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## Transmission of risk preferences from mothers to daughters<sup>☆</sup>



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### ABSTRACT

We study the transmission of risk attitudes in a unique survey of mothers and children in which both participated in an incentivized risk preference elicitation task. We document that risk preferences are correlated between mothers and children when the children are just 7–8 years old. This correlation is only present for daughters. We further show that a measure of maternal involvement is a strong moderator of the association between mothers' and daughters' risk tolerance. This is consistent with a role for socialization and parental investment in the intergenerational transmission of risk preferences.

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## 1. Introduction

Preferences and attitudes such as risk tolerance, patience and the propensity to trust are important determinants of individual choices and outcomes across a range of domains (e.g. Cramer et al., 2002; Anderson and Mellor, 2008; Castillo et al., 2011; Dohmen et al., 2011). There has been growing interest in understanding the development and determinants of these preferences. Moreover, many choices, such as occupation or education, and outcomes such as earnings, are highly

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persistent across generations within families (Black and Devereux, 2011). This draws attention to the role of the family in shaping children's preferences and attitudes (Deckers et al., 2015). While intergenerational persistence may partly reflect the intergenerational transmission of ability (Black et al., 2009), recent theoretical models emphasize a key role for the intergenerational transmission of preferences and attitudes in the persistence of choices and outcomes (Bisin and Verdier, 2000, 2001; Doepke and Zilibotti, 2012; Dohmen et al., 2012). Thus, empirical evidence is needed on the extent to which and the mechanisms by which attitudes and preferences are transmitted across generations.

In this paper we study the transmission of risk preferences in a unique nationally representative survey of mothers and children in which both participated in an incentivized risk preference elicitation task. This study builds on the previous literature in a number of ways. First, the children we study are just 7–8 years old. Kimball et al. (2009), Dohmen et al. (2012) and Zumbuehl et al. (2013) demonstrate that the risk preferences of adult children are correlated with those of their parents. Determining whether this correlation already exists in childhood is an important step in the understanding of the transmission process. Second, the risk preferences of both mothers and children are measured in an incentivized risk task (rather than by survey measures that have been shown to be correlated with preferences elicited in an incentivized task). Third, the mothers and children we study are participants in a large and nationally representative interdisciplinary longitudinal study of child development. This has several important advantages. On the one hand, it allows us to study the intergenerational correlation of preferences in a large and representative sample. Conducting studies with representative samples is important since preferences measured in non-representative samples have been shown to differ markedly from preferences measured in representative samples (e.g. Falk et al., 2013; Slonim et al., 2013). On the other hand, since the data collection was part of an interdisciplinary study, detailed information is available on children's characteristics and upbringing, the mothers' parenting behaviors and attitudes, as well as household and regional characteristics. This information is collected prospectively and contemporaneously (not retrospectively), and contains measures, which capture the degree of effort, which the mother exerts to raise and socialize the child. This is particularly interesting because recent theoretical models of preference transmission assume that the transmission is influenced by parental investment choices (see Bisin and Verdier, 2011, for a review of this literature).

We find that risk preferences are correlated between mothers and children when the children are just 7–8 years old. In our data, the correlation is driven entirely by mothers and daughters. Moreover, for daughters, the degree of transmission is monotonically increasing in maternal involvement or effort. This relationship is robust to controlling for other known correlates of risk taking. As we have no means of experimentally manipulating parental effort, we cannot rule out all possible sources of endogeneity, or provide conclusive evidence on the mechanism. However, our data do allow us to assess whether the association between parental effort and preference transmission is driven by reverse causality from child attitudes to maternal effort, and this does not appear to be the case. These findings are consistent with the hypothesis that the transmission of attitudes from parents to children is responsive to parental effort, and so highlight a possible role of socialization in the development of risk preferences in children.

This study contributes to the literature that studies preferences and economic decision-making of children and adolescents, such as attitudes toward risk and uncertainty (Harbaugh et al., 2002; Sutter et al., 2013; Castillo et al., 2015), rational behavior (Harbaugh et al., 2001; Castillo et al., 2015), time preference (Bettinger and Slonim, 2007; Castillo et al., 2011, 2015), and competitiveness (Gneezy and Rustichini, 2004). Our findings also relate to the role of nurture relative to nature in shaping preferences, which is a central question in both social and biological sciences. While some twin studies highlight the role of genetics in the development of risk preferences (e.g. Cesarini et al., 2009; Zyphur et al., 2009), studies that document cultural differences in the development of attitudes such as competitiveness suggest the importance of nurture (e.g., Andersen et al., 2012). The latter group of studies highlight a role for socialization by showing that the intergenerational correlation in preferences is moderated by aggregate or “macro” variables (for example, whether the family belongs to a matrilineal or patriarchal society). In contrast, we examine whether the intergenerational correlation of attitudes and preferences is moderated by family-level (or “micro”) variables, such as the extent of parental investments in children.

