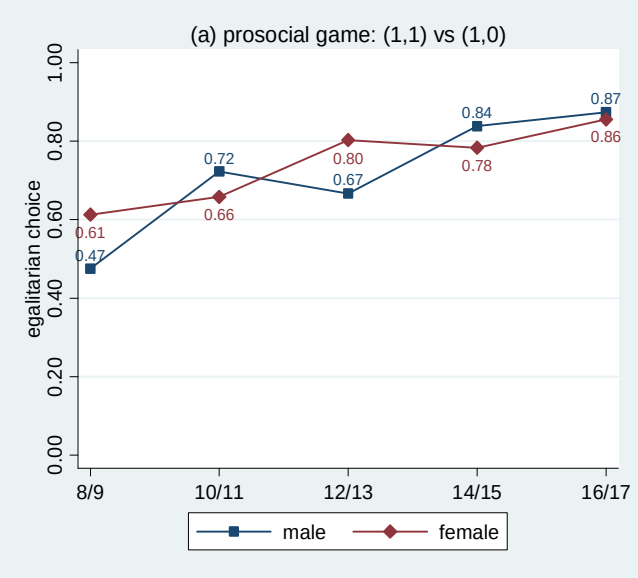
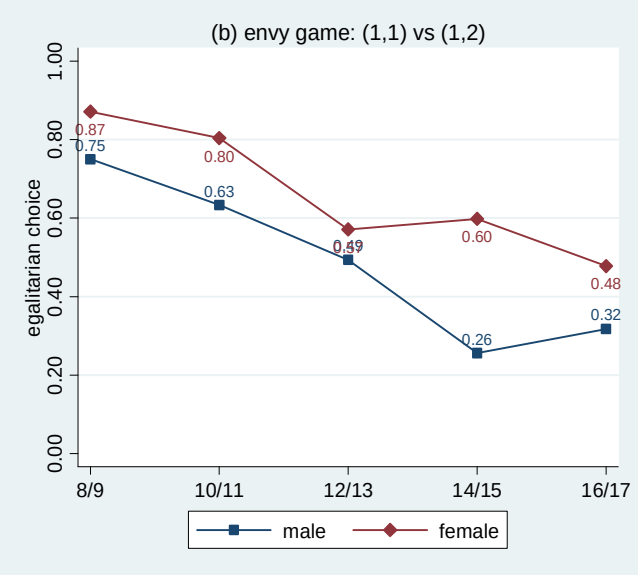


