The development of social strategic ignorance and other regarding behavior from childhood to adulthood *

Isabelle Brocas
University of Southern California and CEPR

Juan D. Carrillo
University of Southern California and CEPR

February 2020

Abstract

We conduct a dictator experiment with children (7 to 16 years old) and adults to study the development of the underlying motivations for other-regarding behavior. Prior to choosing the sharing rule, our participants can manipulate their access to information and remain strategically ignorant of the payoffs associated with some or all of the alternatives. We find that information avoidance is infrequent (11.2% of the trials) and occurs for two opposite motives: some participants –mostly adults– look only at their payoffs and maximize them whereas some other participants –mostly school age children– look only at the other person's payoffs and maximize them. Among fully informed participants, sharing depends on age but it is also nuanced by the opportunity cost of giving.

Keywords: field experiment, developmental decision making, strategic ignorance, other regarding preferences.

JEL Classification: C91, D91.

*We are grateful to members of the Los Angeles Behavioral Economics Laboratory (LABEL) for their insights and comments in the various phases of the project, and to Chris Crabbe for his superb programming skills. We also thank the staff at the Lycée International de Los Angeles –in particular Emmanuelle Acker, Nordine Bouriche, Mathieu Mondange and Anneli Harvey– for their help and support running the experiment in their school. The study was conducted with the University of Southern California IRB approval UP-12-00528. We gratefully acknowledge the financial support of the National Science Foundation grant SES-1851915. Affiliations: Isabelle Brocas and Juan D. Carrillo, Department of Economics, University of Southern California, Los Angeles, CA 90089, United States of America, and CEPR, United Kingdom.

1 Introduction

Giving behavior and other regarding preferences in adults have received substantial attention in the literature in behavioral (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000) and experimental economics (surveyed in Camerer (2003)). A few recent studies also indicate that they develop gradually over childhood and adolescence[1] and that generosity in children is mediated by social interactions.[2] However, it is still an open question whether non-selfish behavior manifests as a result of true underlying preferences or contextual demand effects. Most notably, some experimental research shows that participants in dictator games act more selfishly when they can avoid making a dictator's choice (Dana et al., 2006).

The objective of this study is to investigate to which extent children and adults are willing to manipulate their access to information and avoid learning the social implications of their allocations. To our knowledge, Dana et al. (2007) is the seminal contribution to this experimental literature. In that paper, a dictator chooses between two options of different value, and can learn (or not) the consequences of these options for the recipient. The authors show that 50% of participants forego information and, conditional on that decision, they overwhelmingly choose the high payoff option. By contrast, subjects who obtain the information are often inclined to favor the recipient even at a personal sacrifice. Overall, individuals use strategic ignorance as a commitment device to avoid feeling guilty about their selfish acts. The result has been replicated (Larson and Capra, 2009), although it has also been argued that it is sensitive to psychological manipulations (Grossman, 2014). The findings point to the existence of interactions between psychological factors related to self- and social-image. There is however no developmental study of information avoidance in social games. In particular, while young children are known to behave more selfishly than adults when options are fully disclosed (Fehr et al., 2008), it is an open question whether they would prefer to not know that they are acting selfishly.

Our paper introduces two main novelties into this literature. First, we consider an extended design with several sharing possibilities (four trials with three options of "money for me and money for my partner" in each), where subjects decide which payoff boxes to reveal before making their choices. This methodology allows for a wider array of social strategic ignorance options, that include but go beyond the "moral wiggle room" emphasized in the literature. Second, we analyze the choices of participants from 7 years of age to adulthood in an attempt to unveil developmental changes in the strategic use of

[1] See Harbaugh et al. (2002); Fehr et al. (2008); Eckel et al. (2011); Fehr et al. (2013); Shaw et al. (2014); Brocas et al. (2019).

[2] See Houser et al. (2012); Chen et al. (2016).

social ignorance.[3]

The first result in the paper relates to *lookups*. Only in 11.2% of the trials, subjects open a subset of the six payoff boxes. Therefore, although ignorance is sometimes used, contrary to Dana et al. (2007) and Larson and Capra (2009), it is not favored. This is in support of Grossman (2014) who argues that the default technology, and more generally the experimental procedure, influences the likelihood of remaining ignorant. With a significantly different design and, in particular, a lower demand for ignorance, the effect is reduced considerably. We also show that adults are more likely to refrain from opening all boxes than children, but this behavior does not develop gradually. The second result is about *choices* conditional on being fully informed. In support of the existing literature, we show that over time children move from being spiteful to being fair and finally being somewhat generous. Not surprisingly, their behavior depends very much on the context, that is, on the opportunity cost of giving. The third and final result links *lookups to choices*. Within the trials where participants do not become fully informed, we observe social strategic ignorance both as a commitment to remorseless selfish choices and as a commitment to generous behavior. Indeed, when subjects look only at the "money for me" boxes, they tend to choose the option that maximizes their own payoffs. When they look only at the "money for my partner" boxes, they tend to maximize the partner's payoff. Many of the selfish ignorant subjects belong to the control adult population whereas most of the altruistic ignorant subjects belong to the school age population, including the youngest children. While we cannot rule out the possibility that ignorance is due to a complete lack of interest on a certain payoff, curiosity and a virtually zero cost of obtaining information suggests that it must be, at least in part, strategically motivated.

2 Design and procedures

When we study children and adolescents, it is imperative to adapt the experimental procedures to this special population. In this paper, we follow the guidelines proposed by Brocas and Carrillo (Forthcoming) to meet those requirements.[4] The experiment was conducted through tablet computers in a classroom of the school during school hours and the tasks

[3]The theoretical literature on strategic ignorance mainly focuses on commitment devices to increase one's payoff in individual choice settings subject to self-control (see the model proposed by Carrillo and Mariotti (2000) and further developed by Bénabou and Tirole (2002)). Another strand studies multi-agent situations with conflicts of interests (Brocas and Carrillo (2007) and Kamenica and Gentzkow (2011)). Research on strategic ignorance for other-regarding concerns includes Spiekermann and Weiss (2016) and Grossman and Van der Weele (2017).

[4]The review argues that (i) the length and procedures must be adapted to a population with limited attention span; (ii) incentives must be age-appropriate; (iii) interface and instructions must be simple and graphical; and (iv) a benchmark adult comparison group should be included whenever possible.

were programmed with the open source software Multistage.[5] Participants responded to the task by tapping on the touchscreen. The software recorded the information attended to before making a choice, as well as the final decision. We recruited 220 children and adolescents from 2nd to 10th grade at the Lycée International of Los Angeles (LILA), a bilingual private school in Los Angeles.[6] We ran 28 sessions, each with 8, 10 or 12 participants. For each session, we tried to include only participants from the same grade, but for logistic reasons we sometimes had to mix participants of two consecutive grades. High schoolers from 9th, 11th and 12th grade did not participate in the study because they were taking or preparing for french or US national exams during this period. For comparison, we recruited 70 students at the University of Southern California and we ran 6 sessions at the Los Angeles Behavioral Economics Laboratory (LABEL) at USC, using *identical* procedures.[7] A description of the distribution of our participants is reported in Table 1. Given the small sample of subjects in each grade, we grouped the children and adolescents in 4 age-categories (**C1**, **C2**, **C3**, **C4**). The undergraduates (U) constitute our control group (**C5**).

