Trust in Children

William T. Harbaugh
Economics Department
University of Oregon
and NBER
Eugene, Oregon
Email: bill@harbaugh.org

Kate Krause
Economics Department
University of New Mexico
Albuquerque, New Mexico
Email: kkrause@unm.edu

Steven G. Liday Jr.
Student, Economics Department
University of Oregon
Eugene, Oregon
Email: steveliday@hotmail.com

and

Lise Vesterlund
Economics Department
University of Pittsburgh
Pittsburgh, Pennsylvania
Email: vester@pitt.edu

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1. Introduction

Many relations are not covered by complete contracts. Although the involved parties may prefer a legally binding agreement, it is often too costly to construct a contract which fully accounts for the possible contingencies of the relationship. Absent of such contracts, otherwise advantageous trades may be expected to fail as the parties each choose their payoff maximizing actions. Fortunately there are many real world examples which demonstrate that this need not be the case. In particular there is substantial evidence that we instead rely on a set of social contracts, whereby we trust that others fulfill their part of a nonbinding agreement and abide by such agreements when others trust us to do so. Even when interacting with complete strangers, we often work under the assumption that they can be trusted. When traveling we encounter courteous cab drivers, waiters, and bell-caps that all believe, despite the one-shot interaction of our relationship, that we will reward good service with a good tip. When making one-time purchases, we trust that the conditions of delivery will be acceptable. Or, when selling fruit from an unattended road stand, the farmer trusts that customers will pay for the produce.[1] By trusting and rewarding trust we are able to sustain a society which is superior to what we should expect absent substantial contractual agreements.

Despite their obvious advantages trust and trustworthy behavior are puzzling phenomena. In trusting others self-interested people purposively put themselves in situations where other self-interested people can take advantage of them, and when rewarding trust we choose costly actions which merely improve the well being of others. This raises the question of how we acquire these trusting behaviors. If their presence

allows us to sustain a superior society then it may be argued that we have evolved to have these traits. Perhaps we are genetically coded to be trusting and trustworthy. The substantial degree of heterogeneity in trust both across countries and individuals makes it questionable that genetic coding alone can explain these behaviors.[2] Perhaps the ability to trust and reward trust are behaviors that develop over time. Children may learn from the innumerable lectures parents give about whom to trust, when to trust them, how far to trust, and how they should respond when someone trusts them. Even if we take the skeptical view that these lectures are just talk, it is still possible that children learn from the many examples that parents set for their children in exhibiting trusting and trustworthy behavior. If these traits are developed over time, then how do they affect our behavior? Do we become more or less trusting as we get older? And do the conditions under which we trust become more refined with age? To answer these questions this chapter investigates trusting behavior among children.

We focus on trusting behaviors in children in the belief that this will provide insight into when and how certain aspects of trust behavior are formed. We report the results of an economic experiment that allows us to look at changes in these behaviors with the age of both the "truster" and the "trustee," and we also consider the effects of children's individual characteristics on trusting behavior. Since elements of trust are cognitively complex, involving reading and interpreting subtle nuances in the behavior of others, and the ability to infer other's intentions and motivations, we might expect to find

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[1] This example was first noted by Dawes and Thaler (1988).
[2] For example, Knack and Keever (1997) and Yamagishi in this volume. Note, however, that Buchan et al. (1999) find generally similar levels of trust across countries, when using experiments similar to those used by Berg, Dickhaut and McCabe (1995).

differences among young children, teenagers, and adults in their responses to trust dilemmas.

This research is part of a new effort to use economic methods and models to explore the behavior of children. In Harbaugh, Krause, and Berry (2001) we show that by about age 11, children's consumption choices are generally consistent with rational behavior. In Harbaugh, Krause and Vesterlund (2001) we find that even 7-year-old children tend to value goods more when they own them than when they don't. We take this as evidence that children exhibit an endowment effect which is similar to that found in adults. In more complex economic interactions, we show that bargaining ability among children is very well developed at a surprisingly young age. Already at age 7 children appear to correctly consider the probability of rejection in bargaining games (Harbaugh, Krause, and Liday, 2001). In situations involving choice under risk, we have shown that children's choices are only slightly less consistent across choices than are undergraduates' choices, and we've shown that their behavior can be captured by variants of the same sorts of subjective expected probability models that are commonly used for adults (Harbaugh, Krause and Vesterlund, 2002).

