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How Does Socio-Economic Status Shape a Child's Personality?

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Abstract

We show that socio-economic status (SES) is a powerful predictor of many facets of a child's personality. The facets of personality we investigate encompass time preferences, risk preferences, and altruism, as well as crystallized and fluid IQ. We measure a family's SES by the mother's and father's average years of education and household income. Our results show that children from families with higher SES are more patient, tend to be more altruistic and less likely to be risk seeking, and score higher on IQ tests. We also discuss potential pathways through which SES could affect the formation of a child's personality by documenting that many dimensions of a child's environment differ systematically by SES: parenting style, quantity and quality of time parents spend with their children, the mother's IQ and economic preferences, a child's initial conditions at birth, and family structure. Finally, we use panel data to show that the relationship between SES and personality is fairly stable over time at age 7 to 10. Personality profiles that vary systematically with SES might offer an explanation for social immobility.

Keywords: personality, human capital, risk preferences, time preferences, altruism, experiments with children, origins of preferences, social immobility, socio-economic status

JEL-Codes: C90, D64, D90, D81, J13, J24, J62

1 Introduction

Both economic theory and empirical evidence have established a robust link between economic preferences and IQ and many important outcomes in life. For example, more patient individuals achieve higher levels of educational attainment, resulting in substantially higher earnings (Golsteyn *et al.*, 2014; Shoda *et al.*, 1990). Furthermore, they are more likely to exercise, to be a non-smoker, and less likely to be obese (Chabris *et al.*, 2008; Sutter *et al.*, 2013; Golsteyn *et al.*, 2014). Risk preferences are another important predictor of both economic and health outcomes. A higher willingness to take risks is positively correlated with being self-employed, investing in stocks, with smoking, and taking exercises (Dohmen *et al.*, 2011). Social preferences that reflect an individual's degree of altruism are, e.g., related to overall satisfaction with life (Becker *et al.*, 2012) and productivity at work in a team production environment (Carpenter and Seki, 2011). Finally, higher levels of IQ are associated with higher levels of education (Heckman and Vytlacil, 2001), income (Hanushek and Woessmann, 2008), and job performance (Schmidt and Hunter, 2004). Outcomes like educational attainment, occupational choice, health related behavior, or satisfaction with life shape an individual's life. At the aggregate level, these outcomes are also important for societies as a whole, since they, for example, affect productivity or costs of the health care system. A better understanding of these outcomes requires knowledge about how economic preferences and IQ form.

This paper contributes to the understanding of the origins of economic preferences and IQ by documenting a systematic and strong relation between a family's socio-economic status (SES) and a child's economic preferences and IQ. Conceptually, economic preferences and IQ can be considered as facets of a person's personality (Almlund *et al.*, 2011; Borghans *et al.*, 2008). Personality emerges in childhood and adolescence, and is generally thought of as relatively stable afterward.[1] Previous work by Cunha and Heckman (2007) and Heckman (2008) stresses the importance of parental investments in their children for shaping a child's personality. Since SES largely defines the monetary and cognitive resources available to parents for investments in their child, SES is a prime candidate for shaping a child's personality.

Our paper moves beyond existing work in at least three respects. We study how SES simultaneously shapes time preferences, risk preferences, social preferences, and IQ in one coherent

[1] See Almlund *et al.* (2011), p.117ff or Borghans *et al.* (2008) for a general discussion on the stability of personality. During their development process, children typically become more patient (Bettinger and Slonim, 2007), less risk seeking (Paulsen *et al.*, 2011), and more altruistic (Fehr *et al.*, 2008).

framework. Thereby, we use preference measures that are based on incentivized experiments and well-established measures of SES. Above and beyond studying SES as a "black box", we use our comprehensive data to shed light on how the microstructure of the family environment differs by SES. Our data on family environment cover different aspects of parental behavior such as parenting style, time parents spend with their children, and the quality of time spent together, as well as differences in family structure, initial conditions at birth, and the personality of the child's mother. The SES-specific environmental factors add to better understanding of why SES is important by pointing at potential pathways through which SES affects the formation of personality. Finally, we are the first to use panel data information on children's economic preferences to discuss the dynamic development of children's personality over time. Our study allows assessing the effect of SES on a broad set of cognitive and non-cognitive skills and largely documents dynamic persistence of these effects in a life period that is critical for the development of personality.

We proceed in three steps. First, for each facet of personality under study, we document whether there is a significant relationship between SES and the respective facet of a child's personality. For that purpose, we regress the different personality traits on our measures of SES using wave 1 data when children are on average 7.8 years old. We measure a family's SES by the net household equivalence income and the mother's and father's average years of education.[2] Our results document a strong relationship between SES and a child's time preferences, risk preferences, and IQ: children from families with higher SES are significantly more patient, significantly less likely to be risk seeking, and score significantly higher on tests of crystallized and fluid IQ. Having documented the link between SES and a child's personality, we move on by discussing potential pathways through which SES may affect the formation of personality. We document that numerous dimensions of a child's family environment that have been shown to affect the formation of personality differ systematically by SES. In a final step, we use panel data to investigate dynamic patterns in the relationship between SES and personality. Overall, we show that the relationship between SES and personality is fairly stable over time at ages 7 to 10. Differences

[2]There exists no universal consensus about how to measure SES. It is usually measured by some combination of income, education, and occupation. Bradley and Corwyn (2002) provide a brief discussion of the history and definition of the term SES. Our data also contain information on parental occupation (in 20 categories such as being self-employed, a blue-collar worker, a white collar-worker, or a civil servant). Still, we prefer focusing on parental income and education as measures of parental SES, because they are quantifiable in natural units and thus well apt for our empirical analysis. Furthermore, taken together, variation in educational attainment and income largely captures variation in occupational status.

between children from high and low SES families in patience, fluid, and crystallized IQ persist as children grow. While differences in children's risk seeking behavior by SES become smaller as children grow, a new gap in altruism emerges over time.

The data set we use in this study comprises measures of time preferences, risk preferences, and altruism of 732 children. The preference measures are based on incentivized experiments. All children also participated in tests for fluid and crystallized IQ. Moreover, for all children we have detailed questionnaire measures (completed by their mothers) on SES and dimensions of a child's family environment. The environmental variables include information about family structure (whether the child lives with a single parent, the age of the mother at birth, and the current number of siblings at home), parenting style, how many hours per week the mother is the main caregiver of her child, and what kind of activities parents actually perform with their child when they spend time together. Furthermore, we use information about the mother's IQ and economic preferences to include controls for genetic transmission of ability and to account for intergenerational transmission of economic preferences. Finally, we have information about the child's initial conditions at birth (weight at birth, the week of gestation at birth, and the number of older siblings at birth).

Studying the relationship between parental SES and a child's personality is important for several reasons. First, it enhances our understanding of the sources of heterogeneity in personality. Second, it may be helpful in explaining social immobility. It is well documented that individuals with different personality profiles are likely to end up with different outcomes in life (Chabris *et al.*, 2008; Sutter *et al.*, 2013; Golsteyn *et al.*, 2014; Dohmen *et al.*, 2011; Heckman and Vytlacil, 2001; Hanushek and Woessmann, 2008). An individual's SES is one of those outcomes. Social immobility occurs if children from parents with high SES are more likely to develop a personality profile that is associated with outcomes that result in high SES. This is the link we find. In addition to pointing at a potential mechanism underlying social immobility, our data provide direct evidence for "personality immobility" by SES. Differences in mothers' personality that arise by SES are partly replicated by their children. For example, both mothers and children from higher SES families are more patient and score higher in IQ tests than their lower SES counterparts. Finally, the fact that a child's personality varies systematically with SES is important when explaining later life outcomes with differences in personality traits in childhood or adolescence or children's current behavior with the shape of their preferences (see, for example, the seminal study of Mischel *et al.* (1989) or Sutter *et al.* (2013)). In light of our findings, it is important

to include information about SES when analyzing the influence of personality on outcomes or behavior to avoid potential omitted variable bias.

The literature on the relationship between a child's economic preferences and SES is scarce. We are not aware of any other study that investigates the relationship between SES and children's time preferences. Delaney and Doyle (2012) is the study that comes closest to analyzing this relationship. They use parental answers to questions concerning psychological concepts such as hyperactivity, impulsivity, and persistence of three year old children and show that children from families with higher SES are less impulsive. Concerning risk preferences, Alan *et al.* (2013) study the intergenerational transmission of risk attitudes and use maternal and paternal years of education as control variables that turn out not to be significant. In their data, mothers' and children's risk attitudes are measured in a similar, incentivized task that cannot distinguish between risk neutrality and risk seeking. This is the range in which we document a significant relation between parental education and risk preferences.[3] In the domain of social preferences, Bauer *et al.* (2014) is the only closely related study.[4] Similar to our results, they find a positive relationship between parental education and altruism. It is not significant for younger (kindergarten) children, but becomes significant for older (primary school) children.

