JENA ECONOMIC RESEARCH PAPERS

2010 – 063

Envy and Altruism in Children

by

Kirsten Häger

www.jenecon.de

ISSN 1864-7057

The JENA ECONOMIC RESEARCH PAPERS is a joint publication of the Friedrich Schiller University and the Max Planck Institute of Economics, Jena, Germany. For editorial correspondence please contact markus.pasche@uni-jena.de.

Impressum:

Friedrich Schiller University Jena
Carl-Zeiss-Str. 3
D-07743 Jena
www.uni-jena.de

Max Planck Institute of Economics
Kahlaische Str. 10
D-07745 Jena
www.econ.mpg.de

Jena Economic Research Papers 2010 - 063

Envy and Altruism in Children *

Kirsten Häger†

September 14, 2010

Abstract

Envy and altruism have been studied extensively in adults. Here, we report data from an experiment studying envious and altruistic behavior in children. We study a sample of German school children aged seven to ten in a natural setting. We run two treatments. One treatment investigates envy, the other one studies altruism. Additionally, we collect data on the children's cognitive and social skills, and on their socio-demographic background. Controlling for these factors, we find that older children are significantly more altruistic. Boys care more about their relative position than girls. Socio-demographic information have limited predictive power in both treatments.

Key words: artefactual field experiment, children, envy, altruism

JEL classification: C 91, C 99

*We would like to gratefully acknowledge the support of Daniela Büttgen, Margarete Kühn, M. Mattern, Brigitte Schunk, and Ursula Wiellem as well as the teachers and students of the primary schools of Duisburg and Kobern-Gondorf (Germany) for providing us with the opportunity to conduct this study. We would like to thank Daniel Schunk, Daniel Houser, Oliver Kirchkamp, and Bastiaan Oud as well as seminar and conference participants of the JERWorkshop in Jena, the University of Duisburg-Essen, the annual conference of the German Economic Association (VfS) 2008 in Graz, the European ESA conference 2008 in Lyon, the annual conference of the German Association of Experimental Economics (GfeW) 2008 in Mannheim, the EMAEE 2009 in Jena, and the EEA congress 2009 in Barcelona for helpful comments. We are particularly grateful for financial support by the Chair in Empirical and Experimental Economics of the Friedrich Schiller University in Jena.

†Friedrich Schiller University Jena, kirsten.haeger@uni-jena.de

1 Introduction

Feelings of envy play an important role in daily economic exchange situations. On the one hand, envy might lead to inefficient allocations, for example when consumers spend their money on present consumption of status goods instead of saving for the future. On the other hand, envy might as well have positive effects and competitive envy can be seen as a motor of economic growth and development (e.g. Grolleau et al., 2006, and references therein). While a number of recent studies have investigated concerns about envy in adults (e.g. Grolleau et al., 2006; Zizzo and Oswald, 2001), little is known about the development of envious feelings in children. Do gender differences in envy open up early on in life? How are differences in envy related to cognitive skills and environmental factors of the children's life? The answers to these questions are important: First, because they shed light on the evolutionary origins of human social behavior, and second, because they are informative as to what extent behavioral patterns are shaped by society rather than inborn. Furthermore, children are themselves important economic actors: Their purchasing power in the U.S. and in EU-countries has increased considerably in recent years (McNeal, 1992), and they potentially have an effect on their parents' consumer decisions.

This paper presents an experiment that tests for the existence of envy in children. Our experiments involve more than 400 German school children; half of them make active decisions as proposers, the other half are passive receivers. Because we use school children, we also have detailed and reliable measures on our participants' social and intellectual skills as well as on their socio-demographic background. Consequently, we can control for such differences when drawing inferences about gender or age effects. Furthermore, as we are not able to distinguish between the motives for the non-envious choice, e.g. one's own profit maximization or altruism, we also have a treatment which tests for altruism.

While our study focuses on children, its motivation comes from observations in studies with adults. Among other, studies by Solnick and Hemenway (1998) and Charness and Grosskopf (2001) show that it is often not the absolute level of payoff that matters most for individual utility but rather one's position relative to other individuals. At the same time, there is evidence that a higher relative income or payoff position translates into higher happiness (e.g. Frey and Stutzer, 2002). In sum, there is much evidence that people compare with other individuals from their reference group and that they experience feelings of envy when evaluating their own payoff.

There have recently been a number of economic studies that have investigated trade and exchange behavior of children. These have been conducted

by Harbaugh et al. (2007), Murnighan and Saxon (1998), and Sutter (2007) on children's decisions in ultimatum games. Fehr et al. (2008) and Benenson et al. (2007) consider simple distribution games. Dahlman et al. (2007) extend the study by Fehr et al. (2008) with a second stage testing for reciprocity among children. Harbaugh and Krause (2000) consider dictator and public good games, and Houser and Schunk (2009) explore to what extent pro-social behavior in children is influenced by competitive pressure. These studies show that altruistic and reciprocal motivations are already present in young children, and that they tend to increase with age. In addition, the above studies also forcefully demonstrate that at the age of children in our study, they are already highly familiar with trade and exchange, as they are frequently bargaining with parents, teachers, and friends.