On the other hand, our investigation into children's altruism has revealed some systematic differences between children's and adults' decisions. In one-shot dictator games, where one player is asked to decide how much of a pie to give to an anonymous other player, the youngest children tend to make considerably smaller transfers than do of older children and adults (Harbaugh, Krause and Liday, 2001). We find age differences in behavior across rounds in repeated linear public goods games, where individuals in a group must each decide whether to contribute to a public good and thereby sacrifice

private payoffs for the benefit of the other group members (Harbaugh and Krause, 2000). In multiple-round experiments, adults typically contribute less to the public good in the later rounds, possibly because they learn to free ride. On average, the six- to twelve-year-old children in our study actually contributed *more* to the public good in the later rounds. However, the oldest among them behaved more like adults: participants who were eleven-and-a-half and older contributed less to the public good in the later rounds of the experiment. While the public-good experiments were not designed to investigate trust, one plausible explanation for this result is that the younger children came to trust their (anonymous) group mates, while the older children realized either the possibility that their own trust would be violated, or that they themselves could exploit others' trust in later rounds. This finding may be seen as evidence that trusting and trustworthy behaviors develop with age.

In this chapter we will more carefully examine trust in children. The objective is twofold. First we hope to determine whether trust develops with age, and thus whether models of evolution are likely to appropriately explain these traits. Second, determining the extent to which children exhibit these traits is interesting in and of itself as it will help us determine whether the standard perception of these traits in children is correct. Oddly, while children are perceived as innocent and too trusting, adults do not generally perceive them as being particularly trustworthy.

2. Economics and Trust: Competing explanations

We will use the trust game devised by Kreps (1989) to examine trust in children. Chapter 1 of this volume describes the game and shows that if both participants of this

game aim to maximize their monetary payoff then the standard subgame perfect equilibrium prediction is simply zero passed, zero returned. The initial experimental study of the trust game by Berg, Dickhaut, and McCabe (1995) demonstrated the inadequacy of this prediction. Their study, as well as the many replications thereof, shows that most participants of the game display trust and trustworthiness. There is, however, substantial variance in the amounts that trusters allocate to trustees, and it is clear that they do not follow a single maximizing strategy. One possible explanation is that trusters are uncertain as to which strategy to use (Koford 2001). This is consistent with psychological research that shows that people behave with a degree of randomness when facing an uncertain or risky situation (e.g., Herrnstein 1997).

Observing behavior inconsistent with the selfish equilibrium prediction is not unique to the trust game. Many experiments have revealed behaviors that suggest that participants are not only concerned for their own monetary payoff but also have a preference for the payoffs of others. To capture these behaviors, models of other-regarding preferences have been developed. These models have traditionally been classified as either outcome based or intention based. A common element of outcome-based models is that players are assumed to care about their own monetary payoff as well as their relative share of the total payoff.[3] Typically the models assume that individuals have an inherent preference for an equal split of the overall payoff, but that there is a tradeoff between the participant's monetary payoff and how this compares to the other participants' payoffs. Thus, holding relative payoffs constant, the individual prefers the

[3] Examples of outcome-based models are presented in Lowenstein, Thompson, and Bazerman (1989), Bolton (1991), Fehr and Schmidt (1999), and Bolton and Ockenfels (2000).

largest possible monetary payoff, and holding the monetary payoff constant the individual prefers a more equal division.

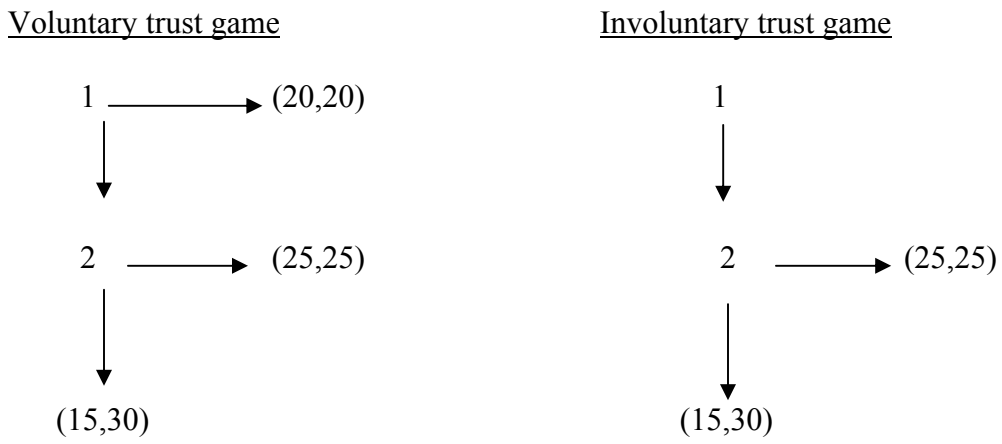
Intention-based models argue instead that the preference for someone else's payoff depends on the intentions of this individual.[4] Individuals may benefit from increasing the payoff of someone who is kind, while benefiting from decreasing the payoff of someone who is unkind. Hence an intentionally kind act may be rewarded and an unkind act punished. Crucial for intention-based models is that they rely on individuals attributing intentions to others. To determine whether behavior in the trust game is consistent with the outcome- or intention-based models, McCabe *et al*. (1998) examine behaviors in the two simple two-person games shown in Figure 1. They refer to these two games as the voluntary and involuntary trust games. In the voluntary trust game, Player 1 can elect to stop the game, yielding payoffs of $20 for each player, or to pass control of the game to Player 2. Player 2 can then either take $30, leaving $15 for Player 1, or choose a payoff of $25 for each. Despite its one-shot nature this game can be seen as measuring trust and trustworthiness because Player 1 in passing control to Player 2 entrusts Player 2 to determine her final endowment. The involuntary trust game is identical to the voluntary one except that Player 1 does not have the option of stopping before Player 2 chooses.