While research on the relation of SES and children's economic preferences is still in its infancy, the effect of SES on children's overall IQ is well established and, according to Bradley and Corwyn (2002), especially clear cut: Children from high SES families score significantly higher on IQ tests. Neff (1938) documented the positive correlation of IQ and SES. In a study on adopted children, Capron and Duyme (1989) use information on SES of both foster and biological parents of the same children to illustrate that SES is positively correlated with children's IQ even if the effect cannot work through genetic transmission. Rindermann *et al.* (2010) and Turkheimer *et al.* (2003) are examples of studies that separately analyze the role of SES for crystallized and fluid IQ. Again, they document a significant and positive effect of higher SES on both components of IQ.

[3]Furthermore, they use information on a family's belongings and monthly expenditures to construct four dummies that split their sample in SES quartiles. These dummies do not have predictive power for boys' risk attitudes, but girls from low SES families are less risk averse.

[4]Benenson *et al.* (2007) also present evidence that higher SES is associated with higher levels of altruism. In their study, however, SES is only measured at school level using the fraction of children who receive a free lunch. Angerer *et al.* (2015) use children's statements about their parents' profession to estimate parental income and education based on publicly available information on starting wages and minimum educational requirements in a given profession. They find a marginally significant, positive effect of higher paternal education on children's donations to a charity.

Anger and Heineck (2010) and Rindermann *et al.* (2010) point to a larger parental influence on crystallized IQ as opposed to fluid IQ that is supposed to have a stronger hereditary component than crystallized IQ. Our findings are in line with all these results.

What sets our paper apart from all existing studies is the fact that we study risk preferences, time preferences, social preferences, and IQ simultaneously in one coherent framework. Nearly no decision in real-life involves only risk, only time, only social, or only cognitive aspects, but not the others. For example, addictive behaviors such as smoking, drinking, or gambling involve risk considerations, but also a trade-off between immediate and delayed utility (Sutter *et al.*, 2013; Ida and Goto, 2009). Therefore, a comprehensive framework allows for additional insights concerning additivity of "risk factors" by SES.

The remainder of the paper is organized as follows: First, we describe the composition of our sample and our measures of economic preferences, IQ, and further variables. Section 3 contains the results and embeds our findings in the existing literature. In the final section, we discuss main implications of our findings.

2 Data

2.1 Sample

Our sample consists of 732 children and their mothers[5] who were recruited using official registry data.[6] Interviews took place in Bonn and Cologne (Germany) and were conducted by trained

[5] Actually, 96% of the children were accompanied by their biological mother, 2% by their biological father, 3 children by a step or foster parent, one child by the new partner of a biological parent. We do not have unambiguous information on the accompanying person for about 1% of the children. Throughout the paper, we will use the term "mother" for the adult accompanying the child.

[6] We received more than 95% of the addresses of families living in Bonn and Cologne (Germany) who had children of age seven to nine. Offers to take part in the study were sent by mail to all families with children born between September 2003 and August 2004 and one third of families with children born between September 2002 and August 2003. 12.5% (N=1874) of the contacted families were interested in participating. Due to capacity constraints, we ultimately invited all families with relatively low income (equivalence income of the household is lower than the 30% quantile of the German income distribution) and / or relatively low education (both parents do not qualify for university studies), and / or single parent families to participate. Moreover, 122 families who do not meet any of these criteria are part of our sample. Since some children of the sample had the chance to participate in a one-year mentoring program, all parents had consented to let their child participate in the program in case he or she would be selected (which happened only after wave 1 interviews were completed).

university students (mostly graduates) of psychology or education science. Children participated in a sequence of 7 experiments, 2 short intelligence tests for fluid and crystallized IQ, and answered a brief questionnaire. In total, interviews lasted about one hour. Children were paid and incentivized using toys and a small amount of money with an average total value of about 9 Euro. We introduced an experimental currency called "stars". At the end of all experiments, children could exchange the amount of paper stars won for toys. The toys were arranged in four categories which visibly increased in value and subjective attractiveness to children (see figure A.1 in the Appendix). Children knew that possessing more stars would allow choosing a toy from a higher category. We ensured that each additional star that would not result in a higher category still had an extra value to the children by converting these additional stars into Lego bricks.

During the time children participated in the experiments, their mothers filled out a comprehensive questionnaire with the following categories of topics: general information about the child such as name, age, gender, number of older and younger siblings, grades at school, friendships etc., socio-economic background of the family, health status of the child and information about early childhood environment, details about child care and parenting style, assessments of personality and attitudes of the child, personality, preferences, and attitudes of the mother.

Table 1 shows basic characteristics of the participating children and their parents.[7] The monthly net household equivalence income (hereafter referred to as income) is calculated by dividing total monthly nominal household income (including any transfers, but after taxes) by a factor that takes into account household size.[8] Calculating the equivalence income follows the procedure suggested by the OECD. The rationale is to account both for the number of persons living in a household and economies of scale. The average income in our sample is 1265 Euro and corresponds to a household that is roughly at the 40% quantile of the German income distribution.[9] The level of education is measured in years of education averaged over mothers and fathers. This variable is constructed by adding up numbers of years of schooling and occupational training (including university). On average, parents have 12.8 years of education which corresponds to having completed a standard apprenticeship after obtaining the secondary school level certificate.

[7] Table 1 and Figures 1-4 refer to the initial wave 1 sample.

[8] In particular, the factor takes on the value 1 for a single-person household. For each additional person aged 14 years or older 0.5 is added, for each person younger than 14 years 0.3 is added.

[9] This statement is based on own calculations using self-reported income data from the SOEP in year 2009 and the cross-sectional weights provided in the SOEP to make the data representative for the German population. Our sampling procedure favors low SES households, see footnote 6.

Roughly 52% of the children are boys.

Table 1: Basic Characteristics of the Sample

Variable	Mean	Std. Dev.	Median	Min	Max
monthly net equivalence income (in 1000 Euro)	1.265	0.668	1.111	0.188	7.143
avg. parental years of education	12.81	2.79	12.25	7	18
male	0.52	–	–	–	–
age (in months)	93.39	6.29	92	84	113

2.2 Description of experiments and IQ tests

In the following, we explain the five incentivized experiments used to measure time preferences, risk preferences, and altruism, respectively. We then present the IQ tests.

2.2.1 Time preferences: piggy bank experiment

Children were endowed with seven 20 cent coins. They could choose how many coins to put in a piggy bank and how many to take immediately. The amount put in the piggy bank was doubled and sent to the children via postal mail one week after the interview. We took great care in ensuring that the amount of coins put into the piggy bank was not influenced by children's trust in the saved money being actually delivered to them: we explicitly addressed the letter to the children themselves, wrote addresses on the envelope, and put the saved amount of money in the envelope while the children were watching.[10] Understanding of the game was checked via a control question. The game only started after the children had fully understood its rules.[11]

[10] Moreover, detached from this experiment, we asked the children three questions concerning their general trust in other people. Using the answers to these questions, we build a standardized trust score. Correlations of the trust score with the number of saved coins are not significantly different from zero at any conventional significance level. We infer that children's level of trust in other people does not influence their decision in the piggy bank experiment.

[11] We drop 17 observations since children could not answer the control question properly and 2 further observations since we do not have information on children's understanding of the game.

The amount of coins put into the piggy bank is our observational measure for the child's discount rate. In particular, a higher number of coins put into the piggy bank implies lower discounting of the future.[12] To see this, assume that the utility of consumption today and consumption in one week follows a twice differentiable utility function u with $u'(x) > 0$, $u''(x) < 0$, $u'(0) \to \infty$ and let future utility be depreciated by δ (discount factor), with $0 \leq \delta \leq 1$. Let a denote the number of coins put in the piggy bank and let b denote the total number of coins available. Then, the child faces the following maximization problem:

$$\underset{a}{\text{maximize}} \quad u(b-a) + \delta u(2a)$$

In the optimum, it holds

$$u'(b-a) = \delta u'(2a).$$

This implies that larger values of δ result in larger values of a, i.e., the less the future is discounted, the more coins are put into the piggy bank.[13]

Figure 1 shows the distribution of saving decisions (N=705). Overall, there is substantial variation in saving choices. About 33% of children choose to save 7 coins. The average number of coins put in the piggy bank is 4.50 with a standard deviation of 2.11 and a median of 4.