Our study extends the existing work mainly through its focus on costly envy. In contrast to the study of Fehr et al. (2008) where the payoff in the envy treatment remains constant for the deciding child while only the receiver's payoff changes, taking away payoff from other children is costly for the proposer in our experiment. We believe that making envy costly is important: First, it helps to clearly separate effects of envy from effects of inequality aversion; inequality aversion does not play a role in our design as the distance between the two payoffs is always constant, only the direction changes. Second, since other studies have found that children are strongly reluctant to give up own payoff, it is far from obvious whether they would take the envious choice in our design. We thus provide a rigid test of envy in children.

Additionally, our study offers one key advantage relative to other studies involving children: We do not only have the experimental observations of the children, but also measures of their cognitive skills (their grade for math), of their social skills (their grades for working behavior and social behavior), of their family background (number of siblings), of the type of sports they are practicing in their spare time (individual sports versus team sports), as well as of the reasons for their choice.

The central questions of our paper are:

1. Are children willing to give up a part of their payoff to be relatively better off than their opponent?

2. Are children willing to give up payoff to increase their opponent's payoff considerably?

3. Are there gender differences in these effects? and

4. Are these differences robust to the inclusion of individual difference

measures such as school grades as well as to socio-demographic background?

As detailed below, we find that the answers to the first three questions are "yes", the answer to the fourth question is mixed.

2 Design of the Artefactual Field Study

Our study was conducted in three elementary public schools in Germany in January 2008 and November 2009. Two schools are located in Duisburg in western Germany (henceforth denoted by DS and DU) and one school is located in Kobern-Gondorf in southwestern Germany (henceforth denoted by KG).[1] In our sample we have a broad range of children from all social backgrounds, since school attendance is mandatory in Germany.[2]

We conducted dictator games with 240 dictators, all of whom attended elementary schools ranging from first to fourth grade. Since 32 classes were involved, we had 32 sessions in total, i.e. one session for each school class. We ran two treatments, each with the same number of classes distributed as equally as possible between all school years and locations.

In both treatments the teachers assigned a random number to each child, which was not publicly announced. Only the teachers and the experimenter knew the number. Two numbers from children of the same class were randomly matched with the help of casting lots. The role of the proposer was assigned to the first child; the role of the (passive) receiver was assigned to the second child. After the experimenter had introduced herself to the class, the proposers were then told one on one by the teacher in the previously determined order to leave the class room and to go to the experimenter who was in a separate empty room or empty hallway. Once the child had arrived, the experimenter carefully explained the game to the child while pointing to the corresponding payoffs. To make the two options salient, the payoffs for the two options were placed on two napkins: The payoff for the proposer was at the side of the table facing the child; the payoff for the receiver was at the experimenter's side. The sides (left/right) of the envious/non-envious and

[1] Duisburg is a city with almost 500,000 citizens. Kobern-Gondorf is a rural town with about 3,500 inhabitants.

[2] Public schools do not charge tuition fees. In 2004 98.2% of all students at the elementary school level attended public schools. 4.4% of all students at the general education level in Germany attended a so-called "Förderschule" in 2004, a special - public or private - school for mentally or physically challenged students (Bundesamt, 2005). These students are not part of our sample, since the three schools in our sample do not have any such students.

altruistic/non-altruistic choice, respectively, were randomized. We found no side effect (two-sample test for proportions, $p = 0.775$, and $p = 0.618$ in treatment 1 and 2, respectively). The gummy bears were placed in a way that it was easy to capture the amount. In addition, we placed a little piece of paper with a number indicating the amount of gummy bears next to each payoff (see figure 1). Thus, the child did not face an abstract choice, but had the options directly in front of him/her.

Figure 1: Experimental set-up

2.1 Treatment 1: (5:3) vs. (6:8)

In treatment 1, the child could either take five gummy bears for him/herself and send three gummy bears to the other child (option A) or (s)he could take six gummy bears for him/herself and send eight gummy bears to the receiver (option B, see table 1).[3] In all cases, the child who took the decision did not know with whom (s)he was matched. This was particularly stressed when explaining the game. Once the decision was completed the experimenter put the proposer's payoff into an envelope and handed it to the child. Then the experimenter placed the payoff for the receiver in a second envelope and assured the child that the receiver would get the envelope at the end of the treatment. Nothing else (e.g. messages) was placed into the envelopes. The receivers remained passive, meaning that they did not become themselves proposers at any point of the experiment, because we wanted to avoid that

[3]We have kept payoffs low, because children at this age are not able to distinguish between high numbers.

children might think that their choice might somehow influence the choice of the other child. Also, each proposer participated only in one of the two treatments to avoid concerns about reciprocity. After the child's decision the experimenter interviewed the child (see appendix C) to find out about the reason for the choice, but also to get additional information about the child. Once the questions were finished the child went back to his/her classroom and the next proposer was sent to the experimenter. Children were not allowed to talk to each other until the experiment was completed. After each treatment the experimenter went into the classroom and handed the envelopes to the teacher in the classroom in front of the children who then gave the envelopes to the corresponding children. Neither the children nor the teacher knew who had sent which envelope.[4]