Location	LILA								USC
Age-category	**C1**		**C2**		**C3**		**C4**		**C5**
Grade	2nd	3rd	4th	5th	6th	7th	8th	10th	U
# subjects	33	21	24	30	24	24	33	31	70

Table 1: Participants by grade and location

Tasks. Participants completed 4 trials of the "social card game", a three-option dictator game, performed in a counterbalanced order in each age group. Trials had identical rules but different payoffs. In each trial, each participant had to choose one card among three. Each card contained two numbers. The number at the top represented the payoff for the participant (the dictator). The number at the bottom represented the payoff for one other participant randomly and anonymously drawn from the pool of participants in the session (the recipient). In each trial, we drew a new recipient for each dictator. Participants did not receive any feedback between trials. They learned only the total amount accumulated

[5] For instructions to download the software, see `http://multistage.ssel.caltech.edu`.

[6] There is less mobility to and from LILA than in most US schools since mastering the french language is a necessary condition for admittance and a main reason for staying at the school.

[7] Most studies with children do not recruit an adult population. We believe it is important to include an adult control group to establish a behavioral benchmark, even if the comparison should be taken with a grain of salt (see Brocas and Carrillo (Forthcoming) for a discussion). Note that the majority of students at LILA are from caucasian families of upper-middle socioeconomic status. After graduating, they attend well-ranked colleges in Europe and North America (including USC). Overall, and despite some obvious differences (nationality, family background, size of peer group), the two populations match reasonably well.

throughout the four trials (their four choices as dictators and the four amounts received as recipients) and only at the end of the experiment. They never learned the identity of participants with whom they were matched. Instructions can be found in Appendix A.

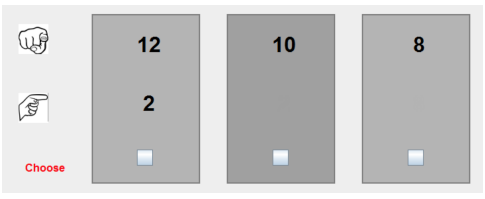
Mousetracking. Payoffs were hidden behind opaque boxes. Participants could disclose these values one by one simply by tapping on them. This technique has been successfully employed to understand choices and choice processes in different game theoretic contexts.[8] It is part of a literature that studies how data other than choices (eye movements, pupil dilation, contemplation, reaction times, emotional expressions, etc.) can improve our understanding of decision-making. The procedure has no cost except for the (negligible) effort of tapping on a box. Participants were clearly instructed that in each task the number at the top was the payoff for themselves and the number at the bottom was the payoff for the other. This information was also visually apparent with a hand pointing inwards for "own payoff" and a hand pointing sideways for "other payoff". It was understood that, if they wished, they could decide not to open one or more boxes. To avoid problems of recall, once a box had been tapped it remained open. After each trial, three new cards appeared with the new payoffs hidden behind opaque boxes. Subjects could again reveal the content of the boxes and had to choose one card. Overall, we put special emphasis in presenting the information with a simple, graphical interface that young children could immediately understand. Figure 1 provides screenshots of one of the tasks (task 1) at the beginning of the game, that is, with all payoffs hidden behind opaque boxes (Figure 1a) and during the game, that is, when some payoffs have been revealed and some still remain hidden (Figure 1b). The screenshots also show the hands pointing inwards and sideways, and the buttons they had to press for choosing a card. The bottom picture shows the payoffs in tokens of the three cards (A, B, C) in the four tasks (1, 2, 3, 4) (Figure 1c).

It took approximately 15 minutes to administer the tasks, including the oral instructions. Participants earned on average 50.4 tokens. They completed a short questionnaire to report their gender and whether they had siblings. After this task, subjects participated in a second task (a repeated coordination game) studied elsewhere (Brocas and Carrillo, 2018). Following Brocas and Carrillo (Forthcoming), we implemented three different conversions depending on the subjects' ages. USC and LILA students from 6^{th} to 10^{th} grade had tokens converted into money and paid immediately after the experiment in cash (USC) or with an Amazon gift card (LILA, where cash is not allowed on premises).[9] For LILA

[8] These include, but are not limited to, backward induction (Johnson et al., 2002), dominance solvable (Costa-Gomes et al., 2001), asymmetric information (Brocas et al., 2014) and timing games (Brocas et al., 2018). Crawford (2008) and Willemsen and Johnson (2011) have detailed surveys of this literature.

[9] Subjects accumulated tokens for both parts of the experiment. Due to a calibration error, earnings in this task were excessively low (around $2). However, when we combined both parts and given that the total duration of the experiment was 45 to 60 minutes, average earnings were in line with the literature

(a) Screenshot: all payoffs hidden



(b) Screenshot: some payoffs hidden

	Task 1			Task 2		
	A	B	C	A	B	C
Self	12	10	8	12	4	4
Other	2	2	8	4	12	0

	Task 3			Task 4		
	A	B	C	A	B	C
Self	12	12	6	4	4	4
Other	0	3	6	0	4	8

(c) Payoff combinations in the four tasks

Figure 1: Social card game

students in grades K to 5$^{\text{th}}$, we set up a shop with 20 to 25 pre-screened, age-appropriate toys with different token prices.[10]

3 Conceptual framework and experimental hypotheses

For the analysis, we use the notation TK for the choice of card $K \in \{A, B, C\}$ in task $T \in \{1, 2, 3, 4\}$ as described in Figure 1c. The tasks feature different combinations of (i) *Selfish* allocations, where the participant gets significantly more tokens than the partner (e.g., $2A$), (ii) *Fair* allocations, where the participant gets the same amount of tokens as the partner and which are also sometimes efficient (e.g., $1C$), and (iii) *Generous* allocations, where the participant gets significantly fewer tokens than the partner (e.g., $4C$). Provided the information is fully revealed, each set of cards can be interpreted as a specific *context* in which choices are made.

We opted for three (rather than two) cards to include some subsets of combinations that differ only in the amount of tokens for the partner (as in Engelmann and Strobel (2004)). Even though we were interested in some specific traits (such as equity, spite and

for our adult population ($14 plus $7 show-up fee) and higher than typical for our adolescents ($12).

[10]These included gel pens, bracelets, erasers, figurines, die-cast cars, trading cards, apps, calculators and earbuds. Overall, each child got between 3 and 7 toys depending on the tokens accumulated and the token price of the options selected. The procedure emphasized the importance of accumulating points while making the experience enjoyable. At this age, a toy is also a significantly more attractive reward than money. Notice that most children are familiar with this method of accumulating points that are subsequently exchanged for rewards, since it is commonly employed in arcade rooms and fairs.

generosity) we added a number of other cards, including some Pareto inferior, never-to-be-chosen alternatives, to increase the cost of not looking. These cards also prevent payoff inferences, thereby augmenting the uncertainty associated to not looking, relative to the previous literature. For the same reason, we also intentionally decided to not feature exactly one Selfish, one Fair and one Generous allocation in each task. More generally, our rich set of alternatives allows us to test Engelmann and Strobel (2004)'s argument that dictator allocations are influenced not only by fairness and inequality aversion, but also by efficiency considerations and maximin preferences.