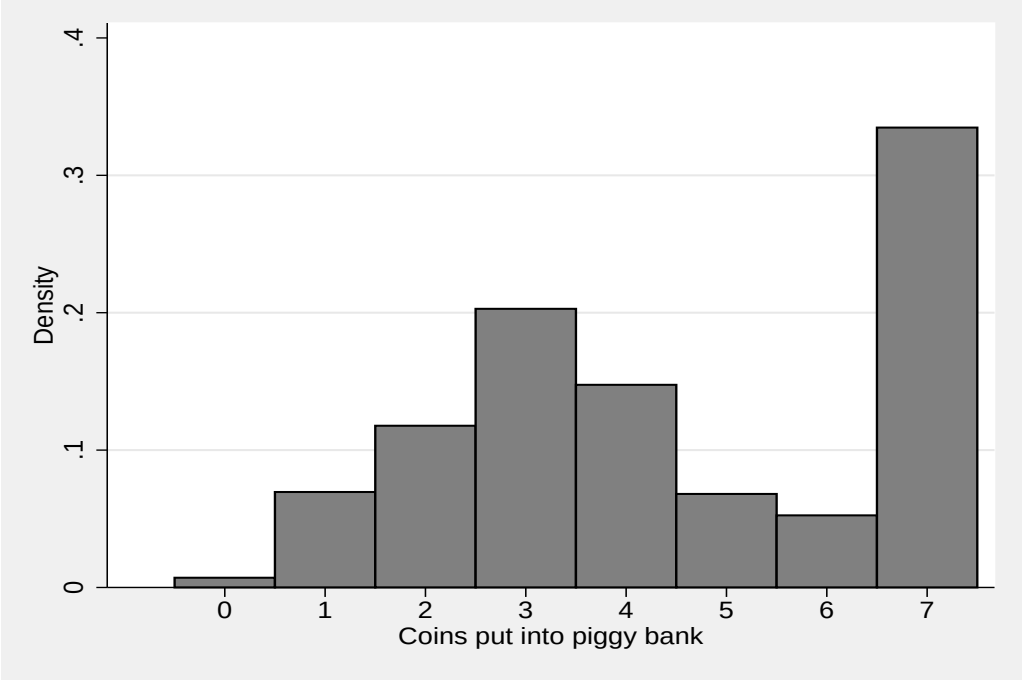
2.2.2 Risk preferences: coin flipping experiment

To elicit risk preferences, the interviewer presented two coins. One of the coins had three stars printed on each side. The other coin had seven stars on one side and zero on the other. Children chose which coin should be tossed. The interviewer explained that choosing the coin with three stars on each side implies winning three stars for sure. Choosing the other coin, however, implies that the outcome (seven or zero stars) is determined by chance, with both outcomes being equally likely. The fact that the safe amount (three stars) was also 'determined' by a coin toss ensures that children did not choose the risky option only for entertainment or game value. After children had made their decision, but before actually tossing the chosen coin, the interviewer presented

[12] This holds under the assumption that children do not take into account their current financial situation when evaluating the saving decision. Table 2 in section 3 provides some affirmative evidence for this assumption as net household equivalence income of the family is not significantly related to the decisions of the children.

[13] The optimum above refers to values of δ which result in an inner solution. Additionally, there are two corner solutions: very impatient children ($\delta < u'(b)/u'(0)$) will not put any coins in the piggy bank, while very patient children ($\delta > u'(0)/u'(2b)$) will put all seven coins in the piggy bank.

Figure 1: Distribution of Saving Decisions (Histogram)



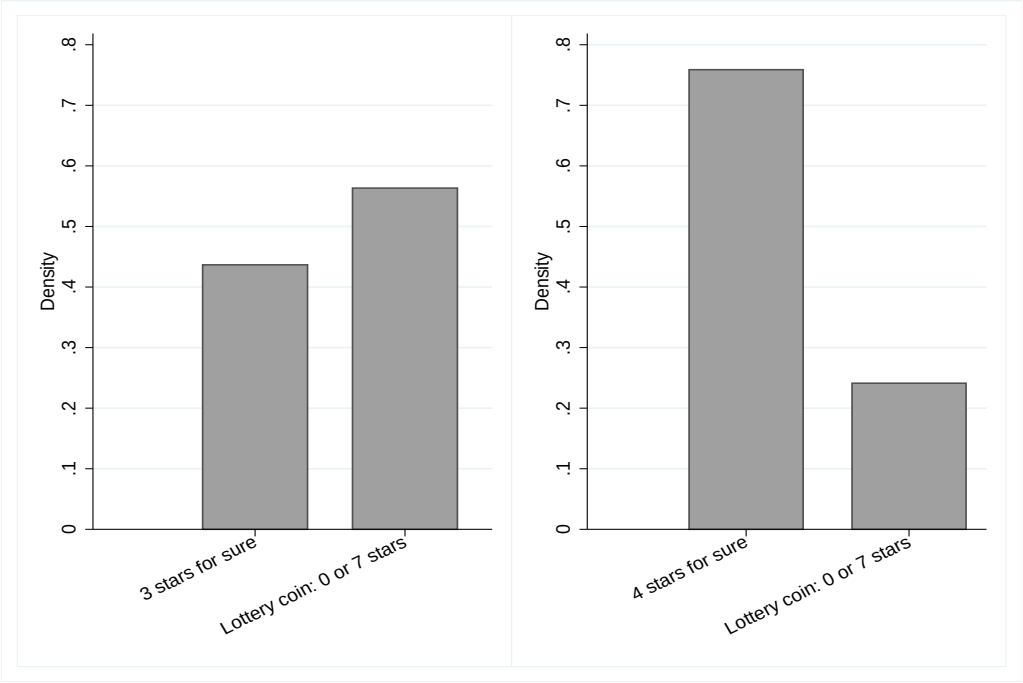
them two more coins in another color. Now, one coin had four stars on each side, while the other coin again had zero stars on one side and seven on the other. Children made their second decision and the interviewer tossed the two chosen coins. The order in which the two variations of the game were played was randomized.

The certainty equivalent of the "lottery coin" is 3.5. Thus, we classify a child as risk averse if he prefers three stars for sure over the "lottery coin". A child is classified as risk seeking if he opts for the "lottery coin" instead of a safe amount of four. We call a child risk neutral if he chooses the "lottery coin" instead of the safe amount of three and the safe amount of four instead of the "lottery coin". Children who opt for the safe amount of three while choosing the "lottery coin" over the safe amount of four make an inconsistent choice and are excluded from the analysis.

Figure 2 depicts the frequencies of choices in the two coin toss experiments excluding inconsistent choices (N=655). More children choose the lottery when the safe amount is lower. In particular, 56% of the children choose the lottery over the safe amount of three, while only 24% of the children choose the lottery in case the safe amount equals four. Overall, 39% of all children are risk averse, 29% are risk neutral, 22% are risk seeking, and 11% of the children make inconsistent choices.[14]

[14]The inconsistent choices do not stem predominantly from lower SES children. Pearson's correlation coefficients

Figure 2: Distribution of Risk Decisions



2.2.3 Altruism: three dictator game experiments

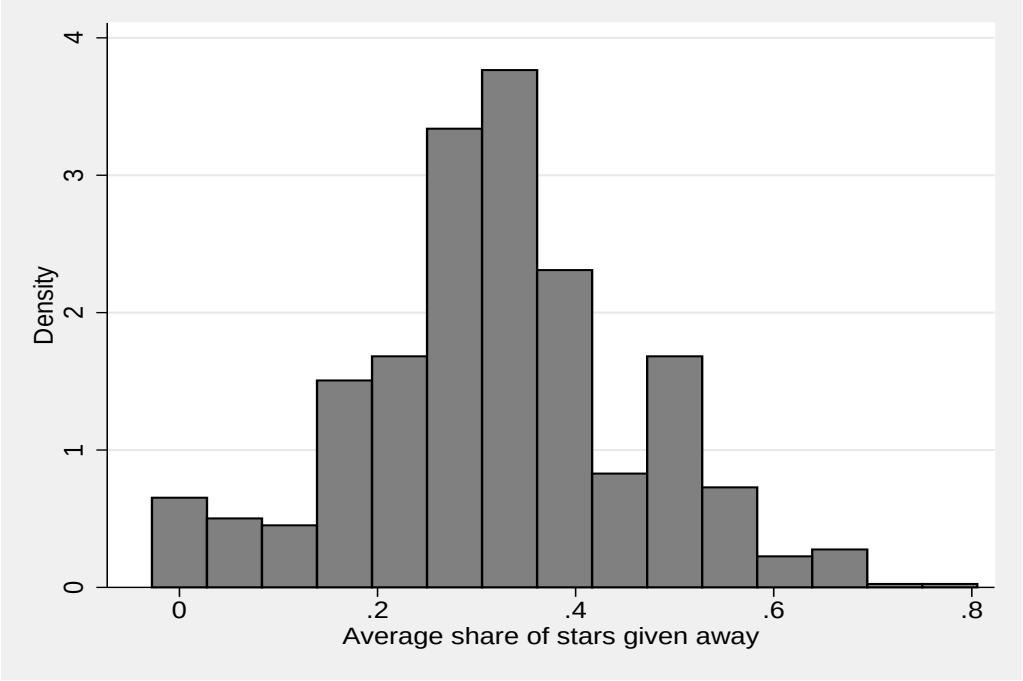
We elicited altruism using three different dictator game experiments, one simple binary choice game as well as two continuous dictator games. Running variations of a similar game generates multiple measures of a child's altruistic behavior and thus allows reducing measurement error. Following the procedures of Fehr *et al.* (2013) in the binary choice game, a child had to decide between two possible allocations of two stars between herself and another unknown child of similar age and from the same city. In one allocation the decision maker received two stars, while the other child received zero stars (2,0). In the alternative allocation both decision maker and recipient received one star each (1,1). Both possible allocations were physically shown to children and interviewers checked whether children had fully understood the implications of each allocation. We also ran two continuous dictator games. In both versions of this game, interviewers showed children two paper bags, one belonging to the interviewed child and the other belonging to another child, the receiver. Between games we varied the receiver. In one game the receiver is a child living in a city nearby. In the other game the child lives in an African country. Children knew that the African child does not live together with his parents since the latter are either "ill or

between inconsistent choices and income or education, respectively, are very low: $\rho = 0.02$, $p = 0.59$ for income and $\rho = 0.07$, $p = 0.06$ for average years of education.