	Option	Proposer	Receiver
Treatment 1	A	5	3
	B	6	8
Treatment 2	A	6	3
	B	5	8

Table 1: Payoff scheme for treatment 1 and 2

Treatment 1 was designed to find out whether children are willing to give up absolute payoff in order to be relatively better off (option A (5/3). Giving up one unit harms the partner by five units. There are multiple reasons for opting for B (6/8) like profit maximization, efficiency, or altruism, and treatment 2 investigates these reasons further. When asked for the reasons for their choice, no child compared him/herself to children outside the game, for example other proposers in the same class. They only compared their payoff to the one of their receiver, their reference group in this experiment.

2.2 Treatment 2: (6:3) vs. (5:8)

The second treatment was conducted in the same way as treatment 1 except that the payoffs were six gummy bears for the proposer and three gummy bears for the receiver and five gummy bears for the proposer and eight gummy bears for the receiver in option A and B, respectively (see table 1).[5]

[4]In case of an uneven number of students, the remaining child received for ethical reasons nevertheless an envelope with gummy bears.

[5]Note that only the payoffs of the proposer have been changed for the second treatment. All other parameters remain the same as in treatment 1.

This treatment serves to distinguish between profit maximization and altruism. We test whether children are willing to give up one unit of payoff in order to let another child benefit from five more units. There are two plausible reasons for opting for B (5/8); one is altruism, and the other one is efficiency concerns. A reason for choosing option A (6/3) is profit maximization. As we will show, a considerable fraction of children did not behave rationally and chose option B (5/8) although this meant giving up one unit of payoff for him/herself. Note that in this treatment as well as in the other treatment and unlike in the study by Fehr et al. (2008), inequality aversion cannot play a role in our task as the distance between the two payoffs of the two children remain the same in both options, only the direction of payoff inequality changes.

When giving reasons for their choice, no child compared him/herself to children outside the game, for example other proposers, they only compared their payoff to the one of the corresponding receiver.

3 Results

In all results, which we report treatment by treatment, we pool the data from the three locations DS, DU, and KG. The distributions of dictators' decisions are not significantly different between locations at the 5%-level in both treatments except for treatments 1 where boys in DS and DU and girls in DS and KG differ in behavior (two-sample test of proportion, stratified by gender, see table 2). The reported results are based on the full sample of children. To show that all results also fully hold if we exclude children with reasons biasing their choices, we report them in the appendix.[6]

	p-values			
	treatment 1		**treatment 2**	
	female	male	female	male
DS/DU	0.668	0.001	0.737	0.717
DS/KG	0.037	0.078	0.143	0.773
DU/KG	0.072	0.168	0.247	0.555

Table 2: Two-sample test of proportion for different locations in both treatments, separately for gender

[6]We excluded those who did not understand the game, claimed to be on a diet, were not hungry, did not like gummy bears, or are not allowed to eat candy. For the results of the tests with the limited sample, see appendix A.

3.1 Treatment 1

First, we look at the results of treatment 1 by gender and age. Figure 2 shows the fraction of children choosing option A (5/3) separately for different age groups. Strikingly, we observe that despite the costs associated with envy, a considerable fraction of children took the envious choice.

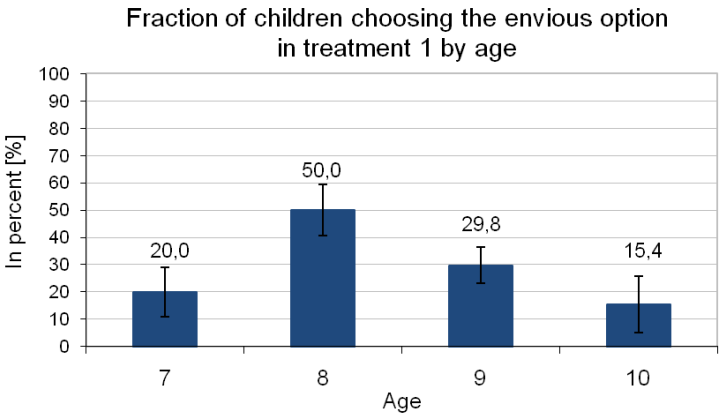

Figure 2: Fraction of children taking envious choice 5/3 in treatment 1

In particular, we observe a significant gender effect (female: $P > |z| = 0.018$, coefficient$= -0.828$) with boys opting for the envious choice A (5/3) more frequently than girls. The fraction of boys and girls choosing option A in treatment 1 was 39.1% and 21.7%, respectively.

Result 1: *Boys take the envious choice more often than girls.*

This cannot be due to different preferences for candies by boys and girls, because we asked the children which gender usually wants more candies. 13.0% of the children that gave an answer to this question stated that girls want more, 38.9% said that boys want more candies. But the largest fraction of 48.1% argued that boys and girls want as many candies.[7]

This finding about more envy behavior among boys than among girls is in line with studies by Gneezy and Rustichini (2004) and Houser and Schunk (2009) who investigated competition among school children as well

[7]Note that we do not have this information about children attending school in DS and DU in the session of 2008.