We test three hypotheses, and predominantly focus on behavioral evolutions with age. The first hypothesis deals with changes in the decision to acquire or stay away from information, the second hypothesis deals with changes in the way other-regarding concerns are affected by the available options, and the last hypothesis deals with the effect of information avoidance on final choices. We detail them below.

First, a main objective of this research is to determine whether subjects refrain from looking at some of the payoff values, which we call "social strategic ignorance." Given the negligible cost of tapping and the significant uncertainty about payoffs, information should be revealed unless the participant has a powerful reason not to. In light of the previous literature (Dana et al., 2007; Larson and Capra, 2009), we anticipate that a fraction of individuals will strategically ignore information about the payoffs of others to avoid feeling guilty about making selfish choices. However, such behavior requires the ability to understand and cope with sophisticated emotions, such as guilt and self-image concerns. Research in neuroscience has shown that the brain areas associated with these emotions (Bastin et al., 2016) are involved in mentalizing and emotion regulation, and such areas are not well developed until adolescence (Ruff and Rothbart, 2001; Konrad et al., 2005). We therefore expect that the proportion of individuals who engage in this strategic behavior will increase significantly with age.

Hypothesis 1. *Social strategic ignorance increases with age until 10th grade and stabilizes afterwards.*

Second, while there is a substantial research on the development of social preferences from childhood to adulthood (Fehr et al. (2008, 2013)), the literature focuses on a restrictive set of options. We know from previous research on adults (Andreoni and Vesterlund, 2001; Andreoni and Miller, 2002) that, for some individuals, altruistic choices depend on the opportunity cost of giving (for example, the opportunity cost of sending 6 extra points to the recipient is a sacrifice of 6 points when choosing $3C$ instead of $3A$, and a sacrifice of only 4 when choosing $1C$ instead of $1A$). Yet, little is known about the developmental trajectory of the balance between efficiency and concern for others. Our three-card design

allows for a study of sophisticated interpersonal trade-offs to evaluate the marginal cost of giving, the marginal benefit of spite and the intrinsic generosity of subjects. Even though this is an uncharted territory and no obvious hypothesis can be made from our current knowledge of development, we hypothesize that the ability to trade-off different elements of a decision develops gradually. This is consistent with theories and experimental findings supporting the idea that young children concentrate on few (often one) dimension of a problem, a phenomenon called centration, and learn to include other dimensions as they grow (Donaldson, 1982; Crain, 2015). A natural consequence of this hypothesis is that young children should care about, say, maximizing their own payoff while disregarding how much this may cost the other party. As they grow and as they pay more attention to other dimensions of their choices, children should learn to think in terms of trade-offs and opportunity costs. Following that line of thought, we hypothesize that older participants should be more sensitive to payoff magnitudes in the monetary trade-offs than their younger peers.

Hypothesis 2. *Social trade-offs are sensitive to payoff magnitudes and to differences between self and other, and this sensitivity increases with age.*

Last, we study how social strategic ignorance affects behavior. Although it seems reasonable to assume that information avoidance is a conscious decision, we cannot rule out the possibility that some participants (especially the youngest ones) do not look at some payoffs by inadvertence or carelessness. We still expect that subjects who avoid information will follow a well-defined objective. Consistent with this, we also expect that their behavior will be on aggregate different from that of subjects who obtain all the information. In other words, we conjecture that the lookup patterns are, to some extent, predictive of final decisions.

Hypothesis 3. *Information avoidance is a deliberate decision that impacts behavior.*

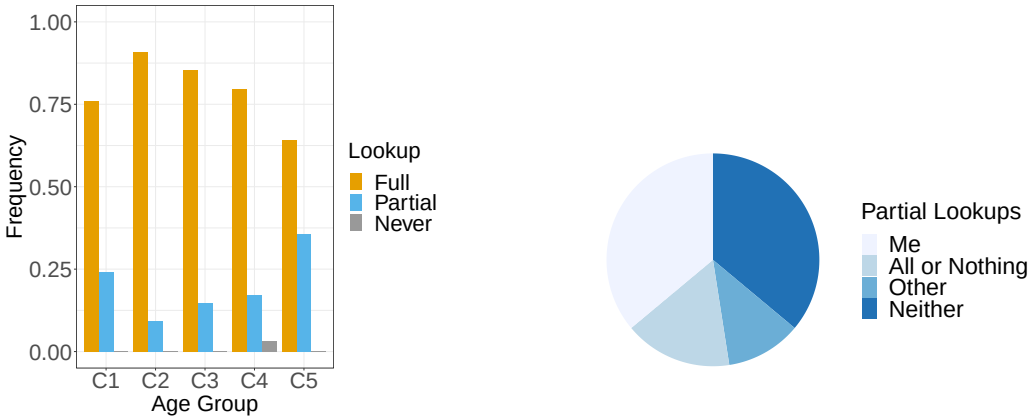
For the descriptive statistical analysis, we perform Pearson's chi-square test of comparison of proportions and use a 5%-level as the benchmark threshold for significance. For the regression analysis, we consider Probit models where the dependent variable is the choice made in a trial, and use (robust) standard errors clustered at the individual level.

4 Results

4.1 Social Strategic ignorance

A main objective of this research is to correlate choices with lookup patterns and, in particular, with the decision to *not look* at certain payoff boxes. In this section, we

determine whether individuals in our experiment engage in *social strategic ignorance* or, on the contrary, they consistently become fully informed before making their decision. Figure 2a reports the fraction of participants within each age group who always look at all payoffs (Full), sometimes engage in social strategic ignorance (Partial), and never open any payoff (Never). Among subjects in Partial, Figure 2b represents the proportion of participants who (i) always look at their own payoffs (Me), (ii) always look at the payoffs of the other player (Other), (iii) look at either all the payoffs or none of them (All or Nothing), and (iv) do not exhibit a clear pattern (Neither).



(a) Lookup patterns by age group

(b) Patterns within Partial lookups

Figure 2: Lookup patterns

The proportion of participants who became fully informed before making their decision is around 75%. This is substantially larger than in Dana et al. (2007) (56%) and Larson and Capra (2009) (47%), even though revelation is a binary choice in those papers whereas it requires opening all 24 boxes in ours. At the same time, the fraction of fully informed subjects is significantly below 1 in all age groups ($p < 0.001$). Indeed, 21% of participants do not always look at all the payoffs, and there are interesting differences across age groups. The proportion of participants who become fully informed is significantly lower in **C5** than in **C2**, **C3** and **C4** ($p < 0.04$) and significantly lower in **C1** than in **C2** ($p = 0.035$).

Participants who remain partially informed constitute 21% of the sample. Among those, the behavior changes between trials. However, and as illustrated in Figure 2b, 36% never miss their own payoff while only 11% never miss the payoff of the other player. Those subjects are biased towards certain type of information (related to "Me" or related to "Other"). Surprisingly, some participants (16%) either look at all the payoffs or take a gamble and look at none of them.

