

# BARGAINING BY CHILDREN

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## I. Introduction

While Adam Smith believed that the propensity to “truck, barter, and exchange” was a part of human nature<sup>1</sup>, it seems unlikely that these behaviors are completely determined at birth. Instead it seems probable that they are at least in part acquired during childhood. In this paper we report on the results of a study that uses economic experiments to examine the development of bargaining behavior in children from age seven to eighteen.

There are good reasons to study bargaining in children. One motivation is that studying bargaining in children may teach us more about bargaining by adults. In most bargaining situations optimal decisions depend on an understanding of how others will respond. Beliefs about fairness, and about what others believe to be acceptable, are important considerations. Very little work has been done on when or how these beliefs and knowledge are acquired. We think it’s likely that people learn how to bargain at the same time they learn so much else - when they are children. We know that adults exhibit wide variations in bargaining behavior, both within and across cultures. It seems likely that these variations lead to different outcomes in such matters as wages, job searches, and housing and auto purchases. Studying the development of bargaining behavior will lead to more knowledge about the sources of this heterogeneity in both behavior and in economic outcomes.

Another set of reasons arise because children make many important decisions that involve bargaining with others. Many family decisions, with important consequences for adults and children, are the result of bargaining between parents and children. An understanding of how children bargain will lead to better models of these decisions. For example, rich parents often want their children to make larger investments in education than the children themselves want to make, while poor parents often prefer smaller investments. Parents and children bargain extensively over the size of these investments, over who will make the sacrifices needed to finance them, and over what kind of education will be acquired. The outcome of this bargaining process will obviously depend in part on the bargaining abilities of the parties involved. An understanding of how these strategies change with variables such as age and sex may also lead to

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<sup>1</sup> Smith (1776/1937)

a better modeling of human capital accumulation. Another important example involves bargaining between children. Research on education consistently shows the importance of peer effects. Modeling how peer effects work requires an understanding of how children with different preferences influence each other's decisions, which is in part a bargaining question.

We use the ultimatum game to study bargaining behavior. For this game two children are paired anonymously and assigned the role of proposer or responder. The proposer suggests how to split some money. If the responder accepts, each gets the amount proposed. If the responder rejects, neither gets anything. If both players only care about their own payoffs then the proposer should offer the smallest possible amount, and the responder should accept. But, there are two reasons to make larger proposals: the proposer might care about the responder's payoff, or she might fear that responder cares about fairness and will reject a small proposal. To distinguish between these two motives we also conducted dictator game experiments. The dictator game is the same as the ultimatum game except the responder has no ability to reject: he just gets whatever the proposer offers. In combination these two games allow us to separate proposals into a fairness component and a strategic component, where the second component is due to a calculation of the chance that a small proposal will be rejected.

We did both experiments on a total of 310 children, in second through twelfth grade classrooms. Almost all the children acted strategically, making larger ultimatum than dictator proposals. We found significant differences in behavior in both games across age, sex, and height. Young children made considerably smaller dictator and ultimatum proposals than older children and adults. Interestingly, they were also more likely to accept small proposals. As a result, when acting as proposers in the ultimatum games, the youngest children actually earned more than the older ones. Older girls made larger proposals than older boys. Among the younger children, shorter girls made much larger proposals than tall ones, particularly in the dictator games. Last, we found that children's self-reported propensity to reject "unfair" ultimatum offers was substantially exaggerated, and that all this exaggeration came from boys.

We conclude that children are good bargainers by the age of seven. Like adults they have preferences about their own payoff and the payoffs of others. Their choices show that they understand that the optimal bargaining strategy depends on the situation and on the preferences of those with whom they are bargaining, and that they have a working knowledge of what those preferences are. However, we do not find that these preferences are fixed, homogenous, or

unexplainable: they vary substantially across age, sex, and relative height. We believe that these results not only support existing work on the existence of cultural differences in economic behavior, they also suggest two new directions for further research in that area: one into how cultural influences affect behavior, and another into the origins of differences in behavior within a culture.

This paper begins with a brief review of the literature from economics, anthropology, and developmental psychology. This is followed by a description of our protocol. We begin the analysis of our experimental results with a descriptive section comparing proposals in the ultimatum and dictator games. We then trace the development of concerns for fairness by looking at how dictator proposals and ultimatum rejections vary with age and height. Next we look at strategic considerations: how good are children at making optimal ultimatum proposals, given the probabilities that small offers will be rejected? We then compare children's actual and stated behavior. In the conclusion we discuss some of the implications of these results.

## **II: Literature Review**

The economic literature on bargaining is extensive, and a more comprehensive review is in Roth (1995). Since devised by Guth, Schmittberger and Schwarze (1982), the ultimatum experiment has been done many times. Proposals typically have a mode at 50% of the endowment and a mean of about 40%. Proposals smaller than this are often rejected, even when the sums involved are very large, as in Cameron (1999), who conducts the experiments on Indonesians using amounts equivalent to several months' wages. While these results are very different from the subgame perfect Nash predictions for selfish preferences, they are not necessarily irrational. Rabin (1993), Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) have created models of preferences for fairness that can accommodate this behavior.

There is evidence that ultimatum behavior varies across cultures. Roth, et al. (1991) study students from four different countries. For their first round ultimatum experiments, average proposals range from 36% in Israel to 47% in the United States. Correspondingly, Israelis are more likely to accept a given proposal than Americans. Henrich (2000) compares ultimatum bargaining behavior (over amounts equivalent to several day's wages) between members of the Machiguenga tribe in Peru with that of graduate students in the UCLA anthropology department.

He finds that the mean offer among the Machiguenga is only 26% of the endowment, and even lower offers are almost always accepted, while at UCLA the mean offer was 48%, and many people at least claimed that they would reject lower amounts. He argues that this provides evidence for cultural differences in economic behavior, and he attributes the Machiguenga's behavior to their culture, which involves few economic relationships outside of the family. Henrich, et al. (2001) report further results from 15 small-scale societies, and argue that differences in the general level of social interactions within a culture can explain differences in behaviors across societies.

In addition to this evidence that culture matters in bargaining there is some evidence of systematic behavioral differences within a culture. Eckel and Grossman (2001) report that in their experiments female college students make statistically significantly larger ultimatum offers than males. While the proposal differences were small, they also found that females were much less likely to reject a given offer. Solnick (2000) also looks at ultimatum games and finds no sex differences in ultimatum proposals, but that female students were much less likely to reject proposals. Croson and Buchan (1999) look for differences in behavior in the "trust game" for different sexes in different countries. They find no differences across countries, but in general women return a larger proportion of the money sent them by an anonymous partner than men do. There is also work on sex differences in dictator games. Eckel and Grossman (1998) report that men give 8% of their endowment, women 16%. Andreoni and Vesterlund (2001) do a version of the dictator game with different endowments and costs of giving, and find that men's proposals are more sensitive to price than women's. Ayres and Siegelman (1995) find that even when using identical bargaining strategies car dealers quote higher prices to (American) women and blacks than to white men. This could be a consequence of the dealers reacting to systematic differences in bargaining behaviors among regular customers, but it could also result from discrimination or differences in average reservation prices among these groups.

Several papers report on across subjects comparisons of behavior in ultimatum and dictator games. In their treatments with real payoffs, Forsythe, et al. (1994) find that proposals in the ultimatum games are significantly larger than those in the dictator games: 46% versus 22% of the pie. They conclude that the ultimatum offers are due in part to fear of rejection, and in part to concern for the other person's payoff. Anderson, Rodgers and Rodriguez (2000) compare ultimatum and dictator behavior for university students in the U.S. and in Honduras. They find

that while in the U.S. people make smaller dictator proposals if they do ultimatum bargaining first, order has no effect with the Honduran participants.

There is one previous study of children and ultimatum games. Murnighan and Saxon (1998) report on a study of bargaining attitudes in children from kindergarten through ninth grade. In face to face interviews they asked individual children, recruited from public school classes, what offers they would make and accept in hypothetical ultimatum bargaining situations involving first money and then candy. In general, subjects seemed much more interested in candy than money, and they often said very different things across the money and candy treatments. They found that the proposals kindergartners gave were quite unstrategic: sometimes they told the experimenter they would give away everything. Third graders said they would make smaller proposals than sixth graders did. Third grade boys seemed the most strategic, and boys in general were more likely to say they would take advantage of others in treatments where they had better information. For responses, the only significant age difference was that the youngest children said they were more likely to accept very small proposals.