Probit regression on envious choice 5/3		
Dummy 8 years	1.168***	(0.421)
Dummy 9 years	0.214	(0.403)
Dummy 10 years	-0.277	(0.639)
Female	-0.828**	(0.350)
Grade math	0.115	(0.198)
Grade social behavior	-0.074	(0.348)
Grade working behavior	0.193	(0.341)
Dummy team sport	$-0.513\star$	(0.318)
Number of siblings	$0.195\star$	(0.119)
Constant	-0.720*	(0.407)
Observations: 98; $R^2 = 0.163$		
Robust standard errors in parentheses; *** p <0.01, ** p <0.05, * p <0.1, $\star$ $p < 0.11$		

Table 3: Probit regression on taking the envious choice 5/3 in treatment 1

as with findings by Gneezy et al. (2003) who investigated adults. The studies mentioned above point in the direction that it is more important for boys to be relatively better off and that in a competitive environment boys perform better than girls. Our results complement their findings, suggesting that envy is an important driving force behind these observations.

Furthermore, we observe a U-shaped relation between age and envious behavior. Children at the age of 8 take the envious option A (5/3) the most frequently (see figure 2). This implies that at the beginning of school attendance being relatively better off seems to become more and more important, but from a certain age on children do not care about being better off so much anymore.

A widely discussed issue is to what extent the presence of siblings affects the development of social behavior. We find that the more siblings a child has the more likely it is to opt for the envious choice A (number of siblings: $P > |z| = 0.101$, coefficient=0.195, see table 3), although this result slightly fails to be significant.

There seems to be converging evidence for an impact of the number of siblings on pro-social behavior. Fehr et al.'s (2008) results point into the same direction as our results. They find that single children share more than children who have siblings.

Children who practice a team sport in their spare time are less likely to opt for choice A (5/3) than children who do not practice sport or who practice an individual sport (dummy team sport: $P > |z| = 0.106$, coefficient=0.513). Learning how to cooperate or help each other during sport activities seems to have an influence on social decisions outside the gym.

In addition to the above mentioned data we have three school grades that were reported on the children's annual report card: A grade for mathematics, a grade for working behavior, and a grade for social behavior.[8]

The regression for treatment 1 (see table 3) reveals that grades do not have any predictive power for the actual choices of the children, although the grade for social behavior is meant to indicate how nicely the child behaves at school towards other children and teachers.

Zizzo and Oswald (2001) find in a study about envy in adults that about 2/3 of the participants are willing to pay to reduce somebody else's outcome. The decision to do so is insensitive to the price of doing so, that is how much outcome of another person you can destroy with one unit of your outcome. We have shown that this willingness to pay for reducing somebody else's outcome is already present in children. They seem to care about their relative position.

We have asked the children for the reason for their choice and let two student assistants classify these answers in a double blind procedure into twelve categories: No answer given, profit maximization, envy, altruism, efficiency, not allowed to eat candies, misunderstood the game, on a diet, not hungry, does not like candies, other, and excuse.[9]

[8]Children at this age have many more grades on their annual report card, e.g. grades for performance in German language, in sports, in arts etc. For anonymity reasons, we were only allowed to obtain three school grades. The mathematics grade seemed most interesting as a measure for cognitive capacities, and the grades for working and social behavior seemed most interesting for social preferences. Mathematics performance is graded on an integer scale from 1 to 6, where 1 is the best grade, and 6 is the worst possible grade. Social and working behavior is graded on an integer scale from 1 to 4, 1 is the best grade, 4 is the worst grade. Unfortunately, we did not receive grades of all children of the second session. Some teachers only provided as with an estimation of the children's performance (above average, average, below average), some teachers did not provide any grades, especially for the children that do not yet officially get school grades. For this reason, we transformed the school grades (class 1 and 2) we received to estimations (grade 1.0-2.3: above average (1); grades 2.4-3.3: average (0); grades 3.4-6.0: below average (-1)) and used these estimations of the children's performance for our analysis (math: mean: 0.33, sd: 0.76; social behavior: mean: 0.73, sd: 0.50; working behavior: mean: 0.62, sd: 0.57). The missing grades are also the reason why the number of observations in the regressions is smaller than our actual number of observations in both treatments.

[9]For the frequency and proportion of answers in treatment 1, see table 8 in appendix

In the first treatment 35 out of 110 children (32%) took the envious choice. 23% of those children claimed that they did this because of envy, 9 out of 35 (26%) found an excuse, but most of the children (37%) did not give an answer.

Out of the 75 children that took the non-envious option B, most children (41%) claimed altruistic reasons; they wanted the other child to receive more candies (see table 8 in appendix A). Our second treatment tested this reasoning. As we will see, these arguments are credible as many children were even willing to give up one gummy bear to make the other child receive five more candies. This is line with other studies, e.g. by Benenson et al. (2007).