Among participants who look at all the payoffs for themselves but not all the payoffs for the other, 59% are in **C5** and 5% are in **C1**. Conversely, among participants who look at all the payoffs for the other but not all the payoffs for themselves, 14% are in **C5** and 29% are in **C1**. Overall, the results provide partial support for Hypothesis 1: in the context of a dictator-game setting, adult dictators are more likely than children to strategically skip information about other people's payoff. It also unveils a novel and intriguing channel of information avoidance–more prevalent in our youngest participants–which consists in focusing on the other person's payoff. However, we did not find support for a gradual development of social strategic ignorance.

We then analyzed the visual trajectories in the trials where all boxes were open. Two patterns were most prevalent. First, top to bottom from left column to right column (48%). Second, left to right from top row to bottom row (36%). It suggests simple and efficient payoff gathering technologies. In only 3% of the observations, the dictator looked first at the three payoffs of the recipient. Participants in (**C1**) use significantly more the first search trajectory than subjects in **C2**, **C4** or **C5** ($p < 0.001$). Within the trials in which participants look at all their own payoffs but not all the payoffs of their partners, it turns out that they did not look at any of the payoffs of the partner in 56% of the cases. Similarly, within the trials in which participants looked at all the payoffs of their partner but not all of their own payoffs, they did not looked at any of their own payoffs in 65% of the cases.

4.2 Informed Choices

In this section we describe the distribution of choices in each task and age group, restricting attention to fully informed choices. Figure 3 presents the results.

The general pattern is broadly consistent with the results obtained in the developmental literature (Fehr et al. (2008, 2013); Shaw et al. (2014); Cobo-Reyes et al. (2019)). In task 1, the majority of younger subjects prefer the selfish option $1A$ but, as they age, some participants exhibit a preference for the fair and socially optimal split $1C$. More precisely, participants in **C1** and **C2** choose $1A$ more often than participants in **C3** and **C4** ($p < 0.05$). They also choose $1C$ less often than all older participants ($p < 0.05$). Not surprisingly, the selfish option $2A$ is overwhelmingly preferred in task 2. In task 3, most young children exhibit spite ($3A$ over $3B$) but this trend is reversed as they age: starting in middle school, the proportion of $3A$ choices decreases significantly while the proportion of $3B$ choices increases significantly (comparisons between **C1** or **C2** and **C3** to **C5**, $p < 0.001$).

The behavior in task 4 is highly heterogeneous. As children age, there is a steady change from the spiteful selfish ($4A$) to the fair ($4B$) and finally to the generous ($4C$)

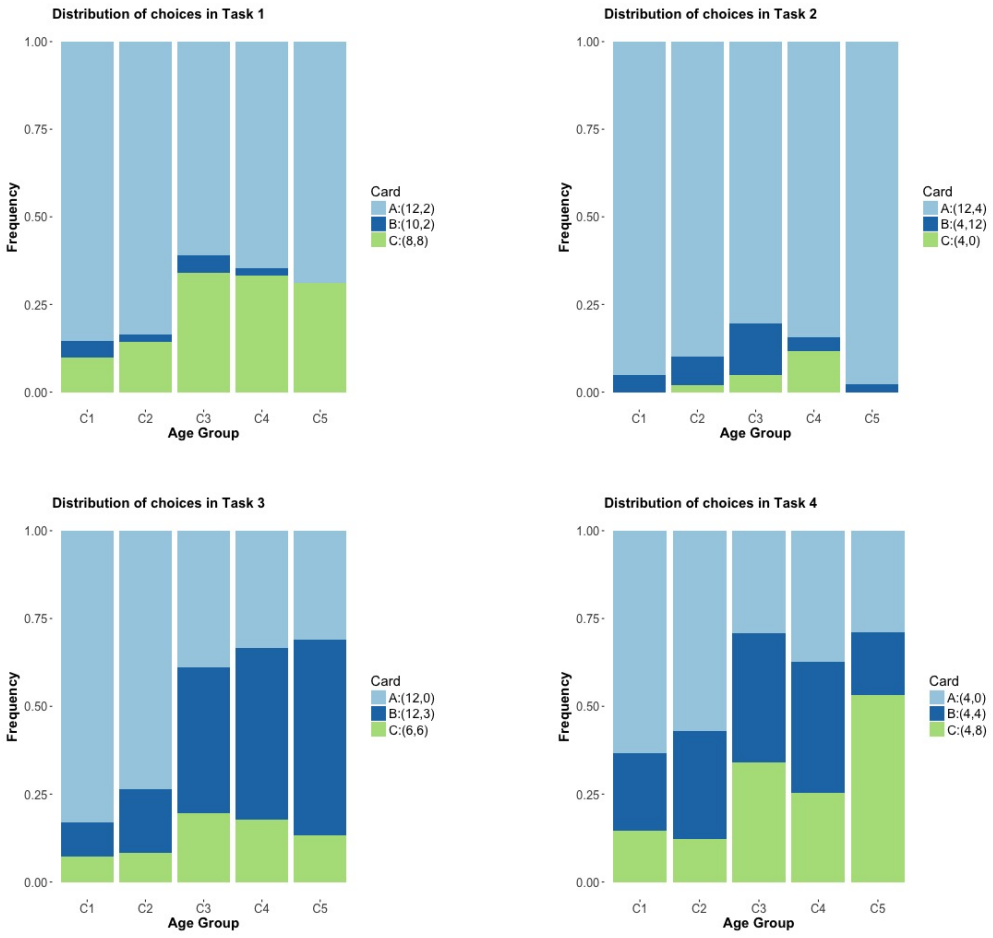


Figure 3: Distribution of choices by task and age group.

option. The proportion of children who choose $4A$ is significantly higher in **C1** and **C2** compared to older age groups ($p < 0.05$) and adults exhibit a significantly higher proportion of $4C$ choices compared to all school-age participants ($p < 0.01$). Finally, it is worth noting that participants very rarely make Pareto-dominated choices that strictly decrease their own payoff ($1B$ or $2C$). They do not favor the fair split $3C$ either, simply because it requires an excessive sacrifice in own payoff (it costs 2 tokens to transfer 1).

To test our Hypothesis 2, we perform three Probit regressions of the trial-by-trial choices as a function of the following explanatory variables: age group dummies, gender dummy (1 if Male), sibling dummy (1 if one or more siblings) and tasks dummies. The results are reported in Table 2.

The first regression corresponds to the likelihood of choosing the *Selfish* allocation in a trial provided the task gives the opportunity to behave selfishly (choosing 1A or 1B, 2A or 2C, 3A or 3B and 4A in tasks 1, 2, 3 and 4). The second regression corresponds to the likelihood of choosing the *Fair* allocation in a trial provided the task gives the opportunity to behave fairly (choosing 1C, 3C and 4B in tasks 1, 3 and 4). The third regression corresponds to the likelihood of choosing the *Generous* allocation in a trial provided the task gives the opportunity to behave generously (choosing 2B and 4C in tasks 2 and 4). The age group omitted category is **C1** in all three regressions. The task omitted category is task 1 in the first and second regression and task 2 in the third regression.