Figure 3. The relative frequency of egalitarian choices of men and women





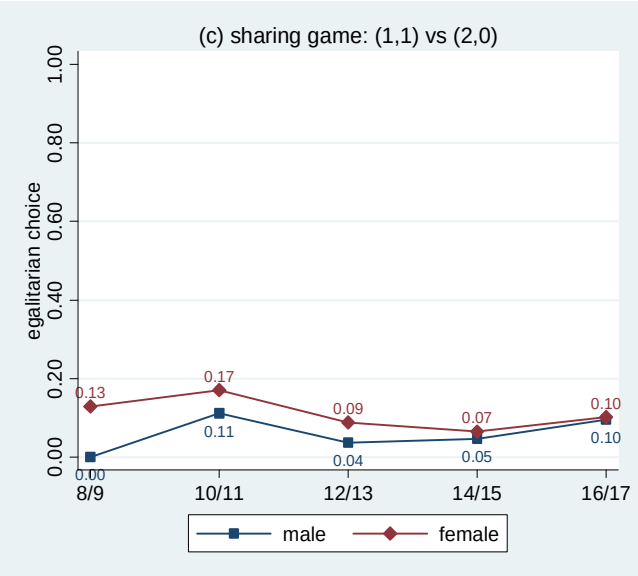


Figure 4. Behavioral types across age groups

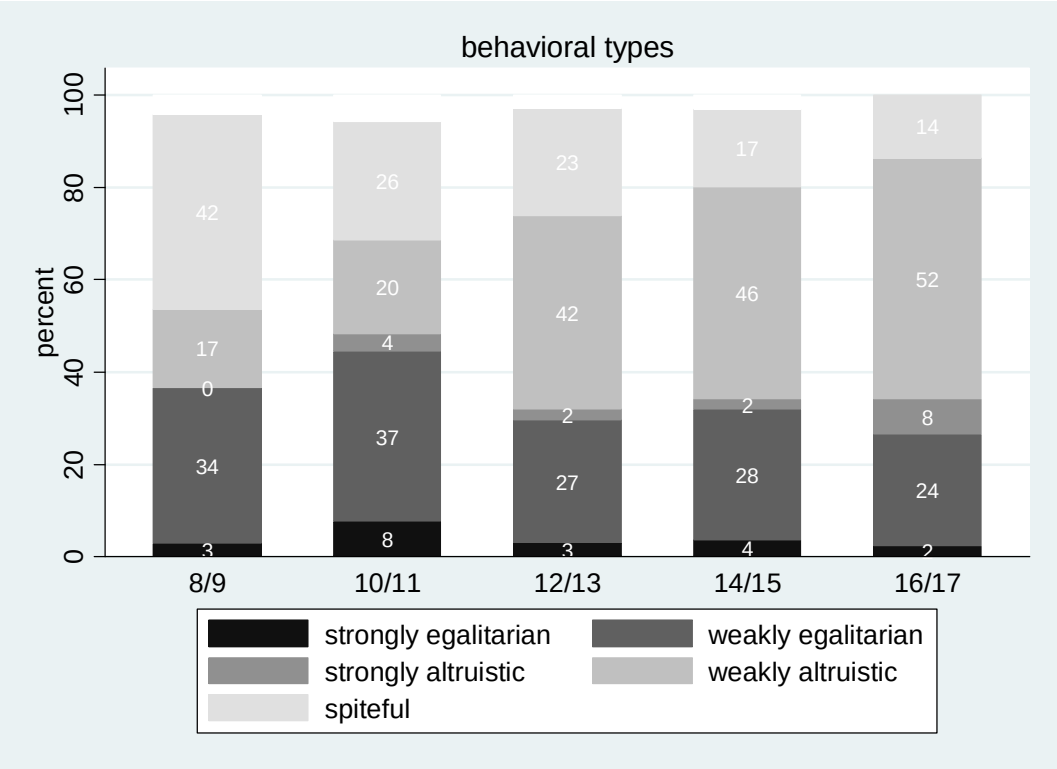
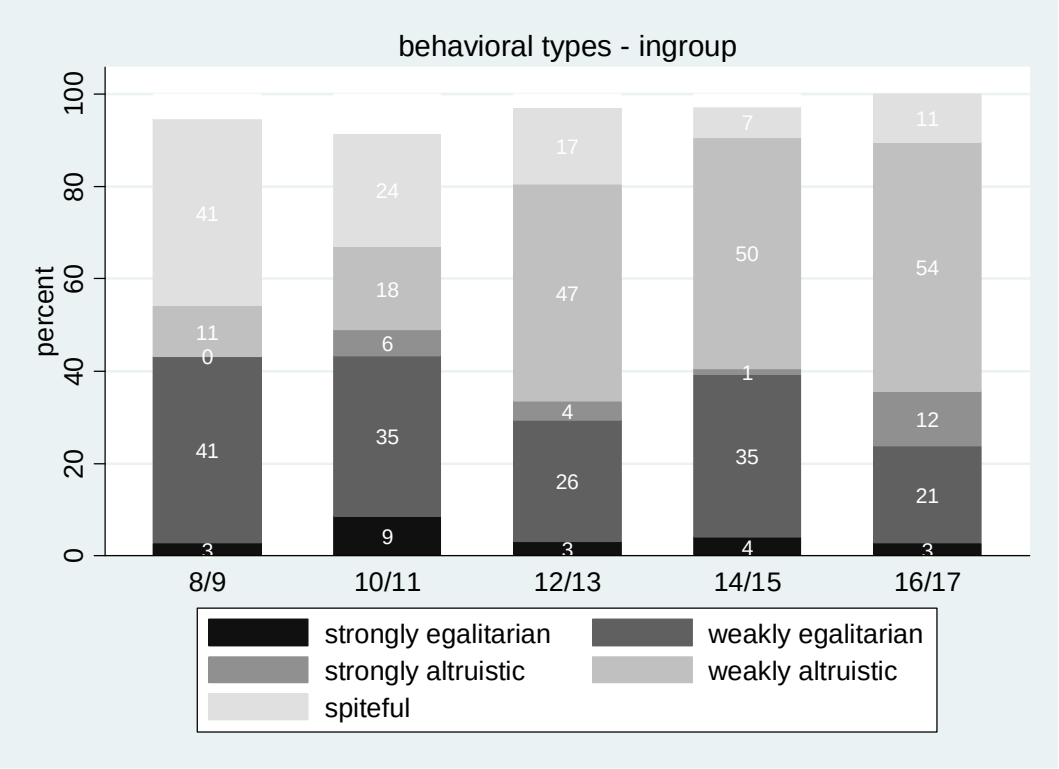