dead". In both versions, children were endowed with 6 stars and could choose how to distribute the 6 stars between the two bags. After the children had distributed the stars among the two bags, the interviewer checked that they had understood how many stars they and the other child received. Only in case they did not understand the resulting allocation, the rules were explained again and children had the opportunity to alter their decision. Our joint measure of altruism is the average share of stars that a child gives away to others in the three experiments.[15]

Figure 3 shows the distribution of altruism (N=717). On average, children give away 32% of the stars at their disposal (standard deviation of 0.14). Children's degree of altruism differs substantially: while some children do not give away any stars, the maximum share of stars donated is 78%.[16]

Figure 3: Distribution of Level of Altruism (Histogram of Average Share of Stars Given Away)



[15]We cooperated with three charity organizations (one in Cologne, Bonn, and Togo (SOS children's village), respectively) to ensure that the allocation decisions were implemented as described, such that non-participating children in Cologne, Bonn, and Togo benefited from the distributed stars in form of toys.

[16]Children can at most give away one out of two stars in the binary choice game, but all stars in the continuous dictator games. Consequently, the maximum possible share donated is bounded from above at 83.3% ((0.5+1+1)/3).

2.2.4 IQ

We elicited two separate measures for crystallized and fluid IQ. Fluid IQ measures the part of overall IQ that refers to general logical reasoning in new situations, intellectual capacity, or processing speed. Crystallized IQ is the part of overall IQ that broadly refers to knowledge that has been acquired in life, e.g., the vocabulary. Following the work of Cattell (1971), these two basic components form general intelligence or simply (overall) IQ.

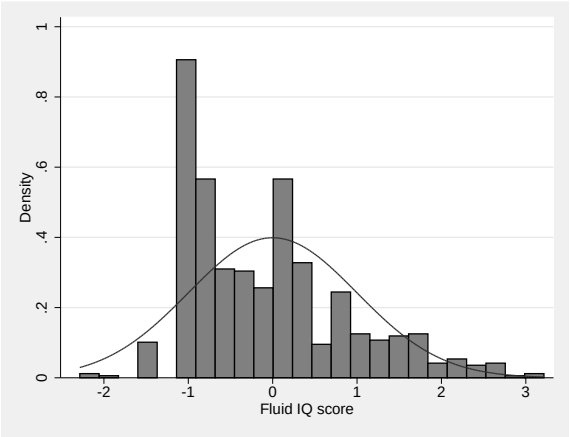
We measured fluid IQ using the matrix test of the HAWIK IV, which is the German version of the well-established Wechsler IQ test for children (Petermann and Petermann, 2010). Children were presented up to 35 blocks or rows of pictures featuring different colors and forms. In each block or row one cell was missing. Each time, children had to choose which of five pictures fitted best into the missing cell. The test contains a stopping rule which ends the test in case children produce four wrong answers in a row or in case four out of five answers in a row are wrong. The number of correct answers is our proxy for fluid IQ. Crystallized IQ was measured using 14 items of the German translation of the commonly used Peabody Picture Vocabulary Test Revised (PPVT-R) (Dunn and Dunn, 2007).[17] For each item, the interviewer read out a word and showed the child four pictures. Children had to decide which picture fitted the word. The number of correct answers is our measure for crystallized IQ.

We standardize both, the measure for fluid and the one for crystallized IQ. The distribution of fluid and crystallized IQ scores, which are positively correlated (correlation coefficient of 0.28), is shown in panels (a) and (b) of Figure 4. In both panels, each bar corresponds to one (discrete) value of the obtained IQ score. For comparison purposes, we also plot a standard normal distribution in the histograms. Moreover, we calculate overall IQ as the sum of the two standardized variables which is then again standardized. The overall IQ scores, which are shown in panel (c) of Figure 4, lie in an interval of three standard deviations around the mean. Expressed on the typical IQ scale with mean 100 and a standard deviation of 15 IQ points, we observe IQ scores ranging from about 55 to 145. This shows that our IQ tests sensitively differentiate between a wide range of possible IQ scores.[18]

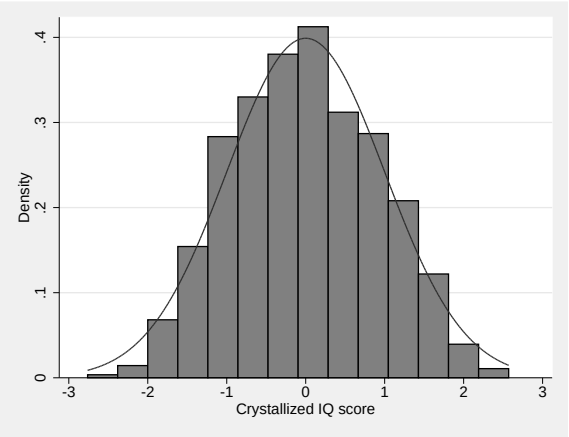
[17] Due to time constraints, we had to restrict the test to 14 items. We have chosen those 14 items that had the largest discriminatory power in the SOEP pretest data of the mother and child questionnaires "MukiIIIb" and "MukiIIIc" that were based on a 61 item version of the PPVT-R test, see, e.g., Bartling *et al.* (2010).

[18] Dropping the outlier with the lowest IQ score (see panel (c) of Figure 4), all results on the relationship between SES and IQ remain qualitatively the same.

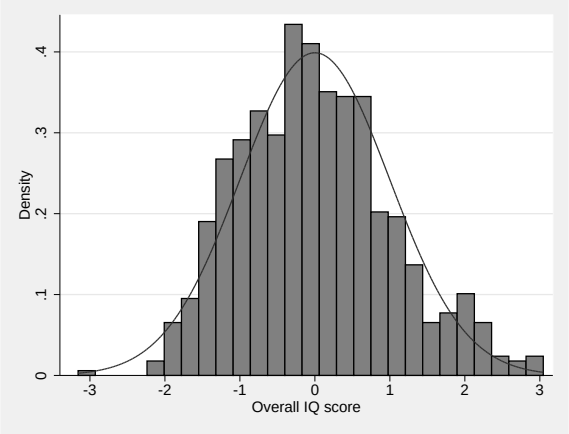
Figure 4: Distribution of Fluid, Crystallized, and Overall IQ Scores (Histograms)



(a) Distribution of Fluid IQ Scores



(b) Distribution of Crystallized IQ Scores



(c) Distribution of Overall IQ Scores

Note: In panels (a) and (b), each bar of the standardized distribution of fluid or crystallized IQ corresponds to one discrete value of the obtained IQ score. Panel (c) displays overall IQ, the standardized sum of standardized fluid and standardized crystallized IQ. For comparison purposes, we plot a standard normal distribution in each of the histograms.

2.3 Mother questionnaire

This section briefly describes and motivates the variables that we use to characterize a child's family environment, that could differ by SES and, at the same time, affect the formation of a child's personality. They are based on mothers' answers to the mother questionnaire. Appendix "Additional information on environmental variables" provides more details on their measurement

and Table B.1 in the Appendix contains summary statistics of these variables.

First, the work of Heckman and coauthors (Cunha and Heckman, 2007; Heckman, 2008) stresses the importance of parental investments in children as well as children's initial conditions for the development of a child's personality. Parental investment is measured in terms of amount of time (in hours per week) that mothers spend with their children as the main caregiver, and the quality of time spent together. The latter is derived in a principal component analysis on questionnaire measures that ask for the kind and frequency of joint activities of mothers and their children (for details see Appendix). The principal component analysis results in four components that we include as additional regressors. These components vary by the intensity of interaction such as (i) reading to a child, playing music or ball games with the child (high interaction), (ii) having joint meals, talking, or doing homework assignments together (everyday interaction), (iii) meeting other families, shopping, or going to the movies (low interaction), and (iv) watching TV or playing computer games together (joint media consumption). Furthermore, we measure a child's weight at birth, the week of gestation in which a child was born, and the child's number of siblings at birth that characterize initial conditions.

Second, we elicited six measures of different parenting styles. Our measures reflect to which extent parenting styles are characterized by emotional warmth, negative communication, inconsistent parenting practices, monitoring, strict control, and psychological control (for details see Appendix). Doepke and Zilibotti (2012) present a theoretical model in which they argue that parenting style depends on the socio-economic environment a family lives in and that parenting style may affect children's preferences. Burton *et al.* (2002) show that both socio-economic factors and parenting style are important determinants of child behavior.