In addition to this economic literature, there is a large literature from developmental psychology that relates, sometimes indirectly, to the development of bargaining behavior. Most of this literature is concerned with how “prosocial” reasoning and behavior develop with age and differ across sexes, and what factors encourage such behavior. Eisenberg and Fabes (1998) provide a comprehensive survey. The word prosocial includes things such as cooperative behavior, distinctions between what is right and what is wrong, compliance with social norms, and absence of criminality. This literature is at least as concerned with how children reason about these issues as about their behavior, and the methodology is often very different from that used in economic experiments. Many studies use surveys or interviews, often asking mothers to describe their children’s behavior. Some involve observations in classrooms and playgrounds, and a few involve laboratory simulations of real life situations, using puppets or similar devices. The experiments often involve some sort of deception and generally do not have salient payoffs.

Kohlberg (1976) is perhaps the most widely cited work in this field. Kohlberg used survey data on how children reason about a series of hypothetical moral dilemmas to argue that children pass through a series of stages of moral development. He found that the biggest shift occurs around age 12, when children begin to move away from seeing moral behavior as a matter of obeying rigid rules and towards seeing it as being a matter of fulfilling obligations to others.

As with earlier theories that have proposed discreet stages of development, e.g. Piaget (1965), attempts to link these stages of reasoning with actual behavior have met with mixed success. However, a meta-analysis of 125 studies by Fabes and Eisenberg (1996), does find that prosocial behaviors generally increase with age. Studies in which simulated or actual donating took place found larger age effects than did surveys. Eisenberg (1986) has shown a positive correlation between prosocial reasoning and cognitive ability within ages, and argues that the age trend is in part due to an increasing capacity for the sort of cognitive reasoning that is needed to keep score and figure out what is fair and what is not.

Perhaps the most related experiment from this literature is Keil (1986). Keil showed second and sixth grade children a videotape of another child, telling them that this was live video and that the two of them would be simultaneously sorting letters by zip-code, for a nickel per letter. Treatments had the videotaped child performing their part of the task either quickly or slowly. At the end of each round, the subject and the co-worker (actually, the experimenter, who decided randomly) allocated the pair's earnings between themselves, taking turns as to who decided the split. Older children were less vengeful after the "co-worker" had divided the nickels unfairly, and were more likely to reciprocate fair and generous distributions. (In the end, every participant was given the same \$2.50 payoff.)

The development of sex differences has also received attention from psychologists. The meta-analysis by Fabes and Eisenberg (1996) documents differences in prosocial reasoning, (girls are better) but reports that differences in actual behavior are not so strong. They also show that there is a general increase in sex differences with age, with some research finding that the differences arise during adolescence. They caution that much of this research suffers from using sex-biased definitions of pro-social behavior. For example, girls might report yes when asked if they would give up their lunch milk to feed a stray kitten, but boys might say yes if asked if they would rescue a kitten from a tree, particularly if use of a ladder or a fire-truck was involved.

Last, there is a substantial literature on the effect of physical characteristics on wages. Perhaps the paper with the closest connection to this work is Persico, Postlewaite and Silverman (2001). The authors find that while taller men earn more than short ones, all this correlation can be explained using height at age 16. Height as an adult does not add any additional explanatory power. They attribute this to the fact that taller adolescents report having larger social networks,

which they hypothesize lead to the development of skills that are valuable in the labor market. This suggests that childhood developmental factors have important consequences for adults.

By conducting standard economic bargaining experiments on children we make several contributions to this literature. We are able to compare children's behavior to what others have already documented for adults, and we can compare the differences that have been found across cultures with differences across age. We can look at how the sex differences in bargaining that have been reported by others occur with age. Last, we can ask whether children are strategic bargainers – do their proposals make sense, given the rules of the game and the odds of rejection.

### **III. Participants and protocol**

We modified the usual dictator and ultimatum protocols so as to make them understandable to children. The instructions are in the appendix. We obtained permission from the Coquille and Myrtle Point, Oregon public school districts to run experiments in their schools and then asked individual teachers for permission to conduct the experiments in their classrooms. Coquille and Myrtle Point are logging and farming towns with populations of about 4,000, and our samples range from about 50% to 90% of the local population in each age group. Since school attendance is mandatory, and few children in these towns go to private schools or are home schooled, we avoid the usual problems of over-sampling children from richer and more educated families present in self-selected samples. Our sample is also more representative of the population from which it is drawn than is typical for economic experiments. On the other hand, while our sample is representative of children in these towns, it is not representative of the national population of children, and it also differs from the samples of college students on which most experiments are conducted.

We did the experiments on 310 children in second, fourth, fifth, ninth, and twelfth grades. The twelfth-graders are included because they are close in age to college freshmen, but closer in other respects to the rest of our sample. We did not collect data on individual ages, but the average ages of these groups are seven, nine, ten, fourteen, and eighteen respectively, and variations of more than a year are rare. Since the experiments were conducted in their regular classrooms, children always played against others of the same age. They also knew the other players, though their specific partners were anonymous and they made their decisions secretly.

Each participant played two ultimatum games, once as proposer and once as responder, and two dictator games, again as both proposer and responder. They were told that multiple games would be played, but not how many of each or of what type. We paid them after each round, and matched them with a different player each time.

Each game was played with an endowment of ten tokens. The ninth and twelfth graders could exchange tokens for cash at the end of the experiment, at preannounced rates of \$0.25 and \$0.50 per token. The younger children could use the tokens to buy toys and school supplies from us at the end of the experiment. We told them that each token was worth about \$0.25, and that our prices were about the same as in a regular store. It was very clear that these payoffs were sufficient to engage the interest of all the age groups.

We conducted two versions of the experiment, one starting with the dictator game and another with the ultimatum game. Within each version there were two groups of subjects, those whose initial role was as a proposer, and those who started as a responder. Subjects kept the same initial role for both games, so that while everyone played each role in each game, they did so in one of four different treatments, with their roles ordered as follows:

Version A:

Treatment 1: dictator proposer, dictator responder, ultimatum proposer, ultimatum responder.

Treatment 2: dictator responder, dictator proposer, ultimatum responder, ultimatum proposer.

Version B:

Treatment 3: ultimatum proposer, ultimatum responder, dictator proposer, dictator responder.

Treatment 4: ultimatum responder, ultimatum proposer, dictator responder, dictator proposer.

Note that with our design some people make, say, their dictator proposal in the first round of the experiment, while others make it in the second, and so on. The number of participants by grade and experiment version are shown in the appendix. In the analysis, we pool the fourth and fifth grade classes.

#### **IV. Results**

We start with descriptive data by age and across games. We show that there are significant differences in proposals across age groups and that even the youngest children make very different proposals in the dictator and the ultimatum games, indicating that they understand

the protocol and that they play strategically. We then look at how behavior is affected by the order in which a game is played and by experience. The next sub-section examines demographic effects. We find that proposals vary with sex and height, as well as with age. Then we look at whether children's ultimatum proposals are optimal, given the observed rejection rates. We follow this with a within-subjects comparison of behaviors across games, and finally we compare stated and actual rejection decisions.

### **Descriptive results by age and game**

Table I shows averages and standard deviations for proposals in the dictator and ultimatum games and for the proportion of proposals rejected, by grade.<sup>2</sup> There are several interesting results. First, children's behavior is broadly similar to that found in the many previous experiments on adults. Average behavior in both games is different from the subgame perfect Nash predictions for selfish people. Dictator proposals are greater than zero, ultimatum proposals are much higher than the sub-game perfect prediction of zero or one, and rejection rates are non-zero for every age group. Only the second grader's dictator proposals come close to the Nash prediction of zero. We find that even the youngest children make larger ultimatum than dictator proposals. Second, we find that dictator proposals increase substantially with age. Ultimatum proposals also increase but by a smaller amount, and most of the increase occurs from second to fourth/fifth grade. The variance of the dictator proposals increases and then decreases with age, while that of ultimatum proposals decreases steadily.

Figure I shows the possible combinations of proposals in the dictator game and in the ultimatum game, with the percentage of children making each combination on the vertical axis. Over all participants, the modal proposal combination is five tokens in the ultimatum game and zero in the dictator game. Combinations in the northwest quadrants of these figures are "strategic" in the sense that they involve a larger proposal in the ultimatum game, where there is a possibility of rejection, than in the dictator game. Overall, 78% of the participants make strictly larger ultimatum proposals, while 92% of the second graders do. Only 7% of kids make a

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<sup>2</sup> Table A.II in the appendix shows the results of Mann-Whitney and Epps-Singleton tests of differences in these proposals across grades. Dictator and ultimatum proposals by second graders differ from those of every other age, with either test. Dictator and ultimatum proposals for any age are significantly different at better than the 1% level, with either test.

dictator proposal that is larger than their ultimatum proposal, and only one of the 74 second graders does this. We conclude that children, even the youngest ones, have a good understanding of the protocols used in these games, and that evidence of strategic behavior can be seen even in the youngest participants.