Player 2 faces exactly the same options (and absolute and relative payoffs) in the two variations of the trust game. Thus, if outcome-based models are accurate, there should be no difference in decisions by Player 2 across treatments. However, if intention-based models are correct, we should find that Player 2 is more likely to choose the

[4] See Rabin (1993), Dufwenberg and Kirchsteiger (1998), Falk and Fischbacher (1998), and Charness and Rabin (2001).

cooperative outcome in the voluntary trust game than in the involuntary one. The reason is that in the voluntary game Player 1's decision not to stop the game may be seen as an intentionally kind action. Consistent with the intention-based models but not the outcome-based ones, McCabe *et al*. (2000) find that Player 2 is much more likely to choose the cooperative outcome in the voluntary game.[5]

Figure 1: A test for intention-based models



Fishbein and Kaminski (1985) are among the few researchers to investigate the development of trust and reciprocity in children using salient payoffs. Their study examines how the perceived motivations behind a kind act affect reciprocal altruism in children. In these experiments, six, eight and eleven-year-olds participated in same-age, same-sex pairs consisting of one confederate and one experiment participant. In some rounds one player was given the choice between a competitive move that would harm the other child and a cooperative move. In a subset of those rounds the experimenters openly instructed the confederate to move in a cooperative fashion. Thus the non-confederate participant was aware that a cooperative move was instructed. They compared the

[5] Andreoni, Brown, and Vesterlund (forthcoming) find a similar result in public good games.

responses of non-confederate participants to this instructed move with responses when the confederate child appeared to voluntarily cooperate. The results did not "support the view that children's perceived motivation of the donor influenced … reciprocity." (p.397) This suggests that intention-based models may fail in predicting reciprocal behavior in children. Fishbein and Kaminski found no gender effects or age differences. This may be due to the limited age range that they examine, or to the confounding factors involved when studying same-age and same-sex interactions.

3. Experiment Procedure and Participants

Although the experimental protocols were very different, a comparison of McCabe *et al*.'s results with those of Fishbein and Kaminski suggest that children might approach trust tasks differently from adults. This suggests that trust or trustworthy behavior may develop over time, and thus models of evolution may fail in fully capturing these traits. To investigate the possibility that trust develops with age, we tested trust and reciprocity behavior in children using a modified version of Berg *et al*.'s (1995) no-social-history, one-shot trust game.[6]

The decision task posed to the participants was as follows. Each participant was to be matched with another anonymous participant. One person in the pair was assigned the role of truster and the other the role of trustee. For each decision each participant was given an endowment of 4 tokens. There were two stages to the task. At the first stage the individual in the role of truster decided how many if any of the four tokens she wanted to pass to the trustee in the pair. Every token passed to a trustee tripled in value. At the second stage the trustee was asked how many if any of her total tokens she would want to

pass back to the truster. Each token sacrificed by the trustee increased the truster's payoff by one token.

We used the so-called strategy method to elicit the trustee's actual strategy. That is, rather than asking a trustee to respond to the amount actually passed by the truster, we did not reveal the amount passed and asked instead that the trustee decide how much she would pass if the initial transfer was respectively 0, 1, 2, 3, and 4. We explained that we would match these responses with the actual transfer from the truster in their pair and that their payoff then would be tabulated.[7]

A total of 153 students in the Coquille, Oregon, public schools participated. Coquille is a rural logging town with an area population of approximately 10,000 people. Because school attendance is close to universal, conducting experiments in schools gives us a group of participants that is very representative of the local population as a whole. On the other hand, Coquille is less diverse demographically than the country as a whole. The experiments were conducted in a total of eight public school classrooms, two each from the third, sixth, ninth and twelfth grade. Children in these classes are typically aged 8, 11, 14, and 17, respectively. Within each grade, the students in one class were trusters, and those in the other class were the trustees.

One option in designing the experiment was to maintain the approach used in experiments where individuals typically are paired with equals (generally college students with college students). As we were interested in the general development of trust we decided instead to ask each truster to make five separate transfer decisions - one to an anonymous trustee in each of the four grades including his or her own, and one with an

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[6] Instructions for obtaining the protocol used can be found at http://harbaugh.uoregon.edu/children/ .

adult.[8] Similarly the trustee was asked to make five separate transfer decisions with a truster from each of the five age groups. Participants were paid for the tokens earned in each of the five decisions. The benefit of this approach is that it allows us to make comparisons across grades.