As the results show, children do more often not give a reason for their choice if they took the envious choice (37% vs. 29%). This might be due to the fact that envy is a cultural taboo that people do not talk about. People are even less willing to admit that they experience envious feelings, even if this is the only reason that can explain their behavior. This argumentation is supported by the fact that only when making the choice (5/3) nine out of the 35 children (26%) very obviously used an excuse while when taking the (6/8) option none of the children used an excuse. Also, children often took a longer time to find a response, or blushed, or rather looked down than towards the experimenter when asked for an explanation. In their study with students Grolleau et al. (2006) find that participants state less often destructive envy which destroys another person's income if they are asked about their own feelings than if they are asked what another person will feel in this situation. This supports the view that envy is a cultural taboo.

Only 3 out of 75 children opting for (6/8) claimed efficiency reasons. This makes us believe that efficiency is not present as a concept in children of that age. They rather look at their own payoff and the payoff of the other child separately as we could also see from their reasons for their choice instead of caring about the total payoff for the paired children.

3.2 Treatment 2

Now we look at the results of treatment 2. Figure 3 shows the fraction of children choosing option B (5/8) separately for the different age groups.

We observe an age effect: The older the children the more likely they take the altruistic option. The increase is statistically significant in 9- and 10-year-olds compared to 7-year-olds, but not for 8-year-olds (see table 4). While 28.6% of the children at the age of 7 take the altruistic choice the fraction of children doing this increases monotonically with age. 75.0% of

A.

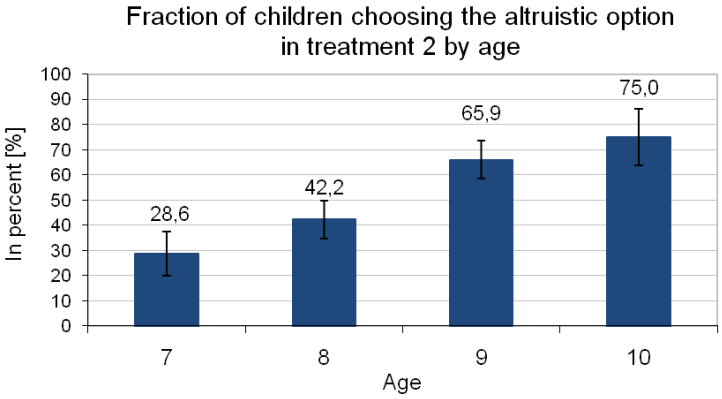

Figure 3: Fraction of children taking altruistic choice 5/8 in treatment 2

the children at the age of 10 are willing to give up one gummy bear to make the receiving child better off.

Result 2: *The older children are the more likely they take the altruistic choice.*

Our results fit the results of Fehr et al. (2008) who find an increase of altruistic choices with increasing age (from 18% at age three/four to 29.5% at age eight/nine). Children in our study are older than those in Fehr et al. (2008). In line with findings in developmental psychology, our children behave more altruistically and interestingly, we still find an increase in altruism with age.

Again, we had asked children about the reasons for their choice (see table 9 in appendix A). More than half (53%) of the 64 children choosing the non-altruistic option A (6/3) did not give a reason for their choice while only 36% out of the children taking the altruistic choice did not give a reason. The reason the most (45%) often argued for the choice B (5/8) was that proposers wanted to be nice to the receiver (altruism), which is credible, because they even had to give up one unit of payoff to do so. This shows that many children at that age already know which behavior would have been the "kind" one. Only three out of the 66 children taking option B (5/8) claimed efficiency reasons. Efficiency reasoning seems not to be present in children of that age.

Probit regression on altruistic choice 5/8		
Dummy 8 years	0.419	(0.421)
Dummy 9 years	0.913**	(0.403)
Dummy 10 years	1.265***	(0.639)
Female	0.142	(0.350)
Grade math	0.134	(0.198)
Grade social behavior	0.256	(0.348)
Grade working behavior	-0.399	(0.341)
Dummy teamsport	0.581**	(0.318)
Number of siblings	0.117	(0.119)
Constant	-1.002**	(0.407)
Observations: 103; $R^2 = 0.129$		
Robust standard errors in parentheses; *** p <0.01, ** p <0.05, * p <0.1		

Table 4: Probit regression on taking the altruistic choice 5/8 in treatment 2

4 Conclusion

We used an experiment to investigate social preferences of German children aged seven to ten attending public primary schools. The sample includes children from very diverse social backgrounds. Moreover, the experiment took place in a natural setting, the school, and was incentivized using gummy bears - one of the most popular candies among German children.

We wanted to find out two things: Are children envious and care about their relative standing? Does altruism already exist at this age or is it due to socialization in adolescence? We had additional information about the children's cognitive and social skills, as well as on their socio-demographic background. With this information we shed light on the question which environmental factors influence the behavior of children.

We found that a considerable fraction of children was willing to give up payoff in order to be relatively better off than their unknown partner. Interestingly, this fraction was higher for boys than for girls suggesting that boys are more concerned about their relative position. This is in line with the finding by Houser and Schunk (2009) and Gneezy and Rustichini (2004) who find that boys are more competitive than girls. This behavior can be explained by the fact that in former times men were involved in many more competitive activities than women such as conflicts between tribes and groups.