Figure 5. Behavioral types and parochialism



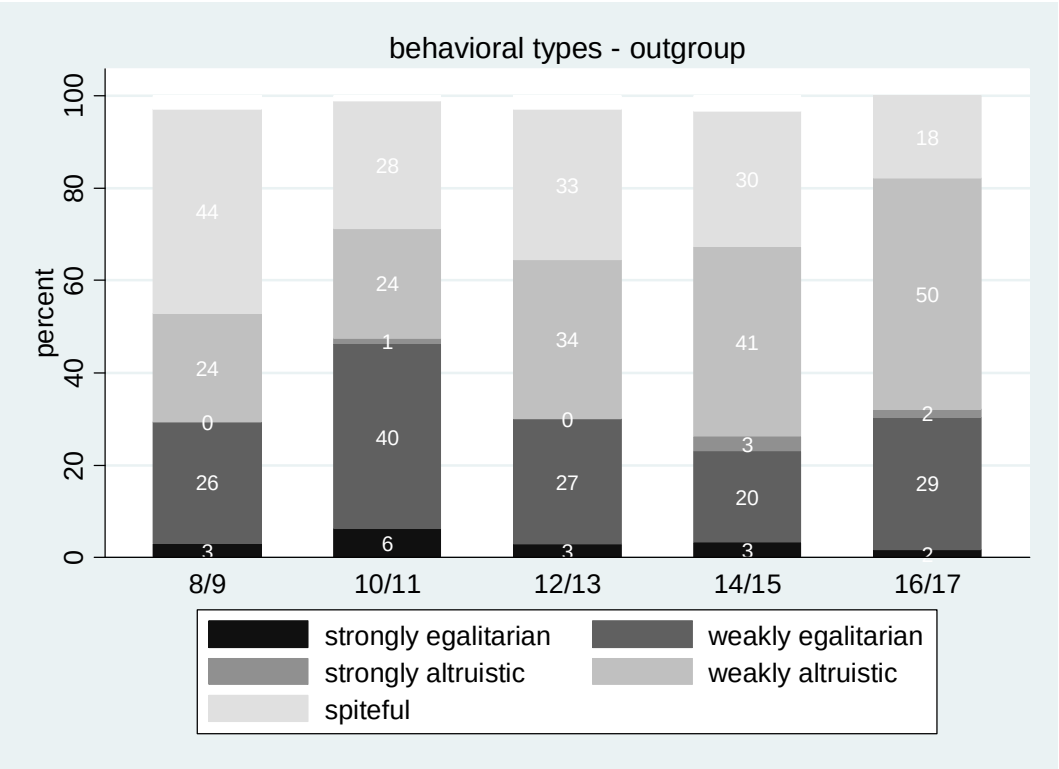
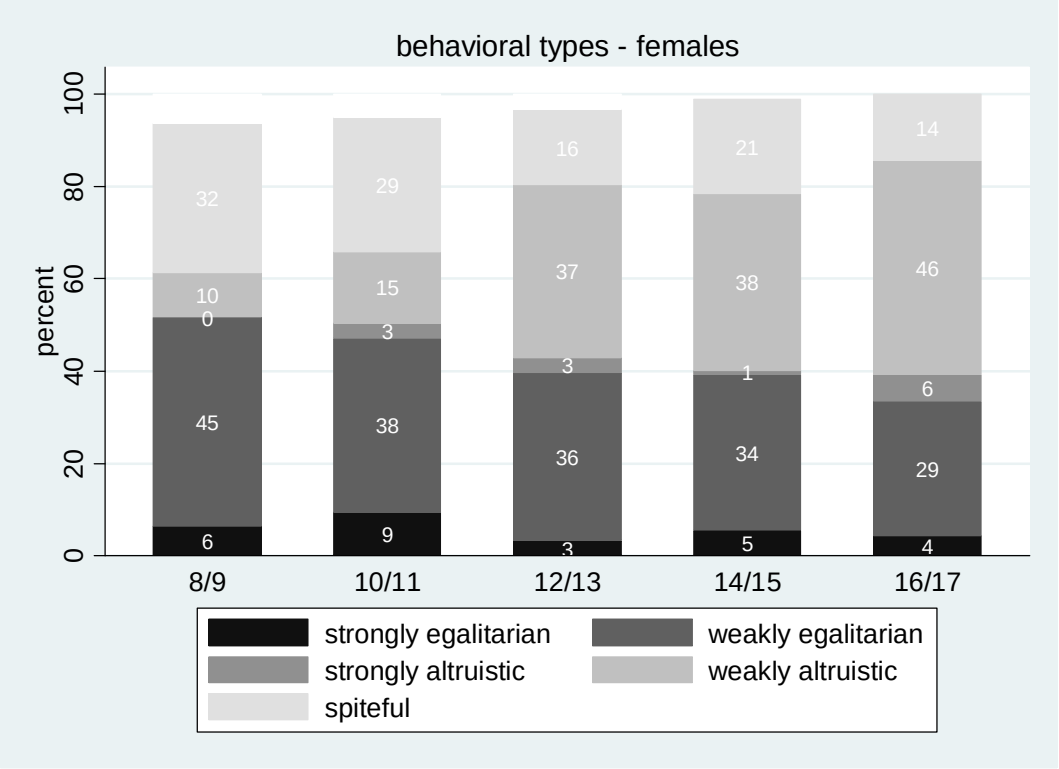
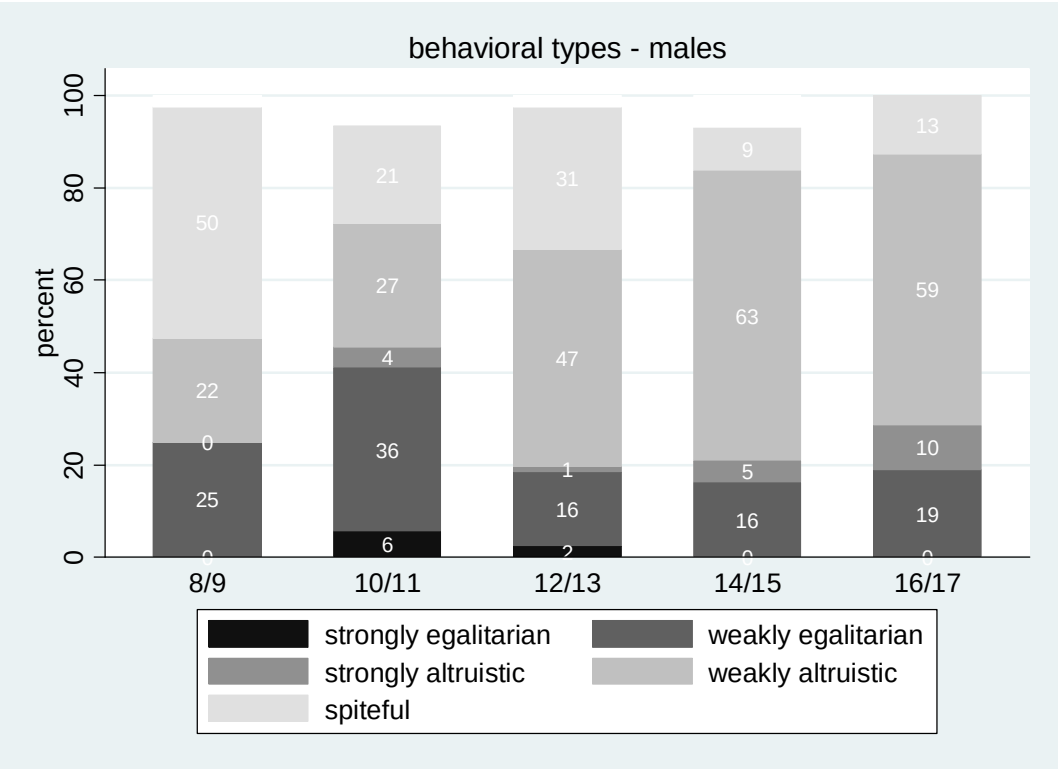