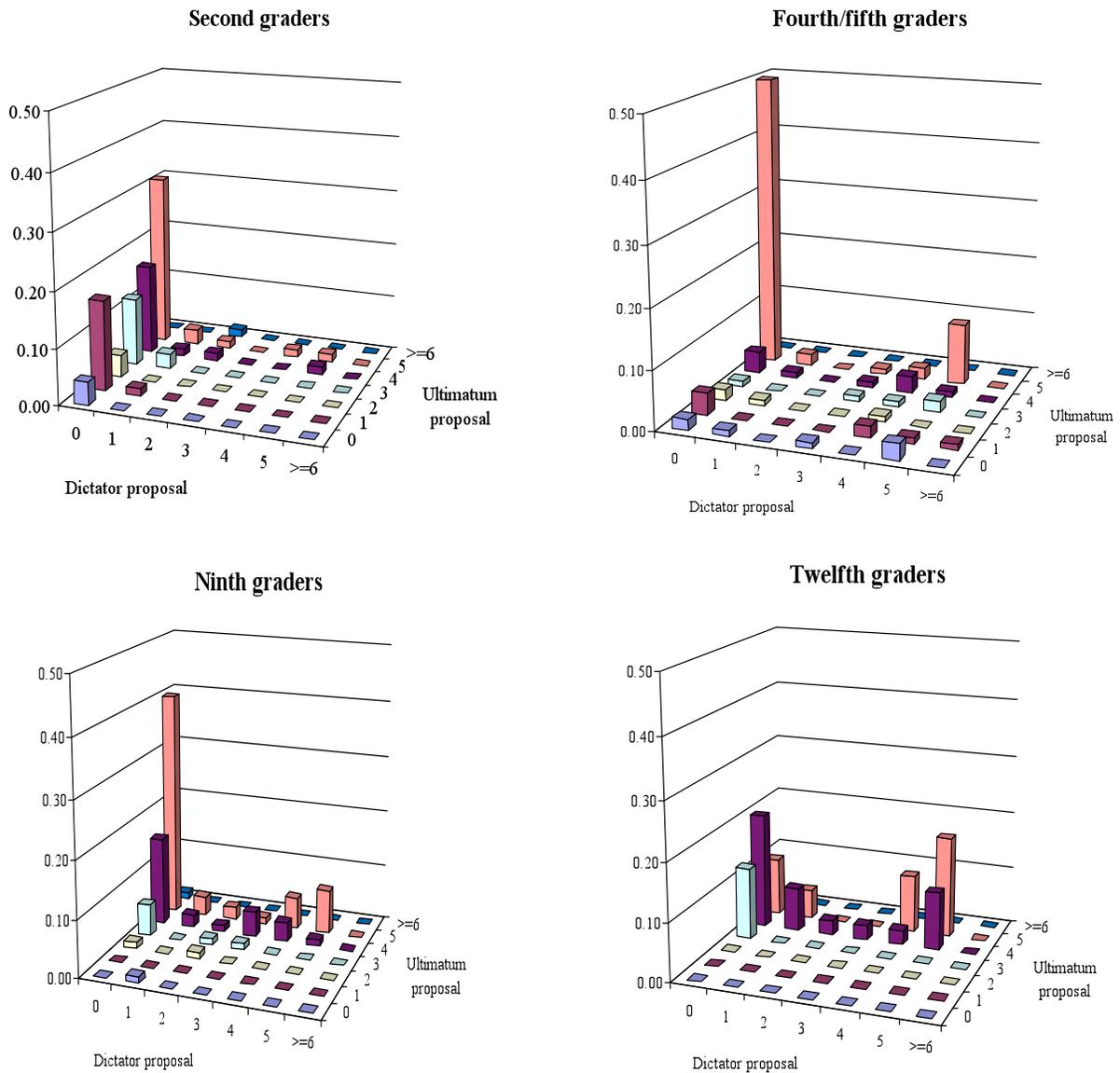
Figure I also reveals some interesting differences across ages. Among second graders, most of the heterogeneity is in ultimatum proposals, while hardly anybody gives any tokens away in the dictator game. The opposite holds among the twelfth graders - dictator proposals cover the range from zero to five, while ultimatum proposals are almost all either four or five. Only a few second graders offer anything close to an even division in both games, while a substantial proportion of the older participants, particularly twelfth graders, do so. For all grades except twelfth, the modal combination of proposals is zero in the dictator game and five in the ultimatum.

**Table I: Dictator and ultimatum proposals and rejection rates, by grade.**

Grade	n	Dictator proposal		Ultimatum proposal		Rejection rate	
2	74	0.35	(1.0)	3.5	(1.7)	0.11	(0.31)
4	106	1.4	(2.1)	4.1	(1.6)	0.14	(0.35)
9	90	1.2	(1.8)	4.5	(0.89)	0.033	(0.18)
12	40	2.1	(1.2)	4.3	(0.69)	0.10	(0.30)
all	310	1.2	(1.2)	4.1	(1.4)	0.10	(0.30)

Note: Means, with standard deviations in parentheses.

**Figure I: Dictator / ultimatum proposal cross tabs, by grade.**



## Order and History

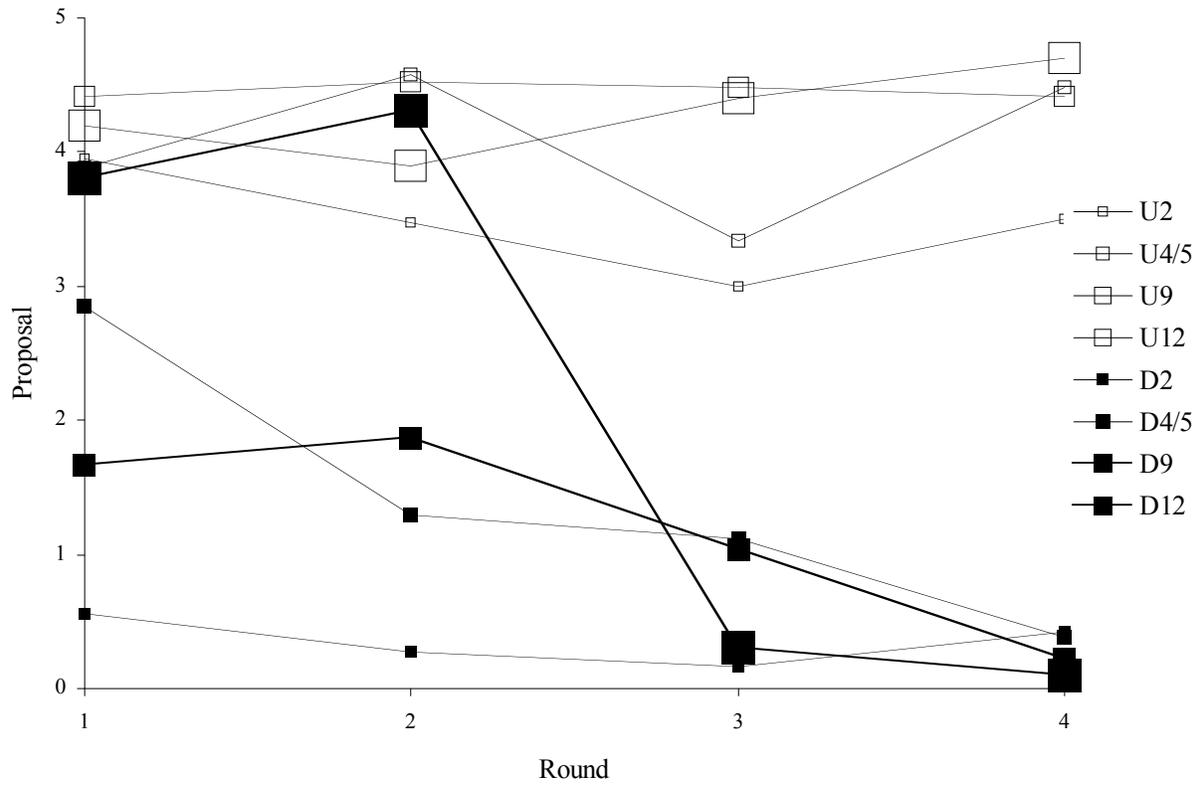
With our protocol there are two reasons why the round in which a decision is made might affect behavior. First, behavior might be affected by history. For example, if someone rejects what you feel was a perfectly reasonable ultimatum proposal, you might feel justified in subsequently making a smaller dictator proposal than you otherwise would have, even to a different partner. Or you might then decide that maybe your proposal wasn't so reasonable after all, and give more in the dictator game, thinking that somehow makes up for it. Second, decisions in one game may be affected by the simple fact that a person played another game first, regardless of the particular events of that game. For example, people may make smaller proposals in later dictator games because, say, playing an ultimatum game reminds them of competition and makes them less generous, regardless of their particular experience in that game. (Similar effects might derive from playing the role of proposer before responder.)