The second treatment showed that altruism can already be observed at an early age. A considerable fraction of children was willing to give up payoff to make their unknown partner better off. Here, we can see a clear age trend. The older the children of our sample are, the more likely they behaved in a pro-social way.

We found a gender effect in the first treatment and an age effect in the second treatment. While our results are very much in line with the results reported in Fehr et al. (2008), we have one main methodological difference: In our study, taking the envious choice is a costly action, since we believe that this is important to reliably identify truly envious actions.

A further advantage of our sample is that we have measures on the children's cognitive and social abilities and on their working attitude. We have also information about the socio-demographic background of the children like the number of siblings, and whether the children are doing team sports in their spare time. Having more siblings and not practicing team sports increases the probability to take the envious option in treatment 1 although this effect is barely not significant. In the second treatment we have seen that children that practice a team sport in their spare time are more likely to take the altruistic choice. Other variables like the grade for social behavior or the math grade do not have an effect.

Future research might extend our results in three ways. First, it is known that adults care about their relative standing (e.g. Solnick and Hemenway, 1998). As we have shown, this is also true for a considerable fraction of children in primary schools. At which age do these concerns emerge? According to Piaget (1952) children younger than our sample are very egocentric and do not think about the consequences their behavior will have for others. Thus, they should also not care about their relative standing and behave like profit maximizers. This still needs to be tested with an experiment with younger children than in our sample. Second, is this behavior innate and unique in all humans or is it acquired during childhood? If the latter is true, does this behavior depend on the social background or on culture? Häger et al. (2010) conducted an artefactual field experiment with children from the egalitarian nomadic tribe of the Penan in Malaysia to test this. Further experiments with children from different cultures would be desirable. Third, would children behave the same way if they grew up in a non-competitive environment? A first answer to this question is given by an experimental study by Shapira and Madsen (1969) which comes to the result that children living in a kibbutz are more cooperative than children living in cities in Israel. Häger et al. (2010) shed further light on this by comparing Penan children raised in an egalitarian tribe to children in our German sample. Nevertheless, this topic remains an open question and demands further research.

References

Joyce F. Benenson, Joanna Pascoe, and Nicola Radmore. Children's altruistic behavior in the dictator game. *Evolution and Human Behavior*, 28(3):168 – 175, 2007.

German Federal Statistical Office/Statistisches Bundesamt. Fachserie 11. Technical Report Reihe 1, 2004/05, Bildung und Kultur, Wiesbaden, 2005.

Gary Charness and Brit Grosskopf. Relative payoffs and happiness: an experimental study. *Journal of Economic Behavior & Organization*, 45(3): 301 – 328, 2001.

Sandra Dahlman, Pontus Ljungqvist, and Magnus Johannesson. Reciprocity in young children. *SSE/EFI Working Paper Series in Economics and Finance*, (674), 2007.

Ernst Fehr, Helen Bernhard, and Bettina Rockenbach. Egalitarianism in young children. *Nature*, 454:1079–1083, 2008.

Bruno S. Frey and Alois Stutzer. What can economists learn from happiness research? *Journal of Economic Literature*, 40(2):402–435, 2002.

Uri Gneezy and Aldo Rustichini. Gender and competition at a young age. *The American Economic Review*, 94(2):377–381, 2004.

Uri Gneezy, Muriel Niederle, and Aldo Rustichini. Performance in competitive environments: Gender differences. *Quarterly Journal of Economics*, 118(3):1049–1074, 2003.

Gilles Grolleau, Naoufel Mzoughi, and Angela Sutan. Do you envy others competitively or destructively? an experimental and survey investigation. *Working Paper Series*, 2006.

Kirsten Häger, Bastiaan Oud, and Daniel Schunk. Envy among Penan children. *mimeo*, 2010.

William T. Harbaugh and Kate Krause. Children's altruism in public good and dictator experiments. *Economic Inquiry*, 38(1):95–109, 2000.

William T. Harbaugh, Kate Krause, and Lise Vesterlund. Learning to bargain. *Journal of Economic Psychology*, 28(1):127 – 142, 2007.

Daniel Houser and Daniel Schunk. Social environments with competitive pressure: Gender effects in the decisions of German school children. *Journal of Economic Psychology*, 30:634–641, 2009.

James U. McNeal. The littlest shoppers. *American Demographics*, 14(2): 48–53, 1992.

J. Keith Murnighan and Michael Scott Saxon. Ultimatum bargaining by children and adults. *Journal of Economic Psychology*, 19(4):415 – 445, 1998.

Jean Piaget. *The Origins of Intelligence in Children*. Oxford University Press, Oxford, UK, 1952.

Ariella Shapira and Millard C. Madsen. Cooperative and competitive behavior of Kibbutz and urban children in Israel. *Child Development*, 40(2): 609–617, 1969.

Sara J. Solnick and David Hemenway. Is more always better?: A survey on positional concerns. *Journal of Economic Behavior & Organization*, 37(3): 373 – 383, 1998.