Figure 6. Behavioral types and gender





Appendix

Tables

Table A1. χ^2-tests for behavioral differences in "in-group all" and "in-group half"

Age group	Prosocial game	Envy game	Sharing game
8/9 years	p=0.157	p=0.979	p=0.791
10/11 years	p=0.856	p=0.382	p=0.913
12/13 years	p=0.678	p=0.083	p=0.923
14/15 years	p=0.923	p=0.342	p=0.925
16/17 years	p=0.902	p=0.532	p=0.536

The table shows that there is no significant difference between the *in-group half* and the *in-group all* condition at the 5%-level in any of the comparisons. The one weakly significant difference (in the envy game for 12- to 13-year-olds) is well within the limits of chance.

Table A2. Probit regressions with egalitarian choice as dependent variable – Interaction of in-group condition and age group

Independent variables	Prosocial game	Envy game	Sharing game
female	0.034	0.170***	0.053**
agegroup	0.040**	-0.094***	-0.010
in-group[A]	-0.025	0.030	0.064
*in-group*agegroup*	0.063**	-0.040	0.004
BIC[§]	813.6	925.7	456.2
# observations	717	717	717

[A] Note that the in-group dummy measures parochialism in 8- to 9-year-olds. The significance of parochialism for the remaining four age groups is tested with separate Wald-tests.

[§] Bayesian information criterion

Wald-tests on the significance of parochialism in each single age group.

Prosocial game

H_0: $\beta_{ingroup} + \beta_{ingroup*agegroup}=0$ p = 0.345[B]

H_0: $\beta_{ingroup} + 2*\beta_{ingroup*agegroup}=0$ p = 0.003[C]

H_0: $\beta_{ingroup} + 3*\beta_{ingroup*agegroup}=0$ p = 0.000[D]

H_0: $\beta_{ingroup} + 4*\beta_{ingroup*agegroup}=0$ p = 0.001[E]

Envy game

H_0: $\beta_{ingroup} + \beta_{ingroup*agegroup}=0$ p = 0.851[B]

H_0: $\beta_{ingroup} + 2*\beta_{ingroup*agegroup}=0$ p = 0.204[C]

H_0: $\beta_{ingroup} + 3*\beta_{ingroup*agegroup}=0$ p = 0.062[D]

H_0: $\beta_{ingroup} + 4*\beta_{ingroup*agegroup}=0$ p = 0.066[E]

Sharing game

H_0: $\beta_{ingroup} + \beta_{ingroup*agegroup}=0$ p = 0.012[B]

H_0: $\beta_{ingroup} + 2*\beta_{ingroup*agegroup}=0$ p = 0.001[C]

H_0: $\beta_{ingroup} + 3*\beta_{ingroup*agegroup}=0$ p = 0.006[D]

H_0: $\beta_{ingroup} + 4*\beta_{ingroup*agegroup}=0$ p = 0.049[E]

[B (C) [D] {E}] significance test of parochialism for 10/11 (12/13) [14/15] {16/17} year olds.