In addition to controlling for the grade of the participants we also included controls for a number of other individual characteristics. Experimental work by economists has generally been motivated by a desire to find results that are common to the experimental participants and to the general population. Relatively little effort has been made to explain the variation that has been found in behaviors. The exceptions have looked at cross-cultural differences in bargaining, (Roth *et al*., 1991), differences in altruism by gender, (Andreoni and Vesterlund, 2001) and the potential influence of training in economics on cooperative behaviors (Frank *et al*., 1996). To more carefully control for the development of economic behaviors, we have included a larger range of individual characteristics than is true in most economic experiments.[9]

Table 1 summarizes the individual characteristics of the trusters and trustees of this study. "Boy" is an indicator variable equal to one if the participant is a boy. Since birth order and height have been identified as statistically significant explanatory variables in previous studies of children's economic behavior we included these measures in this study as well. While there is no clear theoretical explanation for their relationship to economic behavior, both are closely related to social development and status. "Height" is the participant's height in inches. "Birth Order" denotes the participant's rank among

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[7] The strategy method has previously been used in similar experiments on adults. See e.g., Falk *et al*. (forthcoming), Charness *et al*. (2001).

[8] The adult was a hypothetical player. We matched each participant with the average play of adults in previous administrations of this game.

his or her siblings, where the oldest siblings in a family are given a value of one. Values for this variable range from one to five.

Also we included a survey measure of trust. After completing the trust experiment but before calculating payments, each participant responded to the following question: "Overall, can you trust most people?" Responses to this question were used to test consistency between experiment behavior and survey responses. "TrustTaking" is an indicator for the participants' response to the question, and a response of "yes" equals one.

Trusting another person entails the risk of defection. All else equal we may expect more risk averse individuals to be less likely to trust. To control for heterogeneity in risk attitudes we therefore asked trusters to complete a risk task after completing the trust game.[10] For this task, each truster was given five tokens and shown a spinner indicating a 60% chance of doubling the amount staked and a 40% chance of losing the amount staked. Trusters were asked to choose how many tokens they wished to stake on the spinner and how many they wished to keep. We use the number of tokens staked on the spinner as a measure of preference for risk.[11] The "TrusterRisk" variable is the number of tokens that the truster staked in the risk experiment described above. This variable ranged from 0 to 5.

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[9] See Buchan and Croson (1999) for references on cross-country and gender differences in the trust game.
[10] Eckel and Wilson (2000) find that for adults, a truster's attitude towards risk affects her choice of more or less risky trust games.
[11] This method is based on a procedure first suggested by Bernoulli in 1738.

Table 1: Individual characteristics

	Grade:	Boy	Height	Birthorder	SurveyTrust	TrusterRisk
Truster	3rd Grade	0.42	51.7	1.8	0.65	2.27
	6th Grade	0.55	62.2	2.1	0.55	3.35
	9th Grade	0.35	65.8	2.6	0.30	3.45
	12th Grade	0.44	67.3	1.5	0.38	3.06
	Average	0.44	60.7	2.0	0.49	2.98
Trustee	3rd Grade	0.29	55.3	2.3	0.67	
	6th Grade	0.48	59.3	2.2	0.71	
	9th Grade	0.87	67.7	2.0	0.47	
	12th Grade	0.73	68.0	1.5	0.36	
	Average	0.54	61.1	2.1	0.59	

While we use the terms trustee, truster, and partners in describing the experiment, our protocol used the neutral terms of first and second mover and "person you are matched with." Both types of participants were asked how many tokens they wanted to "pass" and the word trust was never used in the protocol.

The experiments were conducted over a three-day period, with the truster session being conducted on the first day and the trustee session on the second day, and finally participants were paid on the last day. Third-graders used their accumulated tokens to purchase items from our experiment store. The experiment store stocks toys, school and art supplies, and games. Items are priced so that one token is worth approximately 25 cents (when compared with prices for similar items at retail stores). We have found that cash is not as salient to young children as is the opportunity to immediately "purchase"

items from the experiment store because children cannot independently go to a retail store to convert cash into goods of their own choosing. The experiment store makes the payoffs immediate and salient for these children. The children in sixth, ninth, and twelfth grade were paid a quarter for each token earned.

Our protocol differs in five ways from the Berg *et al*. protocol. First, we use the strategy method, rather than showing each trustee the actual decision of the truster with whom they are matched. Second, each player is matched with multiple partners (one from each grade). Third, our experiment was blind, not double blind, that is while the participants could not identify the person with whom they were matched, the experimenter could match the decisions to the individual making them. Fourth, the trustees could transfer any portion of their endowment and were not restricted to making transfers from the amount received from the trusters.[12] Finally, all the participants in this study had to wait a day or two for their payoffs, instead of receiving them immediately. These differences should be kept in mind when comparing our results with those of other experimenters.