Matthias Sutter. Outcomes versus intentions: On the nature of fair behavior and its development with age. *Journal of Economic Psychology*, 28(1):69 – 78, 2007.

Daniel John Zizzo and Andrew J. Oswald. Are people willing to pay to reduce others' incomes? *Annales d'Économie et de Statistique*, (63/64): 39–65, 2001.

A Complementing tables

	p-values			
	treatment 1		**treatment 2**	
	female	male	female	male
DS/DU	0.853	0.001	0.862	0.647
DS/KG	0.037	0.101	0.228	0.768
DU/KG	0.053	0.118	0.295	0.473

Table 5: Two-sample test of proportion for different locations in both treatments, separately for gender, without subjects stating reasons 5, 6, 7, 8, and 9 and without subjects who did not understand the game

Probit regression on envious choice 5/3		
Dummy 8 years	1.132***	(0.428)
Dummy 9 years	0.114	(0.408)
Dummy 10 years	-0.252	(0.652)
Female	-0.678*	(0.373)
Grade math	0.149	(0.207)
Grade social behavior	-0.206	(0.387)
Grade working behavior	0.357	(0.389)
Dummy teamsport	-0.373	(0.342)
Number of siblings	0.149	(0.141)
Constant	-0.729*	(0.419)
Observations: 93; $R^2 = 0.151$		
Robust standard errors in parentheses; *** p <0.01, ** p <0.05, * p <0.1		

Table 6: Probit regression on taking the envious choice 5/3 in treatment 1 (without reasons 5, 6, 7, 8, and 9 and without children that did not understand the task)

Probit regression on altruistic choice 5/8		
Dummy 8 years	0.429	(0.401)
Dummy 9 years	0.877**	(0.394)
Dummy 10 years	1.188**	(0.484)
Female	-0.034	(0.307)
Grade math behavior	0.156	(0.217)
Grade social behavior	0.398	(0.385)
Grade working behavior	-0.434	(0.344)
Dummy teamsport	0.456	(0.303)
Number of siblings	0.133	(0.099)
Constant	-0.960**	(0.418)
Observations: 95; $R^2 = 0.122$		
Robust standard errors in parentheses; *** p <0.01, ** p <0.05, * p <0.1		

Table 7: Probit regression on taking the altruistic choice 5/8 in treatment 2 (without reasons 5, 6, 7, 8, and 9 and without children that did not understand the task)

Reason	**5/3**			**6/8**		
	girls	boys	all	girls	boys	all
No answer given	5 (50%)	8 (32%)	13 (37%)	11 (31%)	11 (28%)	22 (29%)
Profit maximization	0	0	0	5 (14%)	6 (15%)	11 (15%)
Envy	4 (40%)	4 (16%)	8 (23%)	0	0	0
Altruism	0	0	0	15 (42%)	16 (41%)	31 (41%)
Efficiency	0	0	0	1 (3%)	2 (5%)	3 (4%)
No candy allowed	0	0	0	1 (3%)	0	1 (1%)
Misunderstood game	0	2 (8%)	2 (6%)	1 (3%)	1 (3%)	2 (3%)
On diet	0	0	0	0	0	0
Not hungry	0	0	0	0	0	0
Doesn't like candy	0	0	0	0	0	0
Other	0	3 (12%)	3 (9%)	2 (6%)	3 (8%)	5 (7%)
Excuse	1 (10%)	8 (32%)	9 (26%)	0	0	0
$\sum$	10	25	35	36	39	75

Table 8: Reasons for choice given by subjects, treatment 1

Reason	**5/8**			**6/3**		
	girls	boys	all	girls	boys	all
No answer given	9 (26%)	15 (48%)	24 (36%)	22 (63%)	12 (41%)	34 (53%)
Profit maximization	0	0	0	5 (14%)	7 (24%)	12 (19%)
Envy	0	0	0	0	4 (14%)	4 (6%)
Altruism	19 (54%)	11 (35%)	30 (45%)	0	0	0
Efficiency	2 (6%)	1 (3%)	3 (5%)	0	0	0
No candy allowed	0	1 (3%)	1 (2%)	0	0	0
Misunderstood game	1 (3%)	0	1 (2%)	0	2 (7%)	2 (3%)
On diet	0	1 (3%)	1 (2%)	0	0	0
Not hungry	1 (3%)	0	1 (2%)	0	0	0
Doesn't like candy	1 (3%)	2 (6%)	3 (5%)	0	0	0
Other	2 (6%)	0	2 (3%)	5 (14%)	2 (7%)	7 (11%)
Excuse	0	0	0	3 (9%)	2 (7%)	5 (8%)
$\sum$	35	31	66	35	29	64

Table 9: Reasons for choice given by subjects, treatment 2

B Experimental Setup

Experimental protocol of the proceeding

- Teachers of the participating classes prepare a list for each class. On these lists we find no names, but a randomly assigned number for each child in order to ensure complete anonymity. In addition, teachers provide us with data about the gender, the age at the day of the experiment, school grades in math, social- and working behavior, as well as the degree of education of the parents classified as below average, average, or above average.