Table A3. Probit regressions with egalitarian choice as dependent variable – Interaction of gender and age group

Independent variables	Prosocial game	Envy game	Sharing game
female	0.049	0.153**	0.097**
agegroup	0.079***	-0.121***	0.001
in-group	0.095***	-0.054	0.069***
*female*agegroup*	-0.011	0.009	-0.023
BIC[§]	819.1	927.2	454.3
# observations	717	717	717

[§] Bayesian information criterion

Wald-tests on the significance of parochialism in each single age group.

Prosocial game

H_0: $\beta_{female} + \beta_{female*agegroup} = 0$ p = 0.367

H_0: $\beta_{female} + 2*\beta_{female*agegroup} = 0$ p = 0.446

H_0: $\beta_{female} + 3*\beta_{female*agegroup} = 0$ p = 0.752

H_0: $\beta_{female} + 4*\beta_{female*agegroup} = 0$ p = 0.965

Envy game

H_0: $\beta_{female} + \beta_{female*agegroup} = 0$ p = 0.001

H_0: $\beta_{female} + 2*\beta_{female*agegroup} = 0$ p = 0.000

H_0: $\beta_{female} + 3*\beta_{female*agegroup} = 0$ p = 0.000

H_0: $\beta_{female} + 4*\beta_{female*agegroup} = 0$ p = 0.007

Sharing game

H_0: $\beta_{female} + \beta_{female*agegroup} = 0$ p = 0.006

H_0: $\beta_{female} + 2*\beta_{female*agegroup} = 0$ p = 0.012

H_0: $\beta_{female} + 3*\beta_{female*agegroup} = 0$ p = 0.245

H_0: $\beta_{female} + 4*\beta_{female*agegroup} = 0$ p = 0.833

Table A4. Probit regressions with other-regarding preference type as dependent variable – Interaction of in-group condition and age group

Independent variables	Egalitarian type	Altruistic type	Spiteful type
female	0.173***	-0.147***	-0.028
agegroup	-0.045**	0.093***	-0.035**
in-group	0.054	-0.066	-0.030
*in-group*agegroup*	-0.003	0.052*	-0.045*
BIC[§]	923.4	909.7	765.9
# observations	717	717	717

[§] Bayesian information criterion

Wald-tests on the significance of parochialism for preference types in each single age group.

Egalitarian type

H_0: $\beta_{ingroup} + \beta_{ingroup*agegroup}=0$ p = 0.273

H_0: $\beta_{ingroup} + 2*\beta_{ingroup*agegroup}=0$ p = 0.187

H_0: $\beta_{ingroup} + 3*\beta_{ingroup*agegroup}=0$ p = 0.334

H_0: $\beta_{ingroup} + 4*\beta_{ingroup*agegroup}=0$ p = 0.538

Altruistic type

H_0: $\beta_{ingroup} + \beta_{ingroup*agegroup}=0$ p = 0.786

H_0: $\beta_{ingroup} + 2*\beta_{ingroup*agegroup}=0$ p = 0.326

H_0: $\beta_{ingroup} + 3*\beta_{ingroup*agegroup}=0$ p = 0.055

H_0: $\beta_{ingroup} + 4*\beta_{ingroup*agegroup}=0$ p = 0.039

Spiteful type

H_0: $\beta_{ingroup} + \beta_{ingroup*agegroup}=0$ p = 0.051

H_0: $\beta_{ingroup} + 2*\beta_{ingroup*agegroup}=0$ p = 0.000

H_0: $\beta_{ingroup} + 3*\beta_{ingroup*agegroup}=0$ p = 0.000

H_0: $\beta_{ingroup} + 4*\beta_{ingroup*agegroup}=0$ p = 0.001

Table A5. Probit regressions with other-regarding preference type as dependent variable – Interaction of gender and age group

Independent variables	Egalitarian type	Altruistic type	Spiteful type
female	0.141**	-0.128*	-0.059
agegroup	-0.057**	0.128***	-0.068***
in-group	0.050	0.045	-0.115***
*in-group*agegroup*	0.017	-0.011	0.019
BIC[§]	923.0	912.4	768.6
# observations	717	717	717

[§] Bayesian information criterion

Wald-tests on the significance of parochialism for preference types in each single age group.