These possibilities create both a problem, in that they complicate the analysis of differences in behavior with respect to demographic variables, and an opportunity, in that by looking at how ordering of the games and individual variations in history affect behavior we can gain some insight into what drives behavior. Figure II shows average dictator and ultimatum proposals by grade and by round. For both games and for most rounds, proposals by second graders are smaller than those of the older children. Dictator game proposals show the biggest changes with order, particularly for the older participants. If the dictator game is played first, proposals by twelfth graders are larger than those of any other age group – and as large as twelfth graders' first round ultimatum proposals. If the ultimatum game is played first, the subsequent dictator proposals by twelfth graders are much smaller, as small as those by second graders. Dictator proposals by the fourth and ninth graders show similar patterns, though not to the same extent.

It is interesting to compare these results with those from Anderson et al. (2000). For U.S. college students, they find the same patterns we find for twelfth graders, while the Honduran students show no decline in dictator proposals if the ultimatum game is played first. They attribute this difference to a distaste for bargaining in the U.S. students, though obviously there are other differences between the groups. Whatever the cause, it is interesting that we find that the drop gets more severe as people get older. Note also that the drop does not come from older

children making small late round dictator proposals: these are almost identical across ages. Rather it comes from the older children making relatively high proposals in the early rounds. This wide variation in dictator proposals across rounds for older children explains part of the standard deviations in Table I. Within a given round, dictator proposals for the older children are quite homogenous.

**Figure II: Proposals by game, grade, and order.**



To see how individual specific history matters, we ran separate regressions for each decision in each treatment, with independent variables representing outcomes in all previous play. There are 16 possible regressions, one for each of the 16 possible combinations of the four treatments and four roles. However, we can ignore the role of responder in the dictator game since there is no decision, and we can ignore the combinations where the decision is made in the first period of the treatment, since the player cannot be conditioning it on any history. For each of the remaining nine combinations of role and treatment we ran a regression on the decision, using any outcomes that have preceded that decision as explanatory variables. We use OLS for the ultimatum proposals, Tobit for the dictator regressions to account for the many proposals at zero, and probit for the binary ultimatum response.<sup>3</sup> The coefficients and standard errors are shown in Table II.

The coefficients on the contemporaneous ultimatum proposal for the last three regressions in this table show that, as expected, larger proposals are more likely to be accepted. The only statistically significant effect of prior history is a finding, in one regression, that people whose ultimatum offers were rejected subsequently make larger dictator proposals than those whose proposals were rejected. (However, this coefficient is based on a small sample - only four people in this group had their proposals rejected.) In particular, we do not find any correlation between the dictator or ultimatum proposal a child receives and the dictator or ultimatum proposal they subsequently make themselves. This suggests that the children understand they are playing with different partners each time, and make independent decisions.

Based on this table we argue that the noticeable decrease in dictator proposals that occurs among the older children when the dictator games are done later in the experiment is derived from some general effect having to do with playing the ultimatum game, rather than from individual specific history. We note that the result that history does not matter, but order does, has implications for the validity of models of fairness that are intended to explain behavior in these games. In particular, the result that the importance of order changes with age suggests that models that explain dictator game behaviors among adolescents and adults will not explain the behavior of young children.

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<sup>3</sup> The results are the same if we use ordered probit for the proposals to account for the fact that only integer responses are allowed, or if we just use OLS for all the regressions.

**Table II: Does history matter?**

Round:	<u>Dictator proposal</u>			<u>Ultimatum proposal</u>			<u>Ultimatum rejection</u>		
	2	3	4	2	3	4	2	3	4
Model:	Tobit	Tobit	Tobit	OLS	OLS	OLS	OLS <sup>+</sup>	Probit	Probit
Partner's dictator proposal	0.354 (0.219)		-0.056 (0.898)		0.153 (0.095)	0.090 (0.059)		0.097 (0.110)	0.078 (0.148)
Partner's ultimatum rejection		3.600* (1.827)	-31.577 (0.000)				-0.057 (0.084)		0.529 (0.639)
Partner's ultimatum proposal		-0.531 (0.530)	-0.802 (0.831)	0.138 (0.092)		0.085 (0.078)	-0.110*** (0.024)	-0.603*** (0.148)	-0.570*** (0.203)
Adjusted or pseudo r-squared	0.0105	0.0269	0.0277	0.0161	0.0209	0.0213	0.21144	0.4075	0.3323
Observations	77	79	78	78	76	77	79	77	76

Notes: Coefficients shown. Standard errors in parentheses.

\* means the underlying coefficient is significantly different from 0 at the 0.10 level, \*\* at the 0.05 level, \*\*\* at the 0.01 level. The dictator proposal regressions are done with Tobit, ultimatum proposals with OLS, and ultimatum rejections with probit.

+ means unable to estimate probit because some responses were perfectly predicted, so results shown are for OLS.

## Age, sex, and size

Next we look at differences in proposals and responses across demographic variables, while controlling for order with regressions. Results are shown in Table III. For the order effects, the proposal regressions basically mirror what is shown in Figure II. Dictator proposals decrease with order, at a rate that accelerates with age. We omitted the order/grade interactions for the ultimatum game proposals, since there is no obvious pattern in Figure I. The age differences also mirror the Figure II results. The older children make significantly larger dictator and ultimatum proposals than the second graders do. These differences are not trivial: in the dictator game the average proposal is 1.2 tokens, and each year of age is associated with an increase in the proposal of about 0.23 tokens. For the ultimatum game the overall average proposal is 4.1 tokens, and each year of age is associated with an increase of about 0.1 tokens. Large changes in behavior are occurring between the ages of 7 and 18.

The first regression for every behavior includes an indicator variable for sex. Boys tend to make smaller dictator and ultimatum proposals, though only the dictator difference is statistically significant. Boys are perhaps slightly less likely to reject a given ultimatum proposal, though the coefficient is not significant. We get insignificant coefficients if we add a sex with proposal interaction effect, to allow the gender effect to vary with proposal size, or an age with proposal interaction. These differences in proposals for boys and girls are similar to the differences cited in Eckel and Grossman (2001) for undergraduate men and women.

Along with sex, the second regression for every behavior includes a measure of relative height. This is the percentage deviation of the participant's height from the mean of all those who participated in the experiment with them – that is, their fellow class members. We measured the second graders ourselves at the end of the experiment, while the other heights are from a survey the students filled out before being paid. Relative height has a significant effect on dictator proposals: children who are one standard deviation taller than the mean propose about half a token less than children who are one standard deviation shorter. As a percentage, this effect is very large.

**Table III: Regressions.**

Independent variable:	<u>Dependent variable:</u>					
	Dictator proposal		Ultimatum proposal		Ultimatum rejection	
order	-0.2567 (0.176)	-0.2563 (0.173)	-0.0012 (0.0696)	0.0038 (0.0695)	-0.0014 (0.0077)	-0.0018 (0.0071)
grade	0.2314*** (0.0607)	0.2283*** (0.0594)	0.0932*** (0.0226)	0.0927*** (0.0225)	0.0060** (0.0026)	0.0060** (0.0025)
order & grade interaction	-0.0529** (0.0242)	-0.0524** (0.0237)				
boy	-0.4121** (0.181)	-0.2671 (0.185)	-0.0226 (0.1569)	0.0473 (0.1636)	-0.0102 (0.0170)	-0.0152 (0.0171)
height		-0.0354** (0.0143)		-0.0181 (0.0123)		0.0016 (0.0012)
ultimatum proposal					-0.0441*** (0.0135)	-0.0411*** (0.0138)
Adjusted or pseudo r-squared	0.0938	0.101	0.0436	0.0473	0.444	0.453

Notes: 310 observations. Marginal effects are shown (cumulative for the Tobit). Standard errors of the marginal effects are in parentheses. \* means the underlying coefficient is significantly different from 0 at the 0.10 level, \*\* at the 0.05 level, \*\*\* at the 0.01 level. The dictator proposal regressions are done with Tobit, ultimatum proposals with OLS, and ultimatum rejections with probit.

Interestingly, height alone explains more of the variance in dictator and ultimatum proposals and ultimatum responses than sex alone does. For all three of these behaviors, adding height to a regression that includes sex improves the fit more than does adding sex to a regression that includes height. Adding it to the regression for dictator proposals decreases the sex coefficient and makes it insignificant at even the 10% level. Adding it to the ultimatum proposal regression actually changes the sign of the sex coefficient, though it is insignificant before and after the addition. We get similar results if we use a measure of height relative to others of the same sex in the experiment, rather than relative to everyone. The regression results on sex and height are essentially unchanged if we run the regressions with indicator variables for order and grade instead of the continuous measures. While there are some nonlinearities with age and order, the basic age and order patterns also hold.