Third, we use information on the mother's IQ and economic preferences.[19] Our questionnaire measures of the mother's risk preferences, time preferences, and altruism have been validated using incentivized experiments by Falk *et al.* (2012). For adults, previous studies document intergenerational transmission of economic preferences (Dohmen *et al.*, 2012; Kosse and Pfeiffer, 2012). Moreover, evidence for the transmission of cognitive ability from parents to their children

[19]We do not have information on the father's economic preferences and IQ. However, according to the results of Anger and Heineck (2010) mothers play a more important role in the transmission of cognitive abilities than fathers. Furthermore, Dohmen *et al.* (2012) document a strong positive correlation of preferences within married couples that is consistent with positive assortative mating, a prediction of the models of Bisin and Verdier (2000) and Bisin and Verdier (2001) on the cultural transmission of preferences.

is abundant. Besides measuring children's fluid and crystallized IQ, we also elicited a measure of mothers' fluid IQ.

Finally, family structure is an important dimension of a child's family environment. We use information about whether a child lives with a single parent, how many siblings currently live in the household, and the mother's age at birth.

3 Results

3.1 The relationship between SES and a child's personality

Tables 2 and 3 present results of the main specifications that are based on wave 1 data. The results suggest that, already at age 7-9, nearly all facets of a child's personality under study vary systematically by SES. In particular, we find that children of higher educated parents are significantly more patient ($p < 0.01$) and significantly less likely to make risk seeking choices ($p < 0.01$).[20] Furthermore, crystallized and overall IQ are significantly higher for higher levels of household income and parental education (all $p < 0.01$). The same is true for fluid IQ, results are somewhat weaker, however. Finally, testing for joint significance of our measures of SES, income and parental education, provides further evidence for a systematic and significant relationship of SES and children's patience, risk seeking, and IQ.

[20] For adults, there is evidence that parental education enhances the willingness to take risk (Dohmen *et al.*, 2011). While only a small fraction of adults is risk seeking (e.g., 9% in Dohmen *et al.* (2011)), 24% of the children in our study are risk seeking. Hence, an increased willingness to take risks for adults essentially means moving from risk aversion in the direction of risk neutrality. That corresponds to what we find for children: On average, children of higher educated parents have risk preferences which are closer to risk neutrality.

Table 2: Main specifications - economic preferences

Variables	(1.1)	(1.2)	(2.1)	(2.2)	(2.3)	(2.4)	(3.1)	(3.2)
	Time Preferences (Coins in Piggybank)		Risk Neutrality (Coin 3-3 vs. 7-0)		Risk Seeking (Coin 4-4 vs. 7-0)		Altruism (Dictator Games)	
Ln(income)	0.238	0.122	−0.013	−0.018	0.005	0.004	0.005	0.007
	[0.283]	[0.277]	[0.047]	[0.047]	[0.041]	[0.041]	[0.013]	[0.012]
Education	0.181***	0.207***	−0.003	−0.001	−0.021***	−0.020***	0.003	0.002
	[0.050]	[0.049]	[0.008]	[0.008]	[0.007]	[0.007]	[0.002]	[0.002]
Age child		0.065***		−0.001		−0.006**		0.003***
		[0.018]		[0.003]		[0.003]		[0.001]
Male		0.971***		0.099***		0.067**		−0.048***
		[0.229]		[0.038]		[0.033]		[0.010]
Constant	2.759***	−4.130**					0.286***	−0.001
	[0.626]	[1.885]					[0.029]	[0.088]
Obs.	704	704	648	648	648	648	716	716
sign. SES	0.000	0.000	0.818	0.843	0.003	0.004	0.226	0.212
R^2	0.008	0.019	0.005	0.013	0.030	0.042	0.004	0.055

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Results for time preferences are estimated using a Tobit model, we use probit models for risk preferences, and OLS for altruism, respectively. We display coefficients for Tobit and OLS and average marginal effects for probit. The dependent variable for time preferences is the number of coins put into the piggy bank. The binary variable risk neutrality equals 1 if a child chooses the coin with 7 stars on one and zero stars on the other side and 0 if a child chooses the coin with three stars on each side (risk aversion). The binary variable risk seeking equals 1 if a child chooses the coin with 7 stars on one and zero stars on the other side and 0 if a child chooses the coin with four stars on each side (risk aversion or risk neutrality). We exclude all inconsistent risk choices. In columns (2.1) to (2.4), we include one additional explanatory variable, a binary indicator of which coin toss decision was presented first. The variable altruism is the average share of total stars given away in the three dictator games. Income denotes monthly net household equivalence income in thousand Euro, years of education measures the mother's and father's average years of education. Children's age is measured in months, male is a binary indicator that equals 1 for boys and zero for girls. The line significance SES displays the p-value of a Wald test for joint significance of ln(income) and education. For Tobit and probit models, R^2 displays Pseudo R^2.

Table 3: Main specifications - IQ

	(1.1)	(1.2)	(2.1)	(2.2)	(3.1)	(3.2)
Variables	Overall IQ score		Crystallized IQ score		Fluid IQ score	
Ln(income)	0.348^{***}	0.309^{***}	0.390^{***}	0.351^{***}	0.166^{**}	0.142^{*}
	[0.083]	[0.079]	[0.082]	[0.079]	[0.084]	[0.082]
Education	0.072^{***}	0.081^{***}	0.084^{***}	0.093^{***}	0.030^{**}	0.036^{**}
	[0.015]	[0.014]	[0.015]	[0.015]	[0.015]	[0.015]
Age child		0.044^{***}		0.038^{***}		0.033^{***}
		[0.005]		[0.005]		[0.006]
Male		0.082		0.133^{**}		-0.002
		[0.067]		[0.066]		[0.072]
Constant	-0.956^{***}	-5.229^{***}	-1.120^{***}	-4.844^{***}	-0.408^{**}	-3.514^{***}
	[0.188]	[0.534]	[0.189]	[0.521]	[0.189]	[0.592]
Observations	731	731	731	731	731	731
sign. SES	0.000	0.000	0.000	0.000	0.001	0.000
R^2	0.106	0.184	0.140	0.201	0.021	0.063
Robust standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1						

Results for overall, crystallized, and fluid IQ scores are OLS estimates. Crystallized IQ is the standardized outcome (mean 0, a standard deviation of 1) of the short version of the Peabody Picture Vocabulary Test Revised (PPVT-R). Fluid IQ is the standardized outcome (mean 0, a standard deviation of 1) of the matrix test of the HAWIK IV. Overall IQ is the standardized sum (mean 0, a standard deviation of 1) of our measures of crystallized and fluid IQ. Income denotes monthly net household equivalence income in thousand Euro, years of education measures the mother's and father's average years of education, children's age is measured in months, male is a binary indicator that equals 1 for boys and zero for girls. The line significance SES displays the p-value of a Wald test for joint significance of ln(income) and education.

We then add the child's age in months and a gender dummy as explanatory variables since previous research has documented their predictive power for a child's personality. A child's age and gender are clearly orthogonal to SES. Results in Table 2 document a statistically significant gender effect for each of the three key economic preferences. Boys are more patient and less altruistic than girls. Compared to girls, boys are more likely to be risk neutral instead of risk averse and more likely to be risk seeking (confirming previous evidence, see Moreira *et al.* (2010), Cárdenas *et al.* (2011), Sutter *et al.* (2013)). Our finding that boys are more patient than girls differs from results in Bettinger and Slonim (2007) and Castillo *et al.* (2011). Concerning altruism, our findings corroborate the results of Fehr *et al.* (2013) whose sharing game is part of our measure of altruism. In the sharing game, girls of age 8 or 9 are significantly more likely than boys to choose the equal split allocation and hence are more altruistic.

Moreover, we find that older children are more patient, less likely to make risk seeking choices, are more altruistic, and score higher in both crystallized and fluid IQ tests. The effects of age on preferences and IQ are well in line with the literature (see, Mischel and Metzner (1962) and Bettinger and Slonim (2007) for patience, Slovic (1966) for risk preferences, Fehr *et al.* (2008), Benenson *et al.* (2007), Fehr *et al.* (2013), Bauer *et al.* (2014), and Angerer *et al.* (2015) for simple sharing games with children of our age group (7-8 years), and Horn and Cattell (1967) for crystallized IQ.)

3.2 How does a child's family environment differ by SES?

The results above provide evidence that SES has predictive power for the facets of a child's personality under study, economic preferences and IQ. The possible pathways through which parental income and education can affect the formation of personality are numerous, complex, and partly hard to quantify. Still, our comprehensive data allow to shed some light on the "black box" SES by discussing how our measures of SES correlate with variables that are known to affect the formation of a child's personality. These variables encompass measures of parental behavior, information on family structure, initial conditions at birth, and maternal personality (economic preferences and IQ). Some of these variables that characterize family environment, e.g., maternal personality, may not only impact a child's personality, but, at the same time, affect parental education and income, our measures of SES. In order to clarify that our analysis does not necessarily reflect unidirectional causal pathways from SES to mediating factors (environmental variables) to a child's personality, we provide a correlational analysis below.