Egalitarian type

H_0: $\beta_{female}+\beta_{female*agegroup}=0$ p = 0.001

H_0: $\beta_{female}+2*\beta_{female*agegroup}=0$ p = 0.000

H_0: $\beta_{female}+3*\beta_{female*agegroup}=0$ p = 0.000

H_0: $\beta_{female}+4*\beta_{female*agegroup}=0$ p = 0.000

Altruistic type

H_0: $\beta_{female}+\beta_{female*agegroup}=0$ p = 0.006

H_0: $\beta_{female}+2*\beta_{female*agegroup}=0$ p = 0.000

H_0: $\beta_{female}+3*\beta_{female*agegroup}=0$ p = 0.001

H_0: $\beta_{female}+4*\beta_{female*agegroup}=0$ p = 0.013

Spiteful type

H_0: $\beta_{female}+\beta_{female*agegroup}=0$ p = 0.310

H_0: $\beta_{female}+2*\beta_{female*agegroup}=0$ p = 0.526

H_0: $\beta_{female}+3*\beta_{female*agegroup}=0$ p = 0.979

H_0: $\beta_{female}+4*\beta_{female*agegroup}=0$ p = 0.776

Experimental material

Procedures:

The experiment was run in June 2008. Each session lasted approximately 50 minutes, including the completion of a post-experimental questionnaire and the distribution of the earned money. All subjects received their money in private at the very end of the session.
Note that all sessions within a particular school were run on the same day. In order to guarantee anonymity, we used partition walls and forbade any kind of conversation between students. The experimenter memorized the instructions and presented them orally in class at the beginning of each session. The instructor paused periodically and let the subjects raise their hands for questions which were then answered privately. An English translation of oral instructions and of the decision sheets is presented below.

Experimental instructions

Welcome to our game. Before we start, we will explain the rules of our game to you. From now on, please don't speak to your neighbors and listen carefully. You can earn money in this game. We will give you the money in cash at the end of the game. It is important that you listen carefully now, to make sure that you understand the rules of our game. We will stop frequently during our explanation and allow you to ask questions. Therefore, please raise your hand and one of us will come to you to answer your question.

Everybody ok so far? *Leave time for questions and answer them privately.*

We will play a game in which you have to decide how to divide money between two people. Each of you will get three different decision sheets. We have brought an example along. Let's look at the example together *(put the slide on the overhead projector).*

(From here on instructions between treatments – outgroup, ingroup all, and ingroup half – differ. We first give the instructions for the outgroup and for the ingroup-all treatment, secondly for the ingroup-half treatment.)

Outgroup/(<u>Ingroup all</u>)[6]:

You will need to decide how to divide money between yourself and a student from this class *(point at the picture on the overhead projector)*. Do you know the students in this class? No? <u>(Yes?)</u> This photo shows people from another class in the same grade as you <u>(from your</u>

[6] Instructions for the in-group all condition are underlined and in brackets. Instructions for the in-group half condition follow below.

class). Each student from your class will be randomly matched with one student from this other class that is in the same grade. (another student from your class).

Everybody ok so far? *Leave time for questions and answer them privately.*

There are two possible ways to allocate the money: the option on the left-hand side and the option on the right-hand side.

With option "left" you get one point and the student from another class in the same grade (your class) with whom you are randomly matched gets no points. One point equals 50 cents *(€0.75, € 1, €2, €3, depending on the age group).* With option "right" you get two points and the student from another class in the same grade (your class) gets one point.

Everybody ok so far? *Leave time for questions and answer them privately.*

Depending on which option you want to choose, you check the box at the left- or the right-hand side. *(Ask a student for his name.)* Let's assume that Markus would like to divide the money according to option "right". Which box would he have to check? Right, the box at the "right" side. How much would Markus earn and how much would the student from another class in the same grade (your class) with whom Markus is randomly matched earn in this case? Right, Markus would get €1 *(€1.50, € 2, €4, €6, depending on the age group)* and the student from another class in the same grade (your class) 50 cents *(€0.75, € 1, €2, €3, depending on the age group). (Write the exchange rate at the blackboard. 0 points = €0, 1 point = 50 cents, 2 points = €1.)*

Everybody ok so far? *Leave time for questions and answer them privately.*

As we mentioned earlier, you will get three decision sheets. The three decision sheets differ from each other in the amounts of money that can be divided. At the end of the game you will get the money based on your decisions for all decision sheets. We will add up the money from all three decision sheets. The student from another class in the same grade (your class) with whom you share your money also receives the money from all decision sheets. How much money you and the student from another class in the same grade (your class) receive depends on your decisions. (Furthermore, you will receive the money which another

student from your class decided to give to you. How much you receive in this case depends on the other student's decisions.)

Ingroup half:

You will need to decide how to divide money between yourself and a student from this class *(point at the picture on the overhead projector)*. Do you know the people from this class? Yes? This photo shows people from your class. In this game we will randomly match groups of two people. In each group we have one "person 1" and one "person 2". Person 1 gets to decide how to divide the money between person 1 and person 2.