The age, sex and height story is more revealing if we just sort the girls and the boys in each class by height, and then evenly divide each sex into three groups: short, medium, and tall. While this doesn't provide the controls for order that the regressions do, the design is balanced and so the means are still unbiased. Figure III shows average dictator proposals for kids grouped by age, sex and by this measure of relative height.<sup>4</sup> If we look at the last pair of bars in the top panel of this figure, for the younger children, we see that, ignoring height, the proposals by young girls and boys are the same. But if we look across the first three pairs of bars we see that, for girls though not boys, there is a large decrease in proposals as height increases. The shortest girls give nearly four times more than the tall ones. The tall boys give three times as much as the tall girls.

For the older kids, shown in the bottom panel, the sex and height story is very different. The last pair of bars shows that, overall, the older girls give more than twice as much as older boys. The first three pairs of bars show that the height effect in girls has diminished, and that again that proposals by boys are similar across height. So, we find that for young children the heterogeneity in dictator proposals is driven entirely by height, not by sex. For the older children, it's driven more by sex than by height.

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<sup>4</sup> We also did this with relative height by class only, rather than class and sex. This makes little difference for the younger kids, but because among the older students the males are on average taller, we end up with very unequal cell sizes.

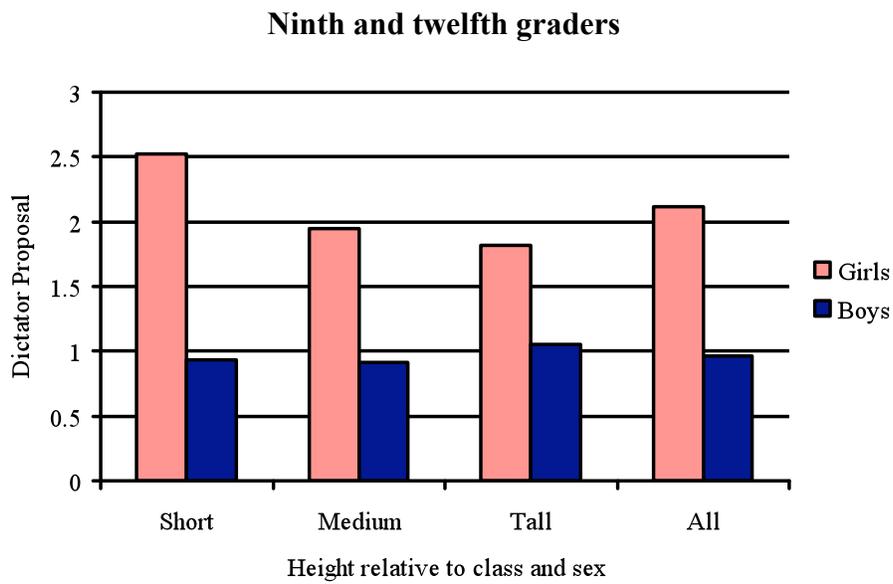
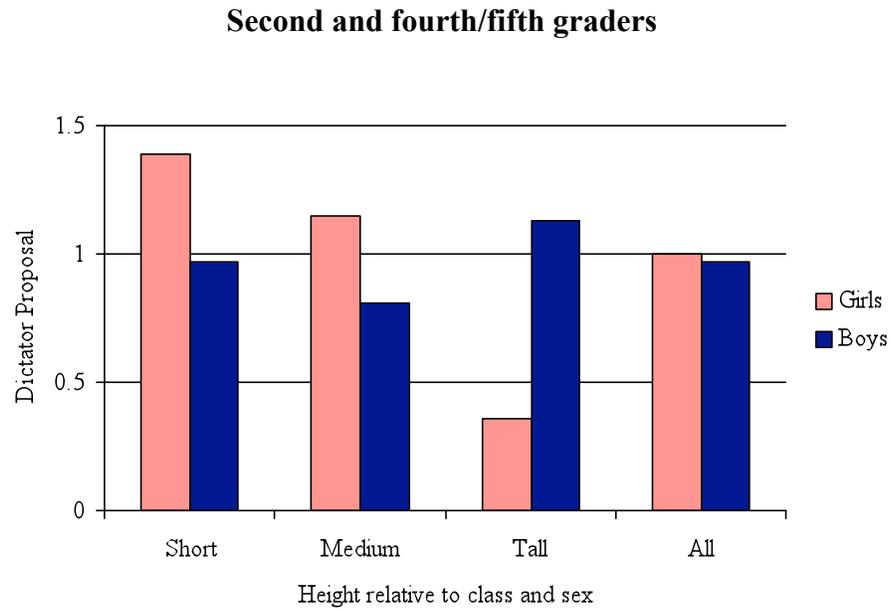
**Figure III: Average dictator proposals by age, sex and size.**

Table A.III in the appendix shows the results of non-parametric tests for differences in dictator proposals according to sex and height. In addition to the ES and MW tests, we also report Fisher's exact test of independence for the proportions of people making zero versus greater than zero proposals. These tests support the statistical significance of sex differences in proposals, particularly among the older children. For differences across the relative height groups the support is mixed: the ES test cannot reject the hypothesis that the distributions are the same, while the MW test and Fisher's test both show a robust difference. The tests support the existence of differences by height in proposals by girls, though Fisher's test is significant only at the 10% level. For boys, the support is weak: the ES test does not support a difference, and the MW and Fisher's tests only support it at the 10% level. None of the tests can reject the hypothesis that the short boy/tall girl groups have the same contributions. Statistical significance also holds if we test these patterns using regressions that control for order effects as was done in Table III. A likelihood ratio test gives a p-value of 0.0364 for the hypothesis that saturated models with grade, sex, and interactions of age with sex and sex with height fit the dictator proposal data better than does a model with only the order, grade, and order with grade interaction variables.

When we include relative height, it is hard to generalize about sex and fairness in the dictator game. For the younger kids, if we compare across the sexes while holding height constant, the sex difference actually switches sign in the tall kids, with tall boys giving more than tall girls. Across sex and height, short girls give the most, but tall girls give the least. For the ultimatum proposals, we don't find any substantial sex differences. There is a modest and barely significant height effect, as the Table III regressions indicate, but it's not monotonic in the boys. Interestingly, it seems to be relative rather than absolute height that matters. The twelfth graders are more than half again as tall as the second graders, but when playing against other twelfth graders, they actually make larger dictator and ultimatum proposals.

## Rejections and optimal ultimatum proposals

The analysis of rejections is only based on few observations, since just 30 of the 310 proposals are rejected. Despite this, the relationship between the proposal amount and the probability of rejection is statistically significant in the regressions shown in the last two columns of Table II. Order does not appear to have any effect on the decision to reject a proposal. Older children are more likely to reject. A one token increase in the proposal decreases the probability of rejection by about 4%, and this effect is significant at the 1% level.

We ran probit regressions on rejections separately for each of the four grades, with the proposal as the independent variable, and then used the estimated probit functions to predict rejection rates for different proposal amounts for each grade. Rounding off to halves, we find that proposals of 2.0, 3.5, 3.5, and 4.0 maximize the predicted returns for grades 2, 4/5, 9, and 12 respectively.<sup>5</sup> These results are shown in Table IV. For every grade, average actual proposals are higher than the estimated optimal proposals. Risk aversion, altruism, and upward bias in children's estimation of the rejection probabilities are all possible explanations for this. The differences, both in terms of the deviation from the optimal proposal, and in terms of the loss in the expected return, are largest for the second graders, the age group least likely to be able to figure this out.

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<sup>5</sup> We get similar results, in levels and changes across grades, if we estimate this using a linear probability model, or if we pool the data across grades and add a variable for the grade to the regression.

**Table IV: Average returns by ultimatum proposal and grade.**

<u>Proposal</u>	<u>Grade</u>			
	<u>Second</u>	<u>Fourth / fifth</u>	<u>Ninth</u>	<u>Twelfth</u>
0.0	1.85	1.99	0.08	0.00
1.0	5.28	3.61	0.83	0.00
1.5	6.65	4.40	1.86	0.00
2.0	<b>7.28</b>	5.07	3.28	0.14
2.5	7.28	5.53	4.69	0.88
3.0	6.95	5.77	5.65	2.79
3.5	6.49 *	<b>5.78</b>	<b>5.99</b>	4.87
4.0	6.00	5.62 *	5.85	<b>5.67</b>
4.5	5.50	5.31	5.47 *	5.47 *
5.0	5.00	4.91	4.99	5.00
6.0	4.00	3.99	4.00	4.00
Average proposal	3.5	4.1	4.5	4.3
Rejections / Obs.	8 / 74	15 / 106	3 / 90	4 / 40
Pseudo R-sq.	0.542	0.456	0.404	0.444

Notes: Rejection probabilities are estimated using probit, separately for each grade.

Bold face indicates the proposal that maximizes the estimated return for that grade.

\* indicates the average proposal for that grade, rounded to the nearest 0.5.