Table 4 displays pairwise correlation coefficients and the corresponding significance levels for the variables that characterize a child's family environment and our key measures of SES, logarithm of household income and parental education. Most of the correlations are significant, revealing that the environment of children from families with different SES varies systematically. In more detail, results from Table 4 show that initial conditions at birth differ significantly by SES. Children from parents with higher income and higher educational attainment typically have a higher weight at birth and are born in a later week of gestation, two indicators that represent favorable initial conditions (Case *et al.*, 2002). Furthermore, children with high SES background typically have fewer older siblings and, thus, are likely to receive more parental attention.

In terms of quality of time, Table 4 documents strong differences according to SES. While

parents with higher SES more often engage in highly interactive activities with their children, low SES parents more often engage in joint activities that involve lower levels of interaction and spend more of the joint time with media consumption. Only in terms of joint everyday activities such as talking or having meals together differences are small. As one would expect, the correlation between household income and total time parents spend with child care is negative and significant. This correlation is due to working mothers who contribute to higher levels of household income and spend less time with their children as main caregiver. In contrast, the correlation between parental education and active time spent with the child is not significant.

With respect to parenting style, parents with higher SES are less likely to use inconsistent parenting practices and a parenting style that is characterized by psychological control. Inconsistent parenting practices include, e.g., threatening a child with a punishment without actually implementing it or the absence of consistent rules of behavior for a child. An example of a parent who is exerting psychological control is, e.g., a parent who does not talk to his child for a while because the child did something wrong. Moreover, in families with higher income, parenting styles that are less strict (e.g., rely less on punishment) and characterized by emotional warmth (e.g., praising a child or showing a child that parents love him or her) are significantly more likely to prevail.

Table 4 also documents significant correlations between SES and maternal personality. High SES mothers tend to have a higher fluid IQ score, to be more patient, and to be less risk averse. The correlation between maternal altruism and SES is not significant. These results largely correspond to the results for children's personality in the main specifications: on average, high SES children have a higher fluid IQ and are more patient.

Table 4: Differences in a child's family environment by SES

	Ln(income)		Education	
	Correlation	Significance	Correlation	Significance
Week of gestation	0.12	***	0.14	***
Weight at birth	0.09	***	0.12	***
# of older siblings	-0.16	***	-0.16	***
Time child care	-0.13	***	-0.03	
Low interaction	-0.15	***	-0.18	***
High interaction	0.18	***	0.23	***
Media	-0.19	***	-0.25	***
Everyday	0.07	*	0.05	
Style warmth	0.12	***	0.02	
Style neg. comm.	-0.05		0.04	
Style inconsistent	-0.07	*	-0.12	***
Style strict	-0.10	**	-0.06	
Style monitor	0.08	*	0.06	
Style psycho	-0.20	***	-0.22	***
IQ child	0.28	***	0.29	***
IQ mother	0.34	***	0.37	***
Time preferences mother	0.04		0.13	***
Risk preferences mother	0.08	**	0.08	**
Altruism mother	-0.02		-0.02	
# of siblings	-0.22	***	-0.10	**
Single parent	-0.03		0.03	
Age mother	0.29	***	0.32	***
*** p<0.01, ** p<0.05, * p<0.1				

Entries are pairwise Pearson's correlation coefficients. Income denotes monthly net household equivalence income in thousand Euro, years of education measures the mother's and father's average years of education. All other variables are described in the Appendix.

Finally, families with different SES also differ in family structure. On average, high SES families consist of significantly older mothers with fewer children. The correlation between parental SES and living in a single parent family is not significant. However, the single parent dummy is the only variable for which the correlation coefficient changes substantially when looking at the mother's years of education only instead of the average parental years of education. The correlation between maternal years of education and the single parent dummy is 0.19 and significant ($p < 0.01$), i.e., children of higher educated mothers, but not children of higher educated parents in general, are more likely to live in a single parent family. In sum, the correlations in Table 4 document that differences in SES are reflected in manifold dimensions of a child's family environment that are known to be relevant for the formation of a child's personality, among them parental behaviors, maternal personality, family structure, and initial conditions at birth.

3.3 Development of personality over time

About 16 months after the first interviews, we collected a second wave of data on children's time preferences, risk preferences, altruism, fluid, and crystallized IQ using exactly the same measurement tools as before. Panel data allow to address two further questions: First, how stable is children's personality over time? IQ is known to be quite rank-order stable already after age 6-10 (Hopkins and Bracht, 1975; Schuerger and Witt, 1989). In contrast, we are not aware of any study that presents evidence on the stability of children's preferences that is based on panel data. Second, panel data allow for an especially clean investigation of how differences in personality of children with different SES develop over time. In particular, it is interesting to study whether differences remain similar, become larger, or decrease.

Table 5 provides first evidence on the stability of children's preferences over time. For each facet of personality under study, Table 5 displays Pearson's correlation coefficients. All correlation coefficients are significant ($p < 0.05$).[21] The results indicate that there is stability in children's personality in the age interval 7-10. While it is hard to judge the magnitude of stability[22], two observations are worthwhile noting: The correlation for overall IQ is comparable to the one in Hopkins and Bracht (1975) who find a correlation of 0.63 for overall IQ in the same age range. In the age interval 7-10, economic preferences tend to be slightly less stable than IQ scores. If our measures of personality traits are affected by measurement error, however, the results represent lower bounds of the degree of stability.

Table 5: Stability of children's personality over time

	Time Preferences	Risk Neutral	Risk Seeking	Altruism	Overall IQ	Crystal. IQ	Fluid IQ
Corr. coeff.	0.317	0.241	0.123	0.365	0.586	0.652	0.310
Obs.	422	380	380	441	443	443	443

The table displays Pearson's correlation coefficients. The dependent variables are exactly the same as in Tables 2 and 3.

Turning to the dynamics of SES differences, we observe that most differences in personality remain quite stable. Table 6 replicates the main specifications displayed in Tables 2 and 3 using

[21] Using Spearman's correlation coefficients instead yields very similar results in terms of size and significance. They rely on ranks instead of absolute levels and allow for any non-linear, monotone relationship over time.

[22] Following conventions in the social sciences, we interpret correlations as rather low if they are between 0.1 and 0.3, as medium if they are between 0.3 and 0.5, and as large if they are larger than 0.5 (Cohen, 1988).

the same facets of personality as dependent variables that now stem from the wave 2 sample of children who are on average about 16 months older than in wave 1.[23] An additional analysis provided in Table B.2 in the Appendix shows that Table 6 reflects dynamic patterns of personality according to SES and that differences in results between waves 1 and 2 are not driven by selective attrition or reduced significance due to a lower number of observations.[24]

[23]SES is a construct that is generally considered to be stable over a period of 16 months. In particular, in our sample, average parental years of education do not change over time. The intertemporal correlation of income is about 0.8. In Table 6 we use the income measure of wave 1. Results are qualitatively the same if we use income as measured in wave 2.

[24]There are two reasons for the lower number of observations in Table 6 than in Tables 2 and 3. First, we succeeded to reinterview 85% of wave 1 families, resulting in a total of 624 interviews in wave 2. Second, 180 children who were reinterviewed in wave 2 had been randomly assigned to participate in an intervention, a mentoring program, that took place between wave 1 and wave 2 interviews. Since the intervention was designed to study effects on children's personality we drop these 180 children in the analysis underlying Table 6. Table B.2 in the Appendix replicates wave 1 results as displayed in Tables 2 and 3 using the same sample as Table 6. With the exception of slightly weaker results for fluid IQ, results in Table B.2 are qualitatively the same as in Tables 2 and 3.

Table 6: Development of personality over time

Variables	(1) Time Preferences	(2.1) Risk Neutral	(2.2) Risk Seeking	(3) Altruism	(4.1) Overall IQ	(4.2) Crystal. IQ	(4.3) Fluid IQ
Ln(income)	0.516	−0.017	−0.061	−0.003	0.353***	0.225**	0.340***
	[0.507]	[0.062]	[0.051]	[0.018]	[0.102]	[0.098]	[0.111]
Education	0.107	−0.016	−0.004	0.006**	0.077***	0.102***	0.022
	[0.084]	[0.011]	[0.009]	[0.003]	[0.019]	[0.019]	[0.020]
Age child	0.039	−0.002	−0.004	0.004***	0.041***	0.036***	0.029***
	[0.036]	[0.004]	[0.004]	[0.001]	[0.007]	[0.007]	[0.008]
Male	1.820***	0.220***	0.187***	−0.059***	0.098	0.168*	−0.012
	[0.391]	[0.047]	[0.043]	[0.015]	[0.086]	[0.086]	[0.091]
Constant	0.773			−0.065	−5.645***	−5.488***	−3.552***
	[4.214]			[0.149]	[0.822]	[0.802]	[0.899]
Obs.	421	339	339	440	442	442	442
sign. SES	0.053	0.164	0.201	0.033	0.000	0.000	0.000
R^2	0.021	0.069	0.079	0.066	0.185	0.187	0.078

*** p<0.01, ** p<0.05, * p<0.1

Results for time preferences are estimated using a Tobit model, we use probit models for risk preferences, and OLS for altruism, overall, crystallized, and fluid IQ scores. We display coefficients for Tobit and OLS and average marginal effects for probit. The dependent variables are exactly the same as in Tables 2 and 3. In columns (2.1) and (2.2), we additionally include a binary variable that equals 1 if the first lottery decision was 4-4 versus 7-0 and 0 otherwise. Income denotes monthly net household equivalence income in thousand Euro, years of education measures the mother's and father's average years of education, children's age is measured in months, male is a binary indicator that equals 1 for boys and 0 for girls. The line significance SES displays the p-value of a Wald test for joint significance of ln(income) and education. For Tobit and probit models, R^2 displays Pseudo R^2.