	Selfish		*Fair*		*Generous*
constant	1.02***	constant	-0.93***	constant	-1.78***
C2	-0.31	**C2**	0.31	**C2**	0.14
C3	-0.83***	**C3**	0.72***	**C3**	0.55*
C4	-0.67***	**C4**	0.65***	**C4**	0.30
C5	-0.74***	**C5**	0.38*	**C5**	0.93***
Gender	-0.07	Gender	-0.13	Gender	0.41**
Siblings	0.35**	Siblings	-0.19	Siblings	-0.46*
Task 2	0.78***	Task 3	-0.41**	Task 4	0.93***
Task 3	0.41**	Task 4	0.14		
Task 4	-0.92***				
# Obs.	1030	# Obs.	777	# Obs.	521
AIC	953.6	AIC	792.2	AIC	433.0

*, ** and ***: significant at the 5%, 1% and 0.1% level.

Table 2: Probit regression of acting selfishly, fairly and generously

The results confirm the developmental trajectories of other-regarding behavior: we observe that, with age, selfishness decreases, fairness increases and generosity increases. In support of Hypothesis 2, the table also critically shows that choices are *context-dependent*. The likelihood of acting selfishly is significantly higher when the alternatives are detrimental to oneself or socially inefficient (tasks 2 and 3 compared to task 1) and it is significantly lower when the alternative is costless for oneself (task 4 compared to task 1). A fair choice is also less likely when it is inefficient (task 3 compared to task 1) and a generous choice is more often observed when it is costless for oneself (task 4 compared to task 2). As in Fehr et al. (2013), males are more generous than females. This is in contrast with well-established results in the adult literature that report that female are more generous in

dictator games (Eckel and Grossman, 1998). The discrepancy might be explained by the documented tendency of men to be more altruistic than women when it is cheap and less altruistic when it is expensive (Andreoni and Vesterlund, 2001). Unfortunately, we do not have enough data to test that hypothesis.[11] Finally, we obtain a family composition effect: children with siblings are significantly more selfish and less generous. A similar effect was found in Fehr et al. (2008) for children under 8 years of age. This effect is present across all age groups in our sample, with no significant interaction between age and family composition. In Appendix B, we provide a more in-depth treatment of age-related changes in other-regarding concerns.

4.3 The effect of lookups on choices

We finally study the biasing effect of lookups on behavior by comparing the choices of fully informed and non-fully informed subjects. A simple way to address this question is to perform the same regression analysis as in Table 2 with the following modifications. First, we consider the full sample. Second, we add a *Lookup* dummy variable that indicates wether the choice was fully informed (All, the omitted category in the regression), based on full information about own payoffs only (Self), based on full information about the other person's payoffs only (Other), or neither of these types of information (Neither). The results are summarized in Table 3.

From these regressions, we observe that concentrating on one's payoff is positively related to *Selfish* choices and negatively related to *Fair* choices. By contrast, focusing on the other person's payoff is negatively related to *Selfish* choices and positively related to *Fair* and *Generous* choices. Overall, and perhaps not surprisingly, look up patterns are predictive of choices: subjects who focus on the payoffs of one player (self or other), maximize the outcome for that person. More subtly, information avoidance is not always directed to favor the dictator's own gains. In other words, social strategic ignorance is not frequently used, but when it is, it takes two different forms: either as a commitment to remorseless selfish choices or as a commitment to behave altruistically. Finally, none of the results in Table 2 regarding the effect on choices of age, task, gender and family composition are affected by the extended analysis.

A further diagnostic consists in classifying trials as a function of the information attended and describe the distribution of behavior in each lookup category. As before, we distinguish between All, Self, Other and Neither lookups. Figure 4 reports the proportion of trials where the dictator maximizes his own payoff (MaxMe) and the payoff of the recipient (MaxOther), respectively.

[11] In a recent study, Cobo-Reyes et al. (2019) also find that teenage females are less altruistic but more

	Selfish
constant	0.98***
C2	-0.319
C3	-0.71***
C4	-0.54***
C5	-0.59***
Self	0.66*
Other	-1.57***
Neither	-0.23
Gender	-0.08
Siblings	0.34**
Task 2	0.64***
Task 3	0.33**
Task 4	-0.97***
# Obs	1160
AIC	1077.2

	Fair
constant	-0.87***
C2	0.19
C3	0.62***
C4	0.49**
C5	0.26
Self	-1.03*
Other	0.80**
Neither	0.08
Gender	-0.11
Siblings	-0.18
Task 3	-0.31*
Task 4	0.13
# Obs	870
AIC	888.04

	Generous
constant	-1.71***
C2	0.08
C3	0.49*
C4	0.32
C5	0.79***
Self	-0.03
Other	1.70***
Neither	0.34
Gender	0.40**
Siblings	-0.43*
Task 4	0.89***
# Obs	580
AIC	500.27

*, ** and ***: significant at the 5%, 1% and 0.1% level.

Table 3: Probit regression of acting selfishly, fair and generously, with lookup variables

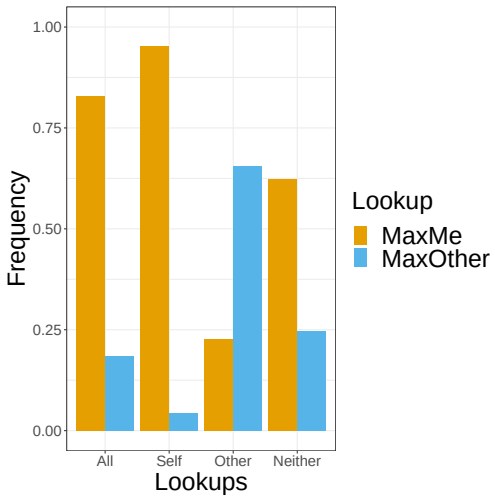


Figure 4: Choices conditional on lookups.

egalitarian than males.

The results complement the previous regression. Lookups are highly revealing of the intentions of our participants. As noted above, individuals tend to maximize the payoffs they focus on, but the goals of an incomplete lookup can diverge. As in the previous literature, some subjects avoid looking at the payoffs of the partner (Self) in a strategic attempt to maximize rewards without a negative moral feeling. These individuals choose the allocation that maximizes their own payoff significantly more often than subjects with All lookups (95% vs. 83%, $p = 0.027$). Some other subjects, instead, focus on the recipient's payoff (Other) as a commitment to behave altruistically. These individuals end up maximizing the recipient's payoff significantly more often than subjects with All lookups (66% vs. 18%, $p < 0.001$). Also, whenever subjects in (**C5**) engage in strategic ignorance, they do it for selfish motives 83% of the time and for altruistic motives 16% of the time. These patterns are not observed in school-age children. In particular, whenever subjects in (**C1**) engage in strategic ignorance, they do it for selfish motives 28% of the time and for altruistic motives 43% of the time. A similar pattern is observed in (**C4**) (27% for selfish motives against 44% for altruistic motives). By contrast, children in the (**C2**) and (**C3**) categories (from 4th grade to 7th grade), never engage in strategic ignorance for altruistic motives. Summing up, Table 3 and Figure 4 provide support for Hypothesis 3: the decision to not look at payoffs has a biasing effect on choices, which suggests that it is an intentional choice. Also, this option is differentially used by individuals of different ages. On the other hand, the changes with age are neither gradual nor monotonic. It is possible that some subjects did not use ignorance as a commitment and, instead, they simply did not care about the payoffs in those boxes. Given the negligible cost of clicking, the natural curiosity of children, and the fact that participants had no information regarding the possible payoffs in the boxes, we think this explanation is unlikely, especially for the case of the dictator's own payoffs.