Could you please draw a card from this bag? Thank you! What's your name? Markus, in this example you have drawn the role of person 1. You may therefore decide about the division of the money in your group. You will need to share the money with one person from your class who has drawn the role of person 2. *(Ask a student for her name.)* Let's assume Julia has drawn that role. You, therefore, do not have to make any decisions in this game.

Everybody ok so far? *Leave time for questions and answer them privately.*

There are two possible ways to allocate the money: the option on the left-hand side and the option on the right-hand side.

With option "left", Markus as person 1 gets one point and person 2 (Julia) gets no points. One point equals 50 cents *(€0.75, € 1, €2, €3, depending on the age group)*. With option "right" Markus gets two points and Julia gets one point.

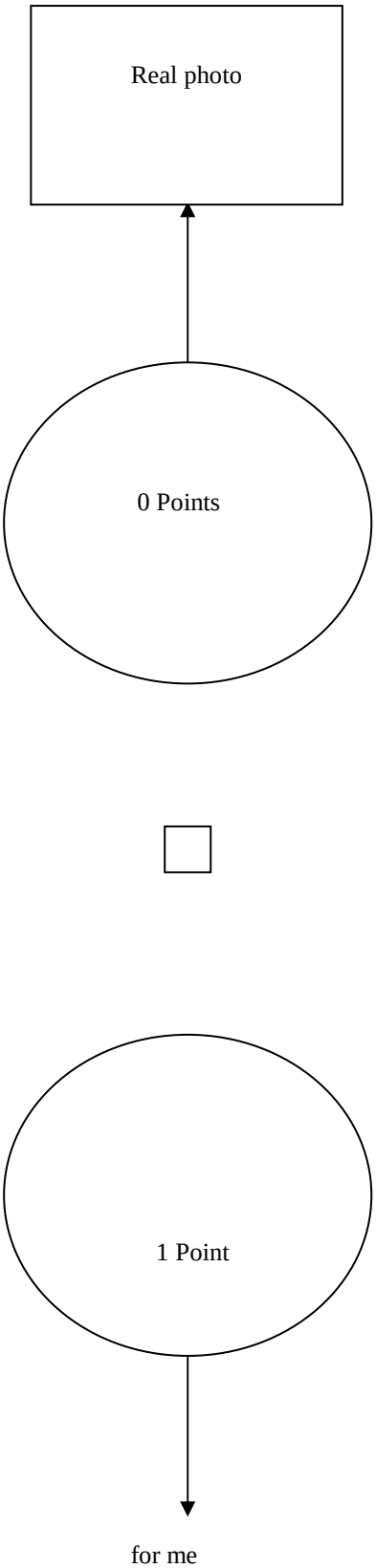
Everybody ok so far? *Leave time for questions and answer them privately.*

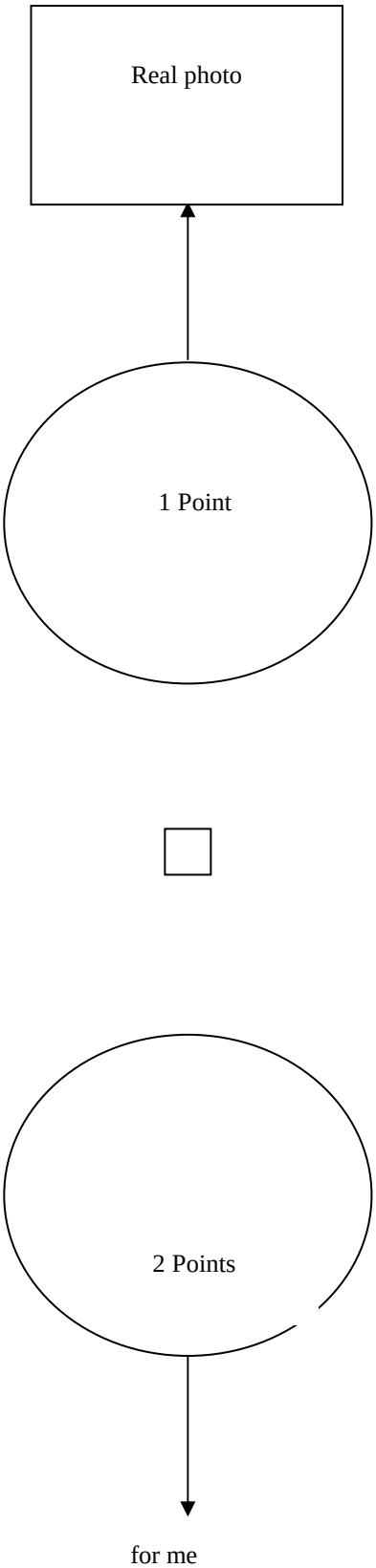
Depending on which option Markus would want to choose, he would check the box at the left or the right-hand side. Let's assume that Markus would like to divide the money according to option "right". Which box does he have to check? Right, the box at the "right" side. How much would Markus earn and how much Julia in this case? Right, Markus gets €1 *(€1.50, € 2, €4, €6, depending on the age group)* and Julia gets 50 cents *(€0.75, € 1, €2, €3, depending on the age group). (Write the exchange rate at the blackboard. 0 points = €0, 1 point = 50 cents, 2 points = €1.)*