4. Results

We begin by considering the decisions of the trusters, and then turn to the trustees' responses.

[12] Andreoni, Harbaugh, and Vesterlund (2002) find that adult trustees make transfers even when they have received nothing from the truster.

4.1 Trusters

Table 2 summarizes the average passes from trusters, by grade of the truster and grade of the trustee. Similar to the experiments on adults, we find that the game-theoretic predictions for selfish preferences are not supported by our data. Average proposals from every grade and to every grade are always significantly different from zero. (Using one-sided t-tests, the highest p-value is 0.002). Of the 410 passing decisions that are made, only 112 (27%) were passes of zero tokens. Only five children out of 82 (6%) passed zero to every partner.

In contrast to the common perception, we do not find that young children are more trusting than older ones. In fact third-graders are those who pass the smallest number of tokens. On average children make larger transfers to older trustees, and conditional on grade it appears as if they are less trusting of members of their own cohort than those of older cohorts.

Table 2: Mean passes from truster to trustee, by grade of truster and trustee.

Grade of Truster	Grade of Trustee					
	3	6	9	12	Adults	Average
3	0.73 (1.15)	1.19 (1.13)	1.23 (1.21)	1.31 (1.41)	1.04 (1.25)	1.10 (1.23)
6	1.25 (0.91)	1.10 (0.85)	1.25 (0.91)	1.15 (0.88)	1.35 (0.93)	1.22 (0.88)
9	1.85 (1.39)	1.85 (1.14)	1.65 (1.18)	1.95 (1.32)	2.05 (1.19)	1.87 (1.23)
12	1.25 (1.06)	0.88 (0.62)	1.00 (1.21)	1.06 (1.00)	1.38 (1.20)	1.11 (1.03)
Average	1.23 (1.20)	1.27 (1.03)	1.29 (1.14)	1.38 (1.22)	1.43 (1.20)	1.32 (0.76)

Note: Maximum possible pass is 4 tokens. Standard deviations in parentheses.

Surprisingly the children and teenagers in this study appear to be less trusting than were the adults in the Berg *et al.* no-history treatment. As shown in Table 3, third-, sixth-, and twelfth-graders all passed significantly fewer tokens (in terms of percent of endowment) than did the no-history subjects in Berg *et al*. Only the ninth-graders passed almost the same percentage of tokens as did the adults.[13] We do not find monotonic changes in passes across ages. Average passes increase with age between third and ninth grade, but twelfth-graders, on average, pass approximately the same number of tokens as third-graders.

[13] If we adopt the conservative approach of treating the average proposal from each person as a single observation, we can reject the hypothesis that contributions equal the adult level of 52% of the endowment,

Table 3: Average percent of endowment passed, by grade of truster.

3rd Graders	6th Graders	9th Graders	12th Graders	Berg *et al,* no history
27%	30%	47%	28%	52%

The differences between our results and those found by Berg *et al*. may be due to differences in our protocol or to the fact that our subject pool is not selected on college attendance. The larger transfers to older trustees suggest perhaps that the difference arises from the much younger pool of trustees with whom our participants are matched. Future work will more carefully examine these possibilities. At the moment we note that, with the exception of ninth-graders, there is practically no difference in passes between ages eight and 17. This suggests that the degree to which we trust others is relatively unaffected by age. To more carefully examine the effect of age and to isolate the effects of individual variables on the pass amount, we estimated OLS panel regressions with random effects to account for the correlation of proposals across participants. Of course, these regressions assume that age and the other continuous variables have linear effects on behavior.

Table 4 provides the coefficients and t-statistics for seven variables and five (overlapping) sets of participants. We estimated separate models for each grade and found similar results for the sixth, ninth, and twelfth-graders. However the results for the third-graders were quite different. Therefore we report pooled results for the sixth through twelfth-graders, but report results for the third-graders separately. "TrusterAge" is the truster's age in years. "Relative Height" is the truster's height in inches, divided by

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at p-values of 0.001 or below for all grades except the ninth-graders. For ninth-graders, we cannot reject the

the average height of the class. The variable "Trustee Grade" is the grade of the trustee.[14] This is the only trustee characteristic that we can plausibly include in the analysis of truster behavior as all other characteristics were unknown to the truster.

Table 4: Regression results for passes by trusters.