### **Within-subjects behavior**

We can also use this data to look for connections between behaviors in the two games. None of the raw correlations between people's dictator proposals, ultimatum proposals, and ultimatum rejections are statistically significant. This result seems at odds with the finding that proposals in both games and ultimatum responses all differ systematically with age, shown in Table III. We resolve this puzzle by looking at regressions that include behavior/grade interaction terms, shown in Table V.

For the dictator proposal, we find that the coefficient on the direct effect is now negative and significant, while that on the interaction term is positive and significant. In other words, young children that are more generous in the dictator game tend to make smaller ultimatum proposals, while older children that are more generous in the dictator game tend to make larger ultimatum proposals. These effects cancel out when we omit the interaction, explaining the zero raw correlation. Results for ultimatum proposals are consistent with those for dictator proposals. The coefficients on the ultimatum response decision and its interaction are not significantly correlated with either proposal, and only the ultimatum proposal coefficient is significant, and that only at the 10% level. (The partner's ultimatum proposal is included as a control for the ultimatum rejection decision.)

These results suggest that different models of behavior may be at work with different age children, and in particular that other-regarding preferences are more likely to be behind the bargaining decisions of the older children than the younger ones. However, while the coefficients in this regression are statistically significant, the r-squareds for the proposal regressions are very low. (The only exception is for the ultimatum rejection regression, but that is driven almost entirely by the explanatory power of the partner's ultimatum proposal. With that variable omitted, the pseudo r-squared is 0.164) The r-squareds don't increase if we just look at the ninth grade and older kids. The most reasonable conclusion should probably be that there is very little connection between behaviors in these games, at any age.

**Table V: Within-subjects behavior regressions.**

Dependent variable and regression model:			
	Dictator proposal	Ultimatum proposal	Ultimatum rejection
Independent variable:	Tobit	OLS	probit
Ultimatum proposal	-0.616** (0.257)		0.058 (0.114)
Grade/ultimatum proposal interaction	0.080*** (0.021)		0.022* (0.012)
Ultimatum response	-2.378 (2.356)	0.143 (0.548)	
Grade/ultimatum response interaction	0.054 (0.327)	0.071 (0.078)	
Dictator proposal		-0.210** (0.082)	-0.024 (0.161)
Grade/dictator proposal interaction		0.028*** (0.010)	-0.007 (0.021)
Partner's ultimatum proposal	-0.229 (0.275)	0.150** (0.072)	-0.757*** (0.107)
Observations	310	310	310
R-squared	0.0224	0.0355	0.4556

Notes: Coefficients shown. Standard errors in parentheses.

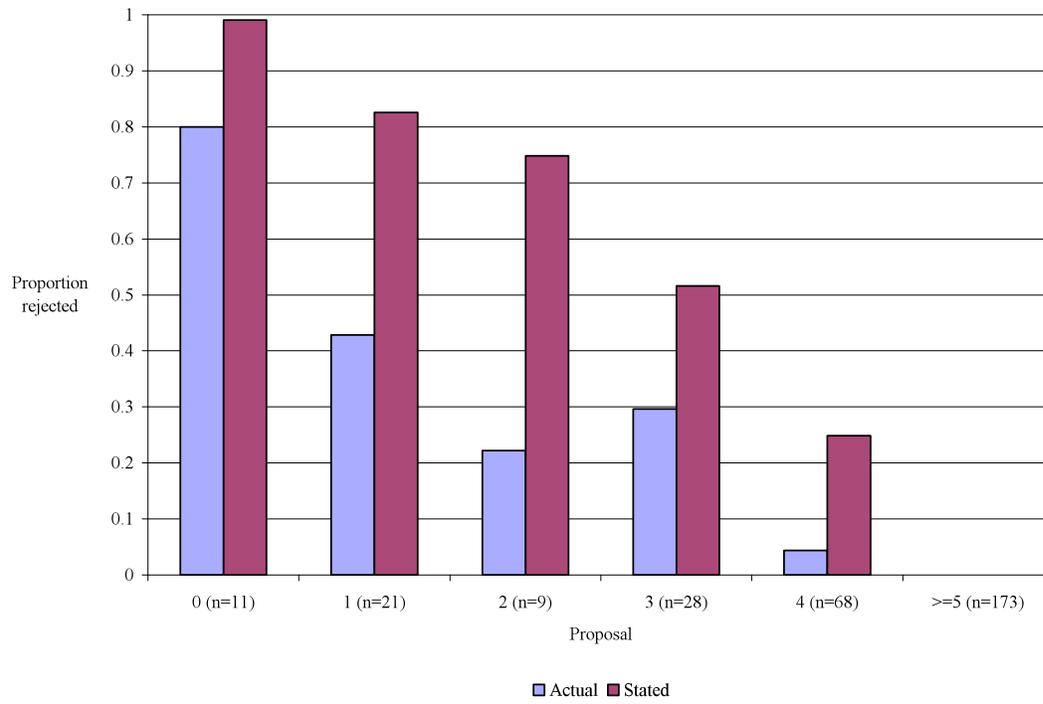
\* means the underlying coefficient is significantly different from 0 at the 0.10 level, \*\* at the 0.05 level, \*\*\* at the 0.01 level. The dictator proposal regressions are done with Tobit, ultimatum proposals with OLS, and ultimatum rejections with probit.

+ means unable to estimate probit because some responses were perfectly predicted, so results shown are for OLS.

### Stated versus actual accept/reject decisions

In addition to experimental data on ultimatum rejections, we have self-reported data from responses to the question “What is the smallest offer that you would accept?” collected in a survey immediately after the experiment. In Figure IV we show a comparison of the actual and the hypothetical rejection rates (calculated from this question) for different proposals. The number of actual proposals at given levels are in parentheses. Despite the small numbers of observations in some cells, the general pattern of decreasing actual rejection rates with larger proposals is very intuitive. The pattern in the stated rejection rates is even more intuitive, both in its trend and in the differences from the actual data. For example, 51% of the subjects say that they would reject an offer of three tokens, but when actually confronted with this situation and actually losing their tokens if they reject, only 23% really do it.

Most of the discrepancy between actual and stated behavior comes from boys. Using the ES test, we can reject the hypothesis that the distributions of lowest acceptable offers are the same for girls and boys at the 0.0000 p-value. On average, boys say that the lowest offer they will accept is 3.50 tokens, while for girls it is 3.14. On the other hand, the regressions in Table II show that, if anything, boys are actually *less* likely to reject a given ultimatum proposal. This difference is all due to sex: relative height does not have any statistically significant correlation with stated behavior. The sex difference in self-reports is highest among the younger children. One interpretation of children’s tendency to exaggerate their toughness as bargainers is that it is further evidence of their strategic abilities. This result also shows the importance of using real rather than hypothetical payments with children: the conclusions about sex differences flip, depending on which data are used.

**Figure IV: Actual and stated rejection rates.**

## V: Conclusion

In this paper we have shown that bargaining behavior changes systematically with age. In the dictator game children make considerably smaller proposals than adults do. Children also make, and accept, smaller ultimatum proposals than adults do. The youngest children make the lowest proposals and they have the highest acceptance rates, controlling for the proposal amount. Even young children are quite strategic, and are very good at playing the ultimatum game. All age groups make proposals that are close to maximizing the expected return, given the rejection rates. When making ultimatum proposals, we actually found that second graders earned more than any other age group, though this may have been as much due to their willingness to make small proposals as to their ability to predict rejection probabilities. When combined with the fact that the second graders give less in the dictator game, we interpret this to mean that the behavioral differences across ages are related to different preferences for fairness, not to differences in the ability to play strategically.

This result gives a new twist to work by others on cross-cultural differences in economic behavior. Explanations of these cultural differences are either really about genetic differences, or they require that there be some way that different cultures persuade people with the same genes to behave differently. We suggest that this latter process happens in childhood, and we provide evidence of substantial behavioral changes in a sample of children from the same culture, over the ages seven to 18.

We have also identified a height effect: relatively taller girls make much smaller dictator proposals, and they are more likely to reject ultimatum proposals. These differences do not decrease as children get more experience with the experiment, however they do decrease with age. This suggests that even within a culture individual differences in bargaining can be sensibly explained using characteristics that affect bargaining power outside the lab. The result that the height effect is supplanted by a sex effect around the age of puberty fits with evidence from the developmental psychology literature on a variety of prosocial (and other) behaviors, and from the evidence from economic experiments on men and women. We think the fact that the differences are larger for the dictator proposals than the ultimatum proposals makes good sense. Dictator proposals are purely a matter of the proposer's preferences, while optimal ultimatum proposals must take the preferences of the responders into consideration.

To our knowledge no prior bargaining experiments have looked at variables such as height, though there is a large literature on sex differences, and a smaller one on status differences. While the evidence is mixed, the general conclusion is that, when making proposals to respondents of unknown sex, women make noticeably larger dictator proposals than men do, make nearly equivalent ultimatum proposals, and are considerably more likely to accept a given ultimatum proposal. Except for ultimatum responses, where we have very little data, these are exactly the results that we find for older children.