In wave 2, children from higher SES families are significantly more patient ($p = 0.05$, Wald test for joint significance of parental income and education) and score significantly higher in tests of crystallized, fluid, and overall IQ ($p < 0.001$, Wald test for joint significance of parental income and education) than children from low SES families. Again, we find that parental income is not a significant predictor of economic preferences, but for crystallized, fluid, and overall IQ (all $p < 0.05$). Furthermore, higher levels of parental education are associated with higher levels of crystallized and overall IQ (both $p < 0.01$).

However, two developments over time point at changes in the relationship between children's SES and their economic preferences. First, at age 8 to 10, children from families with lower SES are no longer found to be more likely to be risk seeking than their higher SES counterparts. This finding could indicate that the typical development pattern that children become less risk seeking

as they grow and finally converge to lower levels of risk seeking behavior induces a catching-up process of children with lower SES. While the share of risk-seeking children decreases from 24% in wave 1 to 19% in wave 2, it is still substantially higher than for adults. For example, using nationally representative SOEP data Dohmen *et al.* (2011) find that 9% of German adults are risk-seekers. On the other hand, a new developmental gap between lower and higher SES children emerges: at older age, children from families with higher SES become significantly more altruistic than their lower SES counterparts ($p < 0.05$ for parental education and the Wald test for joint significance of parental income and education). This is in line with the cross-sectional evidence presented in Bauer *et al.* (2014).

With respect to age differences, older children are still predicted to score higher in IQ tests and to behave in a more altruistic manner, but age differences (in months) in patience that were significant when children were 7 to 9 years old are no longer significant 16 months later. We still observe that boys are significantly more patient, more likely to be risk neutral and risk seeking, and less altruistic than girls. Moreover, gender differences in economic preferences tend to increase over time. For patience, risk neutrality, and risk seeking, this increase is significant (all $p < 0.05$).[25]

4 Discussion

Our results show that SES is a systematic predictor of a child's personality. Already at age 7 to 9, children from families with higher SES are more patient, less likely to be risk seeking, and score higher on tests of crystallized, fluid, and overall IQ. We move beyond treating SES as a "black box" by pointing at potential pathways through which SES may affect the shape of a child's personality: we document that parenting style, quantity and quality of time parents spend with their children, initial conditions, family structure, and maternal personality vary by SES. Finally, we have provided evidence that children's personality is, to some extent, stable over time in the age interval 7 to 10 years, and that differences in children's patience and IQ by SES persist as children grow. While differences in risk seeking behavior between low and high SES children become smaller as children grow, a new gap emerges over time, with high

[25]The p-values refer to an interaction term of wave 2 and the gender dummy (male) when estimating random effect panel data models (Tobit for saving and OLS for risk preferences and altruism) with the same explanatory variables as in Table 6 and an additional interaction term of wave 2 and the gender dummy.

SES children becoming significantly more altruistic than children from lower SES families. By comprehensively documenting the link between SES and a child's personality, our results enhance the understanding of the origins of heterogeneity in personality.

For patience and IQ, it is fair to assume that higher levels tend to favor important outcomes in life since they are associated with higher levels of education (Heckman and Vytlacil, 2001; Shoda *et al.*, 1990), income (Hanushek and Woessmann, 2008; Golsteyn *et al.*, 2014), and better health (Chabris *et al.*, 2008; Sutter *et al.*, 2013; Golsteyn *et al.*, 2014; Shoda *et al.*, 1990).[26] In that sense, our results suggest that, on average, children from families with lower SES are disadvantaged. Of course, this line of reasoning assumes that disparities in personality of children from different socio-economic backgrounds persist until adulthood. The literature on the formation of cognitive and non-cognitive skills does indeed suggest even growing disparities as a consequence of the self-reinforcing and cross-fertilizing nature of skills (Cunha and Heckman, 2007).

In contrast to other studies, we analyze multiple facets of personality in a coherent framework and document that, over time, they all differ systematically by SES. Only such a comprehensive perspective can provide insights on the additivity of "risk factors" that are related to SES. Economic preferences, non-cognitive and cognitive skills affect single decisions and life-outcomes, typically not in an isolated manner, but jointly (Becker *et al.*, 2012; Sutter *et al.*, 2013; Ida and Goto, 2009; Heckman *et al.*, 2006). For example, one would expect that individuals who are at the same time less risk averse and less patient are more likely to engage in addictive behaviors such as smoking, drinking, or gambling (Sutter *et al.*, 2013; Ida and Goto, 2009). Our results document that, on average, children from families with lower SES are less patient *and* more likely to be risk seeking. Thus, they tend to combine personality traits that make them more vulnerable to addictive behaviors.

Our data also provide direct evidence for "personality immobility" by SES. Mothers with higher SES are more patient and score higher in IQ tests, and the same is true for children from

[26] In contrast to patience and IQ, there is no obvious optimal degree of risk aversion that is independent from the environment an individual lives in. Doepke and Zilibotti (2012) introduce the distinction between endogenous and exogenous risk that individuals are exposed to. While exogenous risks cannot be avoided, taking an endogenous risk is a deliberate decision that depends on the individual risk attitude. Also with respect to endogenous risks, it is hard to claim that there is an "optimal" level of risk attitude. For example, Dohmen *et al.* (2011) document that a higher willingness to take risks is both associated with outcomes that are typically thought of as detrimental (e.g., smoking) or supportive to good health (e.g., taking exercises).

families with higher SES.[27] Thus, differences in mothers' personality traits that arise by SES are "replicated" by their children. Personality immobility could be one potential mechanism underlying social immobility, i.e., the fact that, as adults, children from high (low) SES families tend to have higher (lower) SES themselves. One possible explanation is that, for children in high SES families, there are more resources available, which can be invested into forming personality traits that are promising for obtaining a higher educational attainment and a higher income. For time preferences, this intuition is, for example, formalized in Becker and Mulligan (1997). Our findings support their hypothesis: Children from families with higher SES have lower discount rates. Hence, their patience will induce them to make decisions which are more forward looking and therefore more profitable in the long-run such as obtaining higher levels of education. Available resources also significantly influence a child's ability as measured by IQ. IQ, in turn, is likely to affect both educational attainment and income. Together, differences in a child's personality according to parental SES result in a tendency to favor social immobility.

Finally, our results deliver new insights for studies that focus on explaining life outcomes by different preference profiles in childhood. Consider, for example, the work by Mischel and co-authors (Mischel *et al.*, 1988, 1989; Shoda *et al.*, 1990). In a series of experiments, they measure children's patience at the age of four in the so-called Marshmallow task. In this task, children were presented two marshmallows. If they were able to abstain from eating the first marshmallow for about 15 minutes, they also received the second marshmallow. There exists a significantly positive relationship between the amount of "self-imposed delay of gratification" at the age of four and, e.g., academic and social competence, verbal fluency, and the skill level ten years later (Mischel *et al.*, 1989). The results of Mischel *et al.* (1989) are obtained without controlling for SES (and other preferences). We show that children from low SES families exhibit lower levels of patience and tend to be more risk-seeking. Hence, studies that investigate the effect of time preferences on outcomes like academic success without controlling for SES and other preferences are likely to overestimate the effect of time preferences due to omitted variable bias. Likewise, Sutter *et al.* (2013) investigate the role of time and risk preferences of adolescents for their behavior. Controlling for age, gender, the number of siblings, the amount of pocket

[27] Running Tobit (OLS) regressions for mothers' questionnaire measures of patience, risk attitude, and altruism (IQ) on our measures of SES using wave 1 data reveals that better educated mothers are significantly more patient ($p < 0.01$) and mothers with higher education and higher income score significantly higher in IQ tests (both $p < 0.01$). In contrast, the corresponding relationships between SES and risk attitudes or altruism are not significant.

money and German and math grades, they find that more impatient adolescents are more likely to spend money on alcohol and cigarettes, have a higher BMI, and are less likely to save money. In contrast, risk preferences are only a weak predictor of behavior. Since Sutter *et al.* (2013) do not control for parental SES, the coefficient of time preferences could at least partly pick up the influence of SES on behavior. While the work of Mischel *et al.* (1989) and Sutter *et al.* (2013) is highly relevant, our results highlight the need for future research estimating the relationship between economic preferences and life outcomes or behavior using a rich set of control variables, among them SES. For example, if the effects documented in Mischel *et al.* (1989) and Sutter *et al.* (2013) are indeed driven by preferences, advocating childhood interventions aimed at increasing children's self-control and patience may be a possible implication. If, however, less favorable health outcomes and behaviors are due to lower levels of parental monetary or cognitive resources instead of lower levels of patience addressing patience would not necessarily lead to a change in health outcomes and behaviors.