	Regression sample				
Independent Variables	All Participants	3rd Graders Only	6th, 9th & 12th Graders	Boys Only	Girls Only
Trustee Grade	0.018 (1.46)	0.029 (1.27)	0.013 (0.88)	0.01 (0.51)	0.024 (1.57)
Boy	0.13 (0.75)	0.75** (3.04)	-0.20 (-0.89)	. .	. .
Survey Trust	-0.29* (-1.81)	-0.319 (-1.38)	-0.38** (-1.98)	-0.35 (-1.18)	-0.306* (-1.79)
TrusterAge	0.01 (0.50)	-0.693** (-2.62)	-0.009 (-0.25)	-0.037 (-0.78)	0.07** (2.60)
Birth Order	0.16** (2.26)	0.40** (3.64)	0.10 (1.21)	0.03 (0.23)	0.22** (3.15)
Risk Taking	0.06 (1.10)	-0.03 (-0.58)	0.10 (1.37)	0.00 (0.00)	0.04 (0.80)
Relative Height	2.76* (1.91)	9.38** (4.24)	2.71 (1.41)	2.04 (0.81)	5.35** (3.04)
N	82	26	56	36	46

Note: * denotes significance at $p \leq 0.10$; ** at $p \leq 0.05$. Adjusted t-statistics in parentheses.

While the positive coefficient on trustee grade confirms that trusters are more trusting of older partners, we now see that the effect is not significantly different from zero. As expected we also see that more risk-seeking individuals trust more, however the

null.

[14] Adult = 14.

effect is not significant. Interestingly male third-graders tend to be more trusting than females.[15] One possible explanation is that females tend to be more averse to risk. While we have attempted to control for differences in risk attitudes, it may be that the risk involved in trusting others differs from the risk measure we use.

Estimated coefficients for birth order and for height suggest that these factors are positively correlated with trust behavior. The effects, both in terms of magnitude and statistical significance, are particularly pronounced among third-graders and girls. Hardin (2001) provides a possible explanation for the significance of the two variables. He suggests that learning through experience is one path for the psychological development of the propensity or capacity to trust. The more a person experiences positive reciprocity to their own cooperative trusting behavior, the more likely they are to cooperate in the future. Our results are consistent with this explanation for the development of trust. It is likely that in face-to-face interactions taller children are more capable of enforcing reciprocity, and therefore experience higher amounts of positive reciprocity. A similar explanation is plausible in the case of birth-order effects. Older brothers and sisters may be more likely to reciprocate than younger children and thus younger siblings experience more instances of positive reciprocity than do older siblings. Obviously the data cannot conclusively establish the existence of these mechanisms. However, they are possible explanations for systematic correlations and thus warrant further investigation.

The negative correlation between the dependent variable and the trust response from the survey bears mentioning. Individuals who answered that most people were trustworthy passed, on average, one-third of a token less than those who did not answer in the affirmative. This effect generally holds across the samples and is statistically

[15] Eckel and Wilson (2000) find a similar gender result for adults.

significant among older trusters and girls. This result calls into question the validity of survey measures of trust and demonstrates that trust is a matter of context that cannot easily be summarized into a single question. This finding is not unique to children. Glaeser et al. (1999) found that trustworthiness in experiments, but not the willingness to trust, corresponded to participants' responses to survey questions. Individuals who were more trusting in their experiments did not report that they were more trusting in the hypothetical survey questions (see also Ahn *et al.* this volume).

Last, we note that the age of the truster has no general effect on the passed amount. Among third-graders, age is negatively correlated with pass amounts, and the effect is statistically significant. Among girls, age is positively correlated with pass amounts, but the magnitude of the effect is small. However, for the remaining subgroups of participants and the sample as a whole, the estimated coefficients cannot be distinguished from zero. The data does not support the notion that the ability to trust develops between 3rd and 12th grade.

4.2 Trustees

Next we turn to the trustee decisions. Table 5 presents the average amount returned by the trustees of each grade to the trusters of each grade. As was true of behavior for the trusters, trustees do not behave according to the predictions of non-cooperative game theory with selfish preferences. We test the null hypothesis that average returns to each age group equal zero (adjusting for correlated errors across individuals) and that average returns to all ages equal zero (treating each individual as an

observation). In both cases we can reject the null at p-values of 0.0000. Only 3 of the 71 children return zero tokens for every decision with every partner.

Table 5: Mean passes from trustee to truster, by grade of truster and trustee.

Grade of Trustee	Grade of Truster					
	3	6	9	12	Adults	Average
3	7.13 (5.78)	9.13 (8.04)	10.21 (10.03)	9.63 (8.44)	10.92 (11.02)	9.40 (7.93)
6	10.90 (9.74)	11.43 (9.23)	11.24 (12.45)	12.19 (12.37)	11.38 (11.88)	11.43 (10.91)
9	9.40 (8.04)	8.73 (5.68)	8.20 (7.64)	8.60 (7.05)	9.60 (8.09)	8.91 (6.54)
12	10.64 (8.58)	11.64 (7.89)	14.00 (9.21)	11.00 (8.04)	14.91 (12.94)	12.44 (7.12)
Total	9.27 (8.01)	10.11 (7.91)	10.68 (10.21)	10.38 (9.44)	11.38 (10.95)	10.37 (8.50)

Note: Standard deviations in parentheses.