Finally, we analyzed the choices of the fully informed participants as a function of the lookup trajectories. For each age category, we ran a Probit regression of the trial-by-trial choices as a function of lookup patterns, gender, a sibling dummy and tasks dummies. Participants in **C4** and **C5** who look at all their payoffs before dedicating attention to the payoffs of their partners are more likely to choose selfish allocations ($p < 0.05$ in (**C5**) and $p = 0.07$ in (**C4**)) and less likely to choose fair allocations ($p < 0.01$ in (**C5**) and $p < 0.05$ in (**C4**)). Conversely, participants in (**C1**) who do not exhibit discernible lookup patterns are less selfish ($p < 0.05$) and more generous ($p < 0.05$). There is no specific trend in the intermediate age categories (regressions omitted for brevity but available upon request).

These results taken together suggest that the underlying attention mechanisms play a role in decisions: both the decision to attend to specific information and the order in which attention is allocated modulates behavior.

5 Conclusion

We have conducted a dictator experiment with children and adults, where subjects can remain strategically ignorant about some consequences of their choices. We have shown that social strategic ignorance occurs for two opposite motives: either as a commitment to remorseless selfish behavior or as a commitment to behave generously. The frequency of *Selfish*, *Fair* and *Generous* choices depends significantly on age as already emphasized in the literature, but also on opportunity costs. Participants evolve from selfish and spiteful behavior across all contexts (children in elementary school) towards context-dependent behavior: more generous allocations that come at no cost for the dictator (middle and high schoolers) and costly but fair and efficient allocations (predominantly adults).

A major finding is the profuse tendency of participant of all ages to open every box before making their choice. This contrasts with the existing literature where ignorance (Dana et al., 2007; Larson and Capra, 2009) and exit (Dana et al., 2006; Broberg et al., 2007) are frequently used by selfish individuals as commitment devices against guilt. There are several design differences that can collectively explain this divergence.[12] In Dana et al. (2007) and most of the subsequent literature, the experiments are cleverly designed to focus on the "moral wiggle room." Indeed, the unobserved information relates only to the payoff of the recipient and the set of possible realizations is known. As a result, ignorance prevents a possible–but not certain–moral dilemma. Instead, the costs of ignorance are raised in our setting since participants cannot form an expectation of the values in the hidden boxes.[13] Also, in the existing literature recipients are often unaware of the options faced by the dictator, making it easier to justify the decision not to learn such outcomes. Relatedly, recipients are at the entire mercy of dictators, as they do not play in the other role. This has the potential to increase the guilt of not sharing and thereby strengthen the value of ignorance. Finally, Grossman (2014) shows that strategic ignorance decreases significantly when the default is moved from not being informed to being informed. Although in our paper the default is no information, all values are initially hidden. We conjecture that once the subject has revealed his own payoff boxes, it becomes harder to justify not opening the remaining ones.

Our concern for others is closely related to morality and to our emotions around moral and immoral behavior. In principle, anticipating those emotions should guide our decisions. Evidence from adults indicates that emotions modulate behavior in prosocial tasks (Dana et al., 2006, 2007) and cheating games (Coricelli et al., 2014). Studies in

[12] We thank two anonymous referees for suggesting this discussion.

[13] Our design is also arguably less transparent in the demand for ignorance. Hidden boxes that can be uncovered (or not) may be a more natural setup than informing the dictator about the distribution of payoffs of the recipient but not the realization unless it is explicitly desired.

children reveal that children respond to distress (Zahn-Waxler et al., 1992) and to guilt (Kochanska et al., 2002) at around 2 years of age and gradually differentiate between guilt and shame (Ferguson et al., 1991). Evidence shows that guilt is aroused by moral norm violations in children between 7 and 12 years of age. They also feel ashamed as a result of moral transgressions. However, it is not known at what age children become able to anticipate such emotions and take them as a factor of their decision-making.

The fact that some children in our experiment avoid information and commit to a behavior atypical of their age suggests that those participants are able to anticipate their emotions. It is also interesting to observe a different pattern of information avoidance across ages, which reflects different levels of sophistication. Indeed, adults anticipate that information leads them to choose a non-beneficial option. They act upon the anticipated regret of not remaining ignorant, so information avoidance is best described as willful ignorance. Children, on the contrary, anticipate that they will be tempted to choose the non-generous option and they act upon anticipated guilt or shame of a bad behavior. In summary, our evidence suggests that adults use the ignorance mechanism to avoid complying to moral norms while children use it to avoid transgressing them.

References

James Andreoni and John Miller. Giving according to garp: An experimental test of the consistency of preferences for altruism. *Econometrica*, 70(2):737–753, 2002.

James Andreoni and Lise Vesterlund. Which is the fair sex? gender differences in altruism. *The Quarterly Journal of Economics*, 116(1):293–312, 2001.

Coralie Bastin, Ben J Harrison, Christopher G Davey, Jorge Moll, and Sarah Whittle. Feelings of shame, embarrassment and guilt and their neural correlates: A systematic review. *Neuroscience & Biobehavioral Reviews*, 71:455–471, 2016.

Roland Bénabou and Jean Tirole. Self-confidence and personal motivation. *The Quarterly Journal of Economics*, 117(3):871–915, 2002.

Gary E Bolton and Axel Ockenfels. Erc: A theory of equity, reciprocity, and competition. *American economic review*, pages 166–193, 2000.

Tomas Broberg, Tore Ellingsen, and Magnus Johannesson. Is generosity involuntary? *Economics Letters*, 94(1):32–37, 2007.

Isabelle Brocas and Juan D Carrillo. Influence through ignorance. *The RAND Journal of Economics*, 38(4):931–947, 2007.

Isabelle Brocas and Juan D. Carrillo. The development of coordinated behavior in repeated games. Work in progress, 2018.

Isabelle Brocas and Juan D Carrillo. Studying decision-making in children: challenges and opportunities. *Journal of Economic Behavior & Organization*, Forthcoming.

Isabelle Brocas, Juan D Carrillo, Stephanie W Wang, and Colin F Camerer. Imperfect choice or imperfect attention? understanding strategic thinking in private information games. *Review of Economic Studies*, 81(3):944–970, 2014.

Isabelle Brocas, Juan D Carrillo, and Ashish Sachdeva. The path to equilibrium in sequential and simultaneous games: A mousetracking study. *Journal of Economic Theory*, 178:246–274, 2018.