We think these height results are not only intrinsically interesting, but also that they have implications for more important issues. When people behave differently it is either because they have different preferences or because they face different constraints. On a playground with sporadic adult supervision, decisions may involve very different constraints for a little kid than for a big one, and it would not be surprising to see smaller children “sharing” more than large ones. In our experiments, however, decisions are anonymous, and so the constraints are the same for everyone. Given this, the fact that different size kids make different decisions in the experiment means that different size kids have different preferences. In the dictator games with the younger kids, the differences in preferences implied by the proposal differences of the short and tall girls seem very large. Since we do not have data on the height of the older children when they were younger, we are not able to determine whether this effect is permanent or transitory. However, the Persico, Postlewaite and Silverman (2001) result on the permanent effect of adolescent height on adult income, cited above, suggests that it may well be.

Bargaining is a basic economic process, determining how limited resources are allocated to competing interests. Children’s own resources are extraordinarily limited relative to their often apparently insatiable desires. Every day they must strike a host of complicated bargains with their parents, teachers, and peers in efforts to obtain things that, in their ultimate importance, range from trivial to vital. In this paper we have shown that children are rational and strategic bargainers by the age of seven, and that the sorts of tools that economists have successfully applied to studying the bargaining behavior of adults can also be used to study bargaining behavior in children.

**Appendix:****Table A.I: Participants by grade and treatment.**

Grade	N	Version
2	16	A
2	20	A
2	20	B
2	18	B
	74	
4	28	A
5	26	A
4	28	B
5	24	B
	106	
9	25	A
9	18	A
9	22	B
9	25	B
	72	
12	20	A
12	20	B
	64	
Overall:	310	

Forsythe et al. [1994] show that with ultimatum game proposals, the Epps and Singleton [1986] (ES) test of the hypothesis that data from different populations is drawn from the same underlying discrete distribution has considerably more power to reject the hypothesis that the distributions are the same when they are different than do the common non-parametric alternatives. This power is derived from the fact that the alternatives either assume a continuous rather than a discrete distribution, or only compare a measure of central tendency, rather than the entire distributions. Table A.II shows the results of tests of the hypothesis that the distribution of proposals for each game differ across grades, using this test as well as the more familiar Mann-Whitney.

**Table A.II: Non-parametric tests of differences in proposals by grade and game.**

<b>Dictator</b>			
Grade	2	4/5	9
4/5	1.07 <sup>***,+++</sup>		
9	0.83 <sup>***,+++</sup>	-0.25	
12	1.77 <sup>***,+++</sup>	0.70 <sup>**</sup>	0.95 <sup>**,+</sup>
<b>Ultimatum</b>			
Grade	2	4/5	9
4/5	0.58 <sup>***,+++</sup>		
9	0.97 <sup>***,+++</sup>	0.39 <sup>+++</sup>	
12	0.81 <sup>***,+++</sup>	0.23 <sup>+++</sup>	-0.16 <sup>*,+++</sup>

Notes: The numbers are the row mean minus the column mean.

\*, \*\*, and \*\*\* indicate the difference is significant at the 0.1, 0.05, or 0.01 level respectively using the Mann-Whitney test.

+, ++, and +++ indicate the same using the Epps-Singleton test.

Table A.III shows the results of tests of the significance of differences in dictator proposals by age, sex, and height.

**Table A.III: Significance tests of dictator proposal differences by age, sex and height.**

Groups:	<u>First group</u>		<u>Second group</u>		<u>P-value:</u>		
	n	Mean	n	Mean	Epps- Singleton	Mann- Whitney	Fischer's Exact
<u>All grades:</u>							
Girls vs. boys	140	1.46	170	0.965	0.102	0.0121	0.012
Short vs. tall	115	1.36	94	1.03	0.136	0.0741	0.040
Short girls vs. tall girls	52	1.85	42	0.95	0.193	0.0331	0.056
Short boys vs. tall boys	52	0.95	42	1.10	0.256	0.618	0.413
<u>2<sup>nd</sup> and 4<sup>th</sup> / 5<sup>th</sup> grades:</u>							
Girls vs. boys	83	1.00	97	0.97	0.467	0.4043	0.314
Short vs. tall	66	1.17	55	0.78	0.469	0.1248	0.151
Short girls vs. tall girls	31	1.39	25	0.360	0.230	0.0384	0.079
Short boys vs. tall boys	35	0.971	30	1.13	0.626	0.831	0.779
<u>9<sup>th</sup> and 12<sup>th</sup> grades:</u>							
Girls vs. boys	57	2.12	73	0.96	0.0158	0.0018	0.012
Short vs. tall	49	1.61	39	1.38	0.201	0.3863	0.197
Short girls vs. tall girls	21	2.52	17	1.82	0.381	0.3960	0.324
Short boys vs. tall boys	28	0.929	22	1.05	0.373	0.6429	0.548

## Protocol

### Experiment Script

*Note: The vocabulary given here was designed to make sense to the fourth graders. We used it as is on the ninth graders, except as noted. For the second graders, it was necessary to start by explaining the terms proposer and responder. In addition, the directions were given more slowly and with more examples. When giving the examples to the second graders we physically showed them the division and the allocation using the tokens. Whenever possible, we answered questions by repeating or rephrasing the words in the protocol. While these protocols were followed as closely as possible, we did find it necessary to remind the children to pay attention and not talk to each other. Their teachers were very helpful with this.*

*We did not tell them that the games would be repeated with different roles, or that two different games would be played. If asked, we just said “Sorry, we can’t tell you that. You will have to wait and see what happens.”*

“We are going to play some games today. In these games you can get some tokens. When we are all done you can use the tokens to buy items from our store. Each token is worth about 25 cents or a quarter. The stuff you buy in the store is about the same price as in a regular store. Here are the things we have to sell.”

*We then showed the kids the items in the store. We had a selection of toys and school supplies that have proved popular in previous experiments, and the children were invariably quite attentive after this. To avoid threshold effects, we did not tell them prices if asked but just repeated that prices were about the same as in a regular store. The ninth graders were told that each token could be traded in for 25 cents cash at the end of the experiment, the twelfth graders that each could be traded for 50 cents. We then used playing cards to randomly divide the class evenly into two groups, A and B, and we separated the groups to different sides of the classroom.*

“In each of these games half of you are going to be proposers and half responders. We are not going to tell you which you are until later, so pay attention to all the instructions about who does what. *(For the second graders, we then explained what these terms meant.)* Each of you will have a partner from the other group. We will decide who is a proposer and who is a responder by chance. We will also decide who is partner with who by chance, and we will keep it a secret. You will never know who your partner is, and they will never know who you are.”

“I want you to know that no one else in the class will know what you choose to do in today’s game. To be sure of this, on your game sheets you will not even put your name, instead we will give you a number. So do not worry about other people in the game knowing what you choose, because they won’t.”

“You will make all of your decisions by filling out forms that I give you. To help keep your choices secret, we will collect the forms in these envelopes. On your envelope is an ID number.

This is your personal ID number and you need to put it on all the papers that you fill out so that we make sure you get your tokens and so that everything you do is secret.”

*Depending on the treatment, we then either started with the ultimatum or the dictator game instructions below.*

### **Ultimatum Bargaining Protocol.**

“Here is the game. I am going to give you and your secret partner 10 tokens. Your job is to decide how to divide them. But we have a special way of doing this. We’ll call the first partner the proposer. First, the proposer will pick how many of the 10 tokens they want to keep for themselves and how many they want to offer to the other person. They can choose any combination that adds up to ten tokens. After they have decided this, we will tell their responder partner how many tokens the proposer offered them. Then it is the responders turn. They decide if they want to accept or reject the offer. If they accept, the proposer and the responder each get the amount of tokens that the proposer picked. If they reject then both the responder and the proposer get nothing.”

“We’ll try it one time to make sure everyone understands. This is just an example, so it does not count for tokens. *(Pick a child from the front.)* Let’s pretend we are partners. Right now I can see who my partner is, but remember in the real game you will not know who your partner is. I will be the proposer, the person who decides how the chips are split up. You are the responder, who chooses if you accept or not. Suppose I choose 6 tokens for me and 4 for my partner. If you accept, that’s what we each get. If you reject, neither of us gets any tokens.

Now let’s say that I said 7 for me and 3 for my partner. Suppose you said you will not accept this. Than we both get zero tokens. So does everybody understand? Are there any questions?”

*To group A (Tell group B to listen too.):*

“OK, you are the proposers who will make a proposal about how the tokens will be divided. You will be paired with another person in the other group. You will not know who they are and they will not know who you are. You will make a proposal about how to divide the tokens. If your partner accepts how you divided them, then that is how the 10 tokens will be divided. But if they reject your proposal you both get nothing. You can divide the tokens any way you want. Take the first form out of your envelope now. Be sure and write the number on your envelope on the top right side of the form. Make your choice by circling across the two numbers that you choose and then put your form back in your envelope. For example, you could circle 8 for you and 2 for your partner, or 3 for you and 7 for you partner. *(When describing how to fill out the form, hold up a form as an example.)* We have all the time you need, so think about what you want to do.”