- The children of one class are randomly matched in pairs by drawing lots without knowing with whom they are paired. The first child gets the role of the proposer, the second child gets the role of the receiver.

- The class pursues its normal teaching procedure, often as individual work. The proposers go one by one in random order to the experimenter who is located in a separate empty room or empty hallway with her experimental set up. When one child returns to the class, the next one is sent to the experimenter.

- The experimenter sits at a table. To make it easy for the child to capture the different options, each of the two options (5/3 vs. 6/8 and 6/3 vs. 5/8 for treatment 1 and 2, respectively) is arranged on a napkin with the payoff for the proposing child at the side of the table where the child sits and the payoff for the responder at the side of the table where the experiments sits. The gummy bears are placed in a way to make it easy to immediately see the different amount. In addition, we placed a little piece of paper with a number indicating the amount of gummy bears next to each payoff (see figure 1).

- The experimenter explains the game to the child and asks for a choice, underlining the fact that (s)he does not know with whom (s)he is matched.

- After the child's decision, the gummy bears are placed into envelopes. The proposer's envelope is directly handed out to him and the child is assured that the other child will receive the other envelope after the experiment is completed in his/her class.

- Then a couple of questions follow (see appendix C).

- While placing the gummy bears into the envelopes, the experimenter casually asks the proposer about the reasons for his/her choice.
- After all proposers of one class have played the game, the experimenter goes into the class room and hands the envelopes for the receivers to the teachers. The teacher hands out the envelopes to the corresponding children. If there was an uneven number of children in one class, the child that was not matched with a partner also received for ethical reasons an envelope with gummy bears.

C Instructions

Protocol of the interaction/interview with each proposer during the experiment

Experimenter (E): Hallo! Sit down. Your task is to split up gummy bears. You can take some for yourself and send some to another child. The other child is in your class, but you don't know which one of them it will be, because this will be randomly drawn. You can either take 5 (6) gummy bears for yourself and send 3 to the other child or you can take 6 (5) for yourself and send 8 to the other child.

[If you choose this side (E. pointing at one side of the table), who will then get how many gummy bears?

Child (C): I would get ... and the other child would get ...

E: Correct. (Or repeating this question with re-explanation of the game until the child understands it although this rarely happened.)][10]

What do you want to do?

C: I take ... for myself and send ... to the other child.

E: What do you think, who wants usually more candies? Boys, girls, or do both want as much as possible (*these three options in random order)*?

C: ...

E: How many brothers and sisters do you have?

C: ...

E: What do you want to be later?

C: ...

E: Do you like gym classes at school?

C: ...

E: Do you do sports beyond school?

[10]The text in squared brackets was only employed in the session in November 2009. In the session of January 2008 the understanding of the task was inferred from the child's answer to the task.

C: . . .

If yes, E: What kind of sports?

C: . . .

E: Are you member of a club?

C: . . .

E: Why have you decided this way?

C: . . .

E: Thank you for participating. The other child will receive the envelope in a moment. Bye.

Original German version of the interaction with the proposers:

Experimentleiterin (E): Hallo! Setz dich. Deine Aufgabe ist es Gummibärchen aufzuteilen. Du nimmst welche für dich selbst und schickst welche an ein anderes Kind. Das andere Kind ist in deiner Klasse, aber du weißt nicht, wer von ihnen das ist, denn dies wird zufällig ausgelost. Du kannst entweder 5 (6) Gummibärchen für dich nehmen und 3 an das andere Kind schicken oder 6 (5) Gummibärchen für dich nehmen und 8 an das andere Kind schicken.

[Wenn du diese Seite nimmst (E. auf eine Seite zeigend), wer bekommt dann wie viele Gummibärchen ?

Kind (K): Dann bekomme ich ... und das andere Kind ...

E: Richtig. (Falls die Antwort falsch war wurde das Spiel nochmals erklärt und die Frage wiederholt, was selten der Fall war.)][11]

E: Was machst du?

Kind (K): Ich nehme ... für mich und ... für das andere Kind.

E: Wer, glaubst du, will normalerweise mehr Süßigkeiten haben? Jungen, Mädchen oder wollen alle immer möglichst viel haben *(diese drei Optionen in zufälliger Reihenfolge)*?

K: ...

E: Wie viele Brüder und Schwestern hast du?

K: ...

E: Was möchtest du später werden?

K: ...

E: Machst du gerne Sport in der Schule?

K: ...

E: Machst du nach der Schule Sport?

K: ...

[11] Der Text in eckigen Klammern wurde nur bei der Datenerhebung im November 2009 gesagt. Bei der Datenerhebung im Januar 2008 wurde von der Formulierung der Antwort des Kindes inferiert, ob dieses die Aufgabe verstanden hat.

Falls ja, E: Was für Sport?

K: ...

E: Bist du im Verein?

K: ...

E: Warum hast du dich so entschieden?

K: ...

E: Vielen Dank fürs Mitmachen. Das andere Kind bekommt den Umschlag gleich vorbeigebracht. Tschüß.