Isabelle Brocas, Juan D Carrillo, T Dalton Combs, and Niree Kodaverdian. The development of consistent decision-making across economic domains. *Games and Economic Behavior*, 116:217–240, 2019.

Colin Camerer. *Behavioral game theory: Experiments in strategic interaction*. Princeton University Press, 2003.

Juan D Carrillo and Thomas Mariotti. Strategic ignorance as a self-disciplining device. *The Review of Economic Studies*, 67(3):529–544, 2000.

Jingnan Chen, Daniel Houser, Natalia Montinari, and Marco Piovesan. Beware of popular kids bearing gifts: A framed field experiment. *Journal of Economic Behavior & Organization*, 132:104–120, 2016.

Ramon Cobo-Reyes, Jose J Dominguez, Fernando García-Quero, Brit Grosskopf, Juan A Lacomba, Francisco Lagos, Tracy Xiao Liu, and Graeme Pearce. The development of social preferences. *Journal of Economic Behavior & Organization*, 2019.

Giorgio Coricelli, Elena Rusconi, and Marie Claire Villeval. Tax evasion and emotions: An empirical test of re-integrative shaming theory. *Journal of Economic Psychology*, 40:49–61, 2014.

Miguel Costa-Gomes, Vincent P Crawford, and Bruno Broseta. Cognition and behavior in normal-form games: An experimental study. *Econometrica*, 69(5):1193–1235, 2001.

William Crain. *Theories of Development: Concepts and Applications: Concepts and Applications*. Psychology Press, 2015.

Vincent P Crawford. Look-ups as the windows of the strategic soul: Studying cognition via information search in game experiments. *Perspectives on the future of economics: Positive and normative foundations*, 1, 2008.

Jason Dana, Daylian M Cain, and Robyn M Dawes. What you don't know won't hurt me: Costly (but quiet) exit in dictator games. *Organizational Behavior and human decision Processes*, 100(2):193–201, 2006.

Jason Dana, Roberto A Weber, and Jason Xi Kuang. Exploiting moral wiggle room: experiments demonstrating an illusory preference for fairness. *Economic Theory*, 33(1): 67–80, 2007.

Margaret Donaldson. Conservation: What is the question? *British Journal of Psychology*, 73(2):199–207, 1982.

Catherine Eckel, Philip J Grossman, Cathleen A Johnson, Angela CM de Oliveira, Christian Rojas, and Rick Wilson. Social norms of sharing in high school: teen giving in the dictator game. *Journal of Economic Behavior & Organization*, 80(3):603–612, 2011.

Catherine C Eckel and Philip J Grossman. Are women less selfish than men?: Evidence from dictator experiments. *The economic journal*, 108(448):726–735, 1998.

Dirk Engelmann and Martin Strobel. Inequality aversion, efficiency, and maximin preferences in simple distribution experiments. *American economic review*, 94(4):857–869, 2004.

Ernst Fehr and Klaus M Schmidt. A theory of fairness, competition, and cooperation. *The quarterly journal of economics*, 114(3):817–868, 1999.

Ernst Fehr, Helen Bernhard, and Bettina Rockenbach. Egalatarianism in young children. *Nature*, 454(28):1079–1084, 2008.

Ernst Fehr, Daniela Glätzle-Rützler, and Matthias Sutter. The development of egalitarianism, altruism, spite and parochialism in childhood and adolescence. *European Economic Review*, 64:369–383, 2013.

Tamara J Ferguson, Hedy Stegge, and Ilse Damhuis. Children's understanding of guild and shame. *Child development*, 62(4):827–839, 1991.

Zachary Grossman. Strategic ignorance and the robustness of social preferences. *Management Science*, 60(11):2659–2665, 2014.

Zachary Grossman and Joël J Van der Weele. Self-image and willful ignorance in social decisions. *Journal of the European Economic Association*, 15(1):173–217, 2017.

William T Harbaugh, Kate Krause, and Steve Liday. Children's bargaining behavior. *University of Oregon, mimeo*, 2002.

Daniel Houser, Natalia Montinari, and Marco Piovesan. Private and public decisions in social dilemmas: evidence from children's behavior. *PloS one*, 7(8):e41568, 2012.

Eric J Johnson, Colin Camerer, Sankar Sen, and Talia Rymon. Detecting failures of backward induction: Monitoring information search in sequential bargaining. *Journal of Economic Theory*, 104(1):16–47, 2002.

Emir Kamenica and Matthew Gentzkow. Bayesian persuasion. *American Economic Review*, 101(6):2590–2615, 2011.

Grazyna Kochanska, Jami N Gross, Mei-Hua Lin, and Kate E Nichols. Guilt in young children: Development, determinants, and relations with a broader system of standards. *Child development*, 73(2):461–482, 2002.

Kerstin Konrad, Susanne Neufang, Christiane M Thiel, Karsten Specht, Charlotte Hanisch, Jin Fan, Beate Herpertz-Dahlmann, and Gereon R Fink. Development of attentional networks: an fmri study with children and adults. *Neuroimage*, 28(2):429–439, 2005.

Tara Larson and C Monica Capra. Exploiting moral wiggle room: Illusory preference for fairness? a comment. *Judgment and decision Making*, 4(6):467, 2009.

Holly Alliger Ruff and Mary Klevjord Rothbart. *Attention in early development: Themes and variations*. Oxford University Press, 2001.

Alex Shaw, Natalia Montinari, Marco Piovesan, Kristina R Olson, Francesca Gino, and Michael I Norton. Children develop a veil of fairness. *Journal of Experimental Psychology: General*, 143(1):363, 2014.

Kai Spiekermann and Arne Weiss. Objective and subjective compliance: A norm-based explanation of 'moral wiggle room'. *Games and Economic Behavior*, 96:170–183, 2016.

Martijn C Willemsen and Eric J Johnson. Visiting the decision factory: Observing cognition with mouselabweb and other information acquisition methods. *A handbook of process tracing methods for decision research: A critical review and user's guide*, pages 21–42, 2011.

Carolyn Zahn-Waxler, Marian Radke-Yarrow, Elizabeth Wagner, and Michael Chapman. Development of concern for others. *Developmental psychology*, 28(1):126, 1992.

Appendix A: Instructions

Hi, my name is Isabelle and these are my helpers [Introduce helpers]
[For USC: please put your cellphones away and do not talk with each other. Pull dividers]

Today, we are going to play a few games with you. Do you want to play games?

- [For Los Feliz: In all the games, you are going to win points. At the end, you can exchange the points for the toys you saw in the shop.]
- [for USC: at the end of the experiment you will be paid a $7 show up fee and 4 cents for each point you obtain]
- [for Burbank: at the end of the experiment you will be paid with an Amazon gift card 3.5 cents for each point you obtain]

In all the games, you will play with another person in this room. You will play with different persons in different games. Each time the computer will decide who you are playing with but you will not know who this is, and the point is not to find out.

This first game is called the "splitting game". You will be playing with someone in this room but remember, you will not know who this person is. Each of you will see a screen like this. [Project SLIDE 1] (see Figure 5).

There are 3 cards and you need to pick one. Now, what's in each card?