*(Collect the envelopes from the proposers. Match proposers up with responders and fill out forms for the responders and put it in their envelopes. If there was an odd number of players, we matched one player with two partners when computing payoffs.)*

*To group B:*

“You are the responders. You will decide whether to accept or reject the offer. If you accept the offer then you will get the tokens that proposer offered to you and they will get the tokens for they proposed for themselves. If you do not accept the offer then both you and your partner will get zero tokens. In your envelope is a form that tells you how many tokens you have been offered. First, be sure and put your ID number on the envelope on the top right part of your paper. Has everybody done this? OK, now, circle the box to accept or reject the offer. Don’t rush, take your time and think about what you want to do.”

*(Collect the envelopes from the responders. Fill out the forms for the proposers, which tell what the responders decided to do. Put the appropriate number of tokens in the envelopes.)*

“OK, now we are going to do this same game again. But this time everybody will switch roles. So, if you were a proposer, this time you are a responder. If you were a responder, this time you are a proposer.”

*(Repeat the protocol, starting with the specific instructions to the proposers.)*

### **Dictator Bargaining Protocol:**

“Here is the game. I am going to give you and your secret partner 10 tokens. The proposer’s job is to decide how to split these tokens between the two people. Whatever the proposer says is final. The responder doesn’t really decide anything, they just get the tokens the proposer offers them, if any. *(If this game followed the ultimatum game, we added “So, it’s different than the other game. This time the responder doesn’t get a chance to reject the split that the proposer makes. Whatever the proposer says goes.”)*

“We’ll try it one time to make sure everyone understands. This is just an example, so it does not count for tokens. *(Pick a child from the front.)* Let’s pretend we are partners. Right now I can see who my partner is, but remember in the real game you will not know who your partner is. I will be the proposer, the person who decides how the chips are split up. You are the responder. Suppose I choose 6 tokens for me and 4 for my partner. So, that’s what we each get.

Now let’s say that I said 7 for me and 3 for my partner. So, that’s what we each get. So does everybody understand? Are there any questions?”

*To group A (Tell group B to listen too.):*

“OK, you are the proposers who will make a proposal about how the tokens will be divided. You will be paired with another person in the other group. You will not know who they are and they will not know who you are. You will make a proposal about how to divide the tokens. Whatever you decide goes. You can divide the tokens any way you want. Take the first form out of your envelope now. Be sure and write the number on your envelope on the top right side of the form. Make your choice by circling across the two numbers that you choose and then put your form back in your envelope. For example, you could circle 8 for you and 2 for your partner, or 3 for

you and 7 for you partner. *(When describing how to fill out the form, hold up a form as an example.)* We have all the time you need, so think about what you want to do.”

*(Collect the envelopes from the proposers. Match proposers up with responders and fill out forms for the responders and put it in their envelopes. If there was an odd number of players, we matched one player with two partners when computing payoffs.)*

To group B:

“You are the responders. The form in your envelope tells you how many tokens your partner gets and how many you get.”

*(Collect the envelopes from the responders. Fill out the forms for the proposers, which tell what the responders decided to do. Put the appropriate number of tokens in the envelopes.)*

“OK, now we are going to do this same game again. But this time everybody will switch roles. So, if you were a proposer, this time you are a responder. If you were a responder, this time you are a proposer.”

*(Repeat the protocol, starting with the specific instructions to the proposers.)*

### **Payouts:**

After all 4 rounds, we passed out sheets to the children, with the prices of the items in the store. We asked them to write down how many of each item they wanted, and to make sure they didn't spend more than they had. We then collected these sheets along with their envelopes with the tokens, put the items in bags, and returned them. For the ninth and twelfth graders we collected the envelopes, exchanged the tokens for cash, at rates of 25 and 50 cents respectively, and then returned them.

## References:

- Anderson, Lisa R., Yana V. Rodgers, and Roger R. Rodriguez. "Cultural Differences in Attitudes toward Bargaining." In *Economics Letters*, 45-54, 2000.
- Andreoni, James, and Lise Vesterlund. "Which Is the Fair Sex? Gender Differences in Altruism." *Quarterly Journal of Economics* 116, no. 1 (2001): 293-312.
- Ayres, Ian, and Peter Siegelman. "Race and Gender Discrimination in Bargaining for a New Car." *American Economic Review* 85, no. 3 (1995): 304-21.
- Bolton, Gary E., and Axel Ockenfels. "Erc: A Theory of Equity, Reciprocity, and Competition." *American Economic Review* 90, no. 1 (2000): 166-93.
- Cameron, Lisa A. "Raising the Stakes in the Ultimatum Game: Experimental Evidence from Indonesia." *Economic Inquiry* 37, no. 1 (1999): 47-59.
- Croson, Rachel, and Nancy Buchan. "Gender and Culture: International Experimental Evidence from Trust Games." *American Economic Review* 89, no. 2 (1999): 386-91.
- Eckel, Catherine C., and Philip J. Grossman. "Are Women Less Selfish Than Men? Evidence from Dictator Experiments." *Economic Journal* 108, no. 448 (1998): 726-35.
- . "Chivalry and Solidarity in Ultimatum Games." *Economic Inquiry* 39, no. 2 (2001): 171-88.
- Eisenberg, Nancy. *Altruistic Emotion, Cognition, and Behavior*. Hillsdale, NJ: Erlbaum, 1986.
- Eisenberg, Nancy, and Richard A. Fabes. "Prosocial Development." In *Handbook of Child Psychology*, edited by William Damon, 701-78. New York: J. Wiley, 1998.
- Fabes, Richard A., and Nancy Eisenberg. "Meta Analysis of Sex and Age Differences in Prosocial Behavior." *Arizona State University Working Paper* (1996).
- Fehr, Ernst, and Klaus M. Schmidt. "A Theory of Fairness, Competition, and Cooperation." *Quarterly Journal of Economics* 114, no. 3 (1999): 817-68.
- Forsythe, Robert, Joel L. Horowitz, N. E. Savin, and Martin Sefton. "Fairness in Simple Bargaining Experiments." *Games and Economic Behavior* 6, no. 3 (1994): 347-69.
- Guth, Werner, Rolf Schmittberger, and Bernd Schwarze. "An Experimental Analysis of Ultimatum Bargaining." *Journal of Economic Behavior and Organization* 3, no. 4 (1982): 367-88.
- Henrich, Joseph. "Does Culture Matter in Economic Behavior? Ultimatum Game Bargaining among the Machiguenga of the Peruvian Amazon." *American Economic Review* 90, no. 4 (2000): 973-79.
- Henrich, Joseph, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, Herbert Gintis, and Richard McElreath. "In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies." *American Economic Review* 91, no. 2 (2001): 73-78.
- Keil, Linda J. "Rules, Reciprocity, and Rewards: A Developmental Study of Resource Allocation in Social Interaction." *Journal of Experimental Social Psychology* 22 (1986): 419-35.
- Kohlberg, Lawrence. "Moral Stages and Moralization: The Cognitive-Developmental Approach." In *Moral Development and Behavior: Theory, Research, and Social Issues*, edited by T. Lickona, 31-53. New York: Holt, Rinehart and Winston., 1976.
- Murnighan, J. Keith, and Michael Scott Saxon. "Ultimatum Bargaining by Children and Adults." *Journal of Economic Psychology* 19, no. 4 (1998): 415-45.

- Persico, Nicola, Andrew Postlewaite, and Dan Silverman. "The Effect of Adolescent Experience on Labor Market Outcomes: The Case of Height." *University of Pennsylvania Working Paper* (2001).
- Piaget, Jean. *The Moral Judgement of the Child*. New York: Free Press, 1965.
- Rabin, Matthew. "Incorporating Fairness into Game Theory and Economics." *American Economic Review* 83, no. 5 (1993): 1281-302.
- Roth, Alvin E. "Bargaining Experiments." In *The Handbook of Experimental Economics*, edited by John H. Kagel and Alvin E. Roth. Princeton: Princeton University Press, 1995.
- Roth, Alvin E., Vesna Prasnikar, Masahiro Okuno-Fujiwara, and Shmuel Zamir. "Bargaining and Market Behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: An Experimental Study." *American Economic Review* 81, no. 5 (1991): 1068-95.
- Smith, Adam. *An Inquiry into the Nature and Causes of the Wealth of Nations*. New York: The Modern Library, 1776/1937.
- Solnick, Sara J. "Sex Differences in the Ultimatum Game." *Economic Inquiry* 39, no. 2 (2000): 189-200.