Everybody ok so far? *Leave time for questions and answer them privately.*

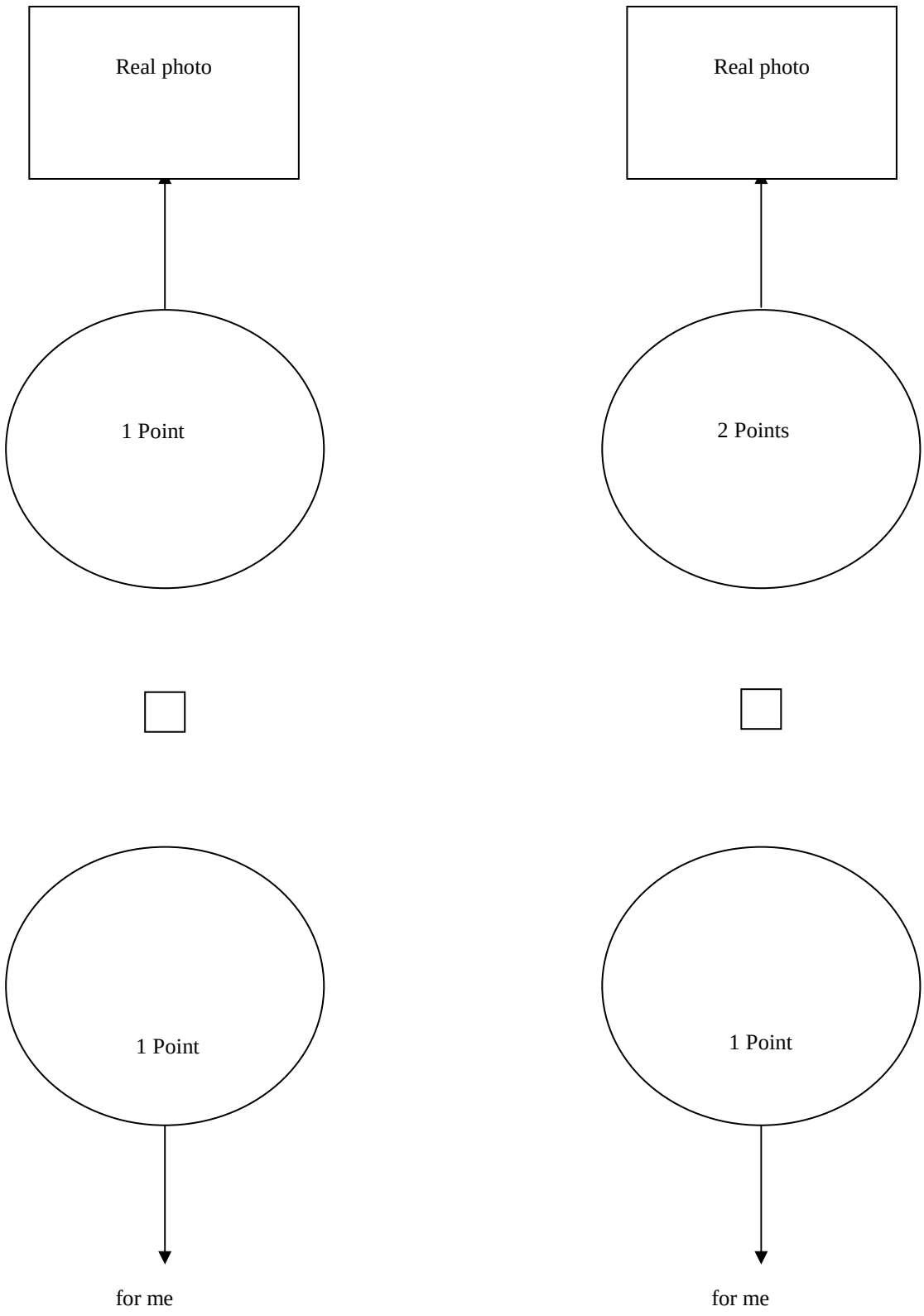
As already mentioned, you will get three decision sheets. However, only students who have drawn the role of the person 1 receive these sheets. The three decision sheets differ from each other in the amounts of money that can be divided. At the end of the game, person 1 will get the money based on his/her decisions for all decision sheets. We will add up the money from all three decision sheets. Person 2 also receives the money from all decision sheets. How much money person 1 and person 2 receive depends on person 1's decisions.

Example (overhead projector)





Decision sheet (for envy game)



[analogously for the other games]