Each card has two numbers. The number at the top is the number of points you will have if you pick that card. The number at the bottom is the number of points your partner will have if you pick that card.

These numbers are hidden but you can see them by clicking on them. For instance, if I want to know the number of points I will get if I choose the second card, I click on it. [Project SLIDE 2]

And if I want to know the number of points my partner will have if I pick the third card, I click on it. When I click on a number, it stays on the screen. [Project SLIDE 3]

You can see as many or as few numbers as you want. You can pick a card without looking at any number, or you can look at some numbers, or you can look at all the numbers. It is entirely up to you. When you have a high number in one card, the number of points for your partner in that card can be high or low and vice versa. You decide which numbers you look at.

When you have decided which card you want to pick, click on the square at the bottom of the card. After clicking, you cannot make any changes, so you need to be sure of your choice before clicking.

You will be playing this game several times, each time with different cards and each time with a different partner. You will not know what your partner chose. At the end, the computer will tell you how many points you earned in the splitting game. These points

are the points you gave to yourself and the points that all your partners gave you.

OK, let's first play for pretend to see how the game works. Remember, this game does not count for real.

If you want to know how much you will earn if you select the first card on the left. What do you do?

[Ask participants to answer]

If you want to know what your partner will get if you select the card in the middle, what do you do?

[Ask participants to answer]

Let's play for real now.

[Announce each new game]

Figure 5: Slide 1 (top), Slide 2 (bottom left) and Slide 3 (bottom right)

Appendix B: Evolution of other-regarding behavior

The results in section 4.2 show that behavior in social settings exhibits grade-related and context-dependent patterns. They provide evidence regarding the distribution of choices by situation and age. However, they do not say how a person's choice in a given context relates to his choice in a different context. To address this question, we perform an analysis at the individual level with the objective of identifying clusters of subjects who follow the same pattern of behavior across contexts. For this investigation, we restrict attention to the 227 participants who always look at all the information.

Note first that behavior is usually concentrated in one or two decisions in tasks 1, 2 and 3 (options $1B$, $2C$ and $3C$ are chosen only 3%, 4% and 13% of the time, respectively). By contrast, behavior is dispersed in task 4 (options $4A$, $4B$ and $4C$ are chosen 43%, 29% and 28% of the time, respectively). We therefore decided to retain tasks 1, 2 and 3 to classify our subjects. We found that only 14 subjects chose option $2B$, indicating little evidence of intrinsic generosity. Since there is no consistent behavior among those subjects on the other tasks, we decided to not classify them further.[14] Despite the large set of possible combinations, among the 213 participants who did not choose $2B$ we found evidence of only four types: *Selfish & Spiteful* ($1A$ - $2A$ - $3A$), *Selfish* ($1A$ - $2A$ - $3B$), *Selfish & Generous* ($1C$ - $2A$ - $3B$) and *Fair* ($1C$ - $2A$ - $3C$). These four types account for 85% of all the subjects who became perfectly informed before making their choices.[15] Figure 6 illustrates the results by age-group.

There is a simple interpretation of the data: selfish behavior is the default mode for most subjects, but it is modulated by context and age. The predominant type among elementary school children is *Selfish & Spiteful*. Spite is abandoned gradually during middle school: many subjects remain selfish but they opt for fair and generous sharing rules as long as they entail zero or little cost to them. These tendencies persist as individuals move from adolescence to adulthood.

Interestingly, the classification of subjects given their choices in tasks 1, 2 and 3 is predictive of their behavior in task 4. Table 4 reports the fraction of spiteful ($4A$), fair ($4B$) and generous ($4C$) choices in task 4 as a function of the subject's type determined in the other tasks. It is worth emphasizing that task 4 is best at disentangling other-regarding concerns, since the personal cost of giving is nil.

We can see from Table 4 that participants categorized as *Selfish & Spiteful* choose

[14] Only 4 subjects consistently chose to maximize the amount for the other ($1C$, $2B$, $3C$ and $4C$).

[15] While we realize the imperfect nature of our labels, we believe that these four types capture important differences in other-regarding behavior. Also, one can make the case that subjects who looked only at their own payoffs and maximized them should also be classified in one of the *Selfish* categories. Adding them to the analysis would not affect significantly the results.

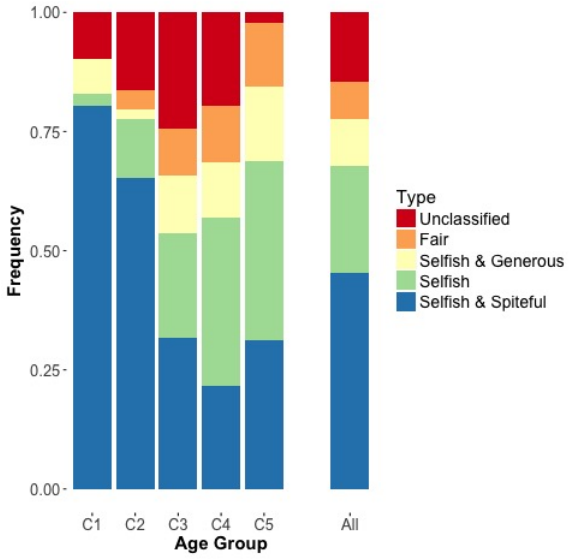


Figure 6: Classification of individuals by age group

the spiteful option ($4A$) most of the time and they virtually never select the generous one ($4C$). On the other end, participants categorized as *Selfish & Generous* and *Fair* are mostly generous and rarely spiteful. The behavior is similar among *Selfish* subjects, except for a slightly larger tendency towards spite and away from fairness.

	% $4A$	% $4B$	% $4C$
Selfish & Spiteful	0.73	0.24	0.03
Selfish	0.16	0.25	0.59
Selfish & Generous	0.05	0.36	0.59
Fair	0.05	0.45	0.50

Table 4: Classification prediction

Overall, choices in task 4 –which reveals how a subject feels about giving per se– is both diagnostic and predictive of behavior in sharing situations at large. Subjects who do not like to give in task 4, do not give in general. Subjects who give as much as possible in task 4, do not behave selfishly when giving does not hurt them.

We next group subjects classified as *Selfish & Generous* and *Fair*, that is, those who give when it is costly for themselves, in a category that we call *Prosocial*. We then perform a predictive exercise by running a multinomial logistic regression of the subject's type on

the card selected in task 4. We report in Table 5 the result of this regression (option 4*A* and *Selfish* type are the omitted categories of the independent and dependent sides of the regression, respectively).

	Selfish & Spiteful	*Prosocial*
4*B*	-1.59***	1.61*
4*C*	-4.53***	1.08
Gender	-0.028	-0.01
Siblings	0.04	-0.60
constant	2.24***	-0.91
# Obs.	194	194
AIC	298.5	298.5

*, ** and ***: significant at the 5%, 1% and 0.1% level.

Table 5: Multinomial logistic regression of individual types

Table 5 confirms that choices in task 4 predict individual types: higher willingness to give in task 4 is associated with a lower likelihood to be classified as *Selfish & Spiteful* and a higher likelihood to be classified as *Prosocial* in the other tasks.