While Table 2 did not confirm the general perception that young children are more trusting than older ones, Table 5 lends slight support to the notion that younger children are less trustworthy. Ignoring the less generous ninth-graders it appears that trustworthiness increases with the age of the trustee. One might argue that this suggests that the trusters are acting rationally when they pass a slightly larger amount to the older and more trustworthy trustees.[16] Interestingly it also appears that the amount returned

[16] This finding differs from that of Fahr and Irlenbusch (2000). They examine trust games where individual's performance in a walnut-cracking task determines their initial endowments. They find that the trustee returns more when the truster has earned the higher endowment, and that the truster sends more

increases with the age of the truster, however this pattern varies substantially across trustee grade. To determine the significance of these age effects we will study them further in our econometric analysis.

Table 6 summarizes the average amounts returned by grade of the trustee and the amount passed by the truster.

Table 6: Average amount returned to truster, by grade of trustee and amount sent.

	Tokens Sent by Truster				
Trustee Grade	0	1	2	3	4
3	0.95 (0.96)	1.63 (1.44)	2.13 (2.25)	2.45 (2.83)	2.24 (3.46)
6	0.73 (1.00)	1.84 (1.56)	2.64 (2.49)	3.07 (2.99)	3.15 (4.24)
9	1.09 (1.16)	1.59 (1.64)	1.83 (1.92)	2.32 (2.22)	2.08 (2.87)
12	1.04 (1.05)	1.95 (1.52)	2.58 (2.02)	3.44 (2.76)	3.44 (3.32)
Average	0.93 (1.04)	1.73 (1.53)	2.29 (2.24)	2.76 (2.77)	2.66 (3.60)

Note: Standard deviations in parentheses.

The children in our study did not display the same high levels of reciprocity, or sensitivity to the amount sent, as did participants in the studies by Berg *et al*. (1995) or

when the trustee has earned the higher endowment. Thus the truster tends to send more to trustees who subsequently reciprocate less. The individual differences in endowments, however, complicate a direct comparison between the two studies.

Koford (2001). In those studies trusting behavior was generally rewarded, while in ours it is not. The average returns by tokens passed indicate relatively small differences in returns across differences in passed amount. For example, looking at the averages across all grades, at the bottom of Table 6, we find that an increase in the passed amount from zero to one increases the returned amount by only 0.8 tokens, an increase from one to two by 0.6 tokens, from two to three by 0.5 tokens, and from three to four tokens, the returned amount actually decreases. As a result, trusters who sent zero or one tokens did much better than those who were more trusting.

Neither the outcome-based or intention-based models of fairness explain the behavior of the trustees in this game very well. Both models would predict that the amount returned would increase consistently as the amount passed increased, either as a reaction to increased inequality or in response to a kinder action by the truster.

One possible reason for the discrepancy is our use of the strategy method to elicit trustees' responses. The experimental literature has yet to reach a consensus on whether using a strategy method results in responses that are different from what we would have found had the players responded to the actual choice of their partner. For example, Brandts and Charness (1998) investigated differences in responses among adults and found no difference between responses to observed action and responses elicited using the strategy method. Others have however found that these methods differ substantially (McCabe *et al*. 2000). While the strategy method is not hypothetical, it may be less salient than actually seeing the choice made by the truster. Indeed it may be that this potential lack of salience is much more important for children than it is for adults.

Another explanation, which may be particularly relevant with children, is confusion. They may find it more difficult to understand how the strategy-method protocol will be implemented. While our impression was that almost all trustees understood the meaning of the decision sheet on which they indicated responses, a majority of them behaved "nonmonotonically" at least once. We define monotonic trustees as those whose returns to trusters weakly increased with passes from trusters within a single grade. Nonmonotonic participants are those who, at least once, stated that they would return strictly fewer tokens in response to a higher pass from a truster within a single grade. Table 7 presents responses of monotonic and nonmonotonic trustees separately. This reveals that almost 2/3 of the trustees choose a nonmonotonic response at least once. Thus the intention and outcome based models can at best capture a minority of the trustees' choices. The obvious task for future research is to determine whether this nonmonotonic pattern is driven by the use of the less salient strategy method, or if it should be seen as evidence that children perhaps exhibit a less refined degree of reciprocity than do adults.

Table 7: Comparisons of average returns, monotonic and nonmonotonic trustees

Grade and Monotonicity	N	% of Grade	Amount Returned by Amount Sent				
			0	1	2	3	4
3rd, Nonmonotonic	17	71	0.70	1.4	1.7	1.7	1.1
6th, Nonmonotonic	13	62	0.52	1.4	1.9	1.7	0.9
9th, Nonmonotonic	10	67	0.94	1.0	1.3	1.4	0.7
12th, Nonmonotonic	7	64	0.66	1.4	2.1	2.7	2.7
3rd, Monotonic	7	29	1.5	2.2	3.2	4.3	5.0
6th, Monotonic	8	38	1.1	2.6	3.9	5.2	6.7
9th, Monotonic	5	33	1.4	2.7	3.0	4.1	4.9
12th, Monotonic	4	36	1.7	2.9	3.5	4.6	4.6

Interestingly, while the average response does not make it worthwhile for the truster to increase the tokens passed, we see that the subgroup of monotonic trustees on average have responses which make it worthwhile for trusters to increase the number of tokens passed. In our econometric analysis we will separately examine trustees with monotonic and nonmonotonic responses.