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Appendix Additional figures

Figure A.1: Arrangement of Toys

Appendix Additional tables

Table B.1: Summary statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Ln(income)	731	1.27	0.67	0.19	7.14
Education	732	12.81	2.79	7	18
Male	732	0.52	0.50	0	1
Age child	732	93.39	6.29	84	113
# siblings	732	1.18	1.05	0	7
Single parent	732	0.36	0.48	0	1
Age mother	701	30.78	6.04	14.67	49.25
Dummy wave 2	732	0.83	0.38	0	1
IQ mother	590	-3.18e-09	1	-3.25	2.65
Time pref. mother	711	7.57	2.15	0	10
Risk pref. mother	713	4.93	2.66	0	10
Altruism mother	715	7.85	1.92	0	10
Style warmth	595	4.38	0.52	2	5
Style neg. comm.	595	2.06	0.68	1	4.5
Style inconsistent	595	2.30	0.80	1	5
Style strict	593	2.69	0.77	1	5
Style monitor	595	4.74	0.43	2	5
Style psycho	594	1.44	0.58	1	4.5
Dummy time	732	0.87	0.33	0	1
Time child care	640	59.81	39.12	0	168
Dummy quality	732	0.83	0.37	0	1
Low interaction	610	-2.20e-09	1.42	-3.22	5.89
Everyday	610	-1.36e-10	1.33	-10.22	2.47
Media	610	9.50e-10	1.34	-2.88	4.47
High interaction	610	2.13e-10	1.38	-3.75	5.42
Week gestation	712	38.64	2.73	23	47
Weight at birth	714	32.97	6.57	5.05	53.5
# older siblings	724	1.80	1.08	1	11

Table B.2: Results in wave 1 using the dynamic sample

Variables	(1) Time Preferences	(2.1) Risk Neutral	(2.2) Risk Seeking	(3) Altruism	(4.1) Overall IQ	(4.2) Crystal. IQ	(4.3) Fluid IQ
Ln(income)	0.226	0.009	0.007	0.009	0.214**	0.232**	0.110
	[0.370]	[0.065]	[0.057]	[0.017]	[0.104]	[0.104]	[0.110]
Education	0.190***	−0.012	−0.021**	0.004	0.082***	0.103***	0.028
	[0.068]	[0.012]	[0.010]	[0.003]	[0.019]	[0.019]	[0.019]
Age child	0.064**	0.001	−0.005	0.005***	0.051***	0.045***	0.037***
	[0.027]	[0.005]	[0.004]	[0.001]	[0.007]	[0.007]	[0.009]
Male	1.091***	0.039	−0.008	−0.048***	0.072	0.121	−0.005
	[0.307]	[0.054]	[0.046]	[0.013]	[0.086]	[0.083]	[0.095]
Constant	−3.869			−0.205*	−5.856***	−5.586***	−3.774***
	[2.781]			[0.121]	[0.737]	[0.692]	[0.857]
Obs.	421	339	339	440	442	442	442
sign. SES	0.000	0.514	0.031	0.069	0.000	0.000	0.032
R^2	0.019	0.011	0.034	0.081	0.187	0.219	0.058

*** p<0.01, ** p<0.05, * p<0.1

We estimate the correlates of time preferences using a Tobit model, the correlates of risk preferences using a probit model, and use OLS for altruism, overall, crystallized, and fluid IQ scores. We display coefficients for Tobit and OLS and average marginal effects for probit. The dependent variables are exactly the same as in Tables 2 and 3. In columns (2.1) and (2.2), we additionally include a binary variable that equals 1 if the first lottery decision was 4-4 versus 7-0 and 0 otherwise. Income denotes monthly net household equivalence income in thousand Euro, years of education measures the mother's and father's average years of education, children's age is measured in months, male is a binary indicator that equals 1 for boys and 0 for girls. The line significance SES displays the p-value of a Wald test for joint significance of ln(income) and education. For Tobit and probit models, R^2 displays Pseudo R^2.

Appendix Additional information on environmental variables

All environmental variables are based on mothers' answers to questions of the mother questionnaire.

Single parent – dummy variable that equals 1 if a parent is living together with a child only (and not with a husband, wife, or partner) and 0 otherwise

Age mother – age of the mother at birth of the child (in years)

Dummy wave 2 – dummy variable indicating whether information from wave 2 is available for a particular individual.

IQ mother – IQ score of the mother is based on a 10 item subset of the Standard Progressive Matrices Plus (SPM Plus) test. We have chosen the 10 item subset to obtain maximal discriminatory power across individuals according to own pretests. The variable corresponds to the standardized number of right

answers. Mother's IQ was only measured in wave 2 of data collection. For that reason, we use the interaction of the variable "IQ mother" and "Dummy wave 2" in the additional specifications.

All information on parenting style was only measured in the questionnaire of wave 2. Consequently, in the additional specifications, we use six interaction terms of the parenting style variables listed below and the "Dummy wave 2" as control variables. Each of the six parenting style variables is based on two (out of originally three) items of the parental questionnaire for seven to eight year old children in the SOEP (Bioage08a and Bioage08b). For each dimension of parenting style, we have chosen those two items that had the highest corrected-item-total-correlation in the SOEP waves from 2010 and 2011. All items have a common scale ranging from 1 (never) to 5 (always). To assign a single value to each style, we sum the scores of the two items and divide the sum by two if both items are available. If information on one item is missing, we use the available information from the other item as the value of the style. The introductory question was "How often do the following things happen?". Below, we report the wording of the two items used for each style.

Style warmth – I show my child with words and gestures that I like him/her. I praise my child.

Style neg. comm. – I yell at my child because he/she did something wrong. I scold my child because I am angry at him/her.

Style inconsistent – I threat my child with a punishment but do not actually follow through. I find it hard to set and keep consistent rules for my child.

Style strict – If my child does something against my will, I punish him/her. I make it clear to my child that he/she is not to break the rules or question my decisions.

Style monitor – When my child goes out, I know exactly where he/she is. When my child goes out, I ask what he/she did and experienced.

Style psycho – I think my child is ungrateful when he/she does not obey me. I do not talk to my child for a while because he/she did something wrong.

Time pref. mother – Standardized answer to the question: How would you describe yourself: Are you generally an impatient person, or someone who always shows great patience? Please tick a box on the scale, where the value 0 means "very impatient" and the value 10 means "very patient" (source: SOEP).

Risk pref. mother – Standardized answer to the question: How do you see yourself: Are you generally willing to take risks (risk-prone), or do you try to avoid risks (risk-averse)? Please answer on a scale from 0 to 10, where 0 means risk-averse and 10 means risk-prone (source: SOEP).

Altruism mother – Standardized answer to the question: How would you assess your willingness to share with others without expecting anything in return, for example your willingness to give to charity? Please use a scale from 0 to 10, where 0 means you are "completely unwilling to share" and a 10 means you are "very willing to share". You can also use the values in-between to indicate where you fall on the scale.

Dummy time – dummy variable that equals 1 if information on the variable "time child care" is available and 0 otherwise; the dummy is used in an interaction with the information on time spent with child care.

Time child care – answer to the question: "Please consider a typical week: How many hours per week are you the main care giver of your children?". In the additional specifications, we use the interaction of the variable "time child care" and "Dummy time".

Dummy quality – dummy variable that equals 1 if information on all four variables "Low interaction", "Everyday", "Media", and "High interaction" is available and 0 otherwise.

Low interaction, Everyday, Media, High interaction – The four variables containing information on the quality of time mothers and children spent together are derived in a rotated Principal Component Analysis on the following 16 items that results in four principal components. Most of the items are taken from the German version of the child questionnaire 5-6 years old from the SOEP wave 2008. The introductory question was: "How many times during the last 14 days did you or the main care giver engage in the following activities with your child?". Answers were given on a four item scale: daily – several times per week – at least once per week – never. List of items: (1) Do homework assignments with the child, (2) talk to each other, (3) have a joint meal (lunch / dinner), (4) have a joint snack (e.g., eat cake), (5) outdoor activities (take a walk etc.), (6) go shopping with the child, (7) visit other families with children, (8) painting or doing arts and crafts, (9) playing cards/game of dice, (10) watching television or videos with the child, (11) playing PC or internet games together, (12) going to theater for children, circus, museum etc., (13) reading/telling German stories, (14) go in for sports with the child, (15) go to music lessons or play music together, (16) go to the movies.
Roughly speaking, the variable "high interaction" loads high on factors (13), (14), and (15), the variable "Low interaction" on (6), (7), (12), and (16), the variable "media" on (10) and (11), and the variable "everyday" on (3), (4), (1), (2), and (5).

Week gestation – indicates the week of gestation in which the child was born

Weight at birth – indicates the weight of the child at birth (in 10 grams)

 # older siblings at birth – indicates the number of siblings at birth