Table 8 reports the estimated coefficients when using random effects OLS regressions to estimate trustee responses. As both the age and the gender of the trustee have little effect on their response we report only the pooled results.

Table 8: Regression results for returns by trustees.

Variables	All	Nonmonotonic	Monotonic
Truster Grade	0.03**	0.02	0.06**
	(3.01)	(1.43)	(3.26)
Boy	-4.74	-0.02	-1.28
	(-1.04)	(-0.07)	(-1.31)
Survey Trust	0.68	0.14	1.15
	(1.55)	(0.40)	(1.23)
Trustee Age	0.10	0.05	0.14
	(1.33)	(0.82)	(0.94)
Number of Siblings	-1.90	-0.04	-0.01
	(-1.27)	(-0.40)	(-0.02)
Birth Order	0.05	0.11	0.76
	(0.18)	(0.61)	(1.27)
Tokens Passed	0.45**	0.15**	1.03**
	(15.15)	(4.78)	(19.25)
Relative Height	-2.25	-1.28	-0.66
	(-0.68)	(-0.48)	(-0.09)
N	71	47	24

Note: * denotes significance at $p \leq 0.10$; ** at $p \leq 0.05$. Adjusted t-statistics in parentheses.

Neither relative height nor birth order is significant. This is not inconsistent with the learning model presented earlier. An individual who experiences a high level of positive reciprocity will not necessarily reciprocate himself. We also note that the trustee's age has no significant effect on the amount passed. Combined with our earlier finding that trusters do not place significantly larger trust in older trustees suggests that they correctly are anticipating this response.

As expected, the amount sent is positively correlated with the amount returned. The coefficient is much larger among the monotonic than the nonmonotonic subjects. Despite

the nonmonotonic pattern, however, we find that on average an increase in the amount sent increases the amount returned. The truster's grade was also positively correlated with the trustee's return. This is possibly a reaction to an inferred higher status of older subjects. An analogous result has been found in adults. Glaeser et al. (1999) find that adult participants behave more trustworthily towards individuals of higher status. Alternatively it may be that children believe that a different set of social standards applies for those who are older. Their parents and teachers do not lie to them or cheat them, which may not be the case with their peers. Their parents and teachers also actively reinforce social norms including reciprocity. Therefore, participants may be hesitant to "cheat" adults.

5. Conclusions

In this chapter we examined trusting and trustworthy behavior in children. We asked whether our approach to these complex tasks develop with age. We conducted a set of experiments with students in third, sixth, ninth and twelfth grade to investigate this question. Like adults, the students in our experiment did not follow the game-theoretic prediction of passing and returning zero tokens, and we conclude that even the 8-year-old children show clear evidence of trusting and trustworthy behavior. In contrast to common perception we do not find that the youngest participants are more trusting than older cohorts, nor do we find that they are much less trustworthy.

Across the ages examined in this study we observe surprisingly little variation in trusting and trustworthy behavior. This suggests that if these traits develop with age then

they are likely to do so when we are very young. This is consistent with what we have found in a series of other experiments, including those that involve altruistic preferences.

Surprisingly the children in our experiment did not pass or return as many tokens as adults have in similar experiments. In addition, children did not vary their return amount in response to the passed amount to the extent adults do. It may be that the trustees' behavior resulted from our use of the strategy method rather than age. Future work will have to investigate this possibility.

We found that a number of factors were correlated with participants' trust behavior. Status appears to matter. Trusters tended to pass more tokens to older partners, and trustees returned more when paired with an older partner. This effect, however, was only significant for trustees. Relative height and birth order were positively related to the truster's pass amount, possibly because taller children and younger siblings have experienced higher rates of positive reciprocity. These effects were largest among the youngest participants.

Self-reported trust was negatively correlated with the trusters' pass amount, with a small coefficient. It was positively (although insignificantly) correlated with trustees' return decisions, however, and these coefficients were generally large. The significance and robustness of this correlation suggests caution in the use of surveys to measure trust behavior in children.

Overall, we believe this experiment reinforces the argument that the sorts of experiments and models that economists are using to investigate and explain the behavior of adults can also be used with children, with suitable modifications to ensure salience and understanding. In particular, we find that even in this rather complicated experiment,

children's trusting behavior is (broadly) qualitatively comparable to what has been found in adults and that individual characteristics matter, particularly among the youngest participants. However, we note that data from children is noisier (in both senses of the word) than that from adults, and that experiments need to be carefully designed, and conducted with large samples to obtain reliable estimates of the effects of individual characteristics.

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