Section 2 describes our data and sample in greater detail, as well as the risk preference elicitation procedure. Section 3 presents the results, and Section 4 concludes.

## 2. Data and summary statistics

### 2.1. The ECDET study

The children and mothers in our study are participants in the “Study of Early Childhood Developmental Ecologies in Turkey” (ECDET). ECDET is a longitudinal survey that has been developed by a team of social scientists to explore in depth the developmental environment of young children and its effects on the development of cognitive and non-cognitive skills, starting from the age of 3 (Baydar et al., 2010). The ECDET survey follows a nationally representative sample of just over one thousand 3-year-old children and their mothers, drawn from 19 different regions in Turkey.<sup>1</sup> Data are collected through

<sup>1</sup> More information on the sampling methodology can be found in Baydar et al. (2010). Data from the first wave of the ECDET survey has been compared to population-representative micro-data from the Turkish Statistical Institute. In terms of observable characteristics such as age, education and marital status, the ECDET data corresponds very well with a population-representative sample of mothers with own children aged 3–5. Over the five waves of

home visits that last 2–3 h. Participants have been surveyed annually since 2008. The dataset contains an extraordinarily rich set of variables, which are useful for our analysis. For example, we have detailed information on household characteristics, the socio-economic background of the family, and the cognitive ability of the child. These allow us to directly control for important determinants of risk behavior. Importantly, we also have extensive information on parenting behaviors and the level of effort mothers and fathers exert to raise their child, and these provide an opportunity to investigate the preference transmission mechanism in greater detail.

We designed a risk module for mothers and children, and fielded it in the course of the 5th wave of data collection in the ECDET study, which took place in 2012. Further details are given below. The analysis reported in this paper is based on data collected in the 5th wave of data collection although some measures are drawn from earlier waves (where noted). The ECDET study, including the risk module, does not collect data directly from fathers, due to their limited willingness to participate.<sup>2</sup> Nevertheless the survey data contain some information on fathers provided to us by mothers, which we utilize in our analyses.

## 2.2. Characteristics of the children, mothers and the environment

In the Wave 5 data the households in our sample have on average 5.1 members, out of which 2.7 are children. The children are between 6.8 and 8.9 years old. The mothers are on average 34 years old and have 5.9 years of education. Only 17% report being engaged in gainful employment. Out of those women who are not working, 99% classify themselves as housewives. Almost all women are married (98%) and out of those who are married, 94% report having a husband who is working. The fathers of the children are on average more educated than the mothers and have an average of 7.4 years of education.

Prior research has documented an association between religiosity and risk taking (e.g. Benjamin et al., 2010). The dataset contains several items concerning the degree to which the mother is involved in religious activities, which we use to construct a proxy for religiosity. Since risk preferences over small gambles might systematically differ with the household's wealth we also control for the household's socio-economic status in the analysis. We use information on the household's monthly expenditure levels and the family's material belongings to construct a measure of the household's socio-economic status. First, we obtain a measure of material wealth by extracting a common factor from the single response items of a detailed material wealth questionnaire (Filmer and Scott, 2012). In a second step, we extract a common factor from both the per capita expenditure of the household and the material wealth measure obtained in the first step. This procedure allows us to effectively combine information from both sources.

## 2.3. The incentivized risk preference elicitation task

We use an incentivized elicitation task for both mothers and children to measure risk preferences. The task is based on Gneezy and Potters (1997), whereby subjects receive a certain amount of money and are asked to divide this endowment ( $W$ ) between a risky and a riskless option. The major advantage of this task is that it is intuitive and easy to understand, and that it involves a single decision. Ease of implementation and comprehension is particularly important for our purposes, as our subjects are young children.<sup>3</sup>

In our task, the risky option has a 50% chance of generating a good outcome, in which case the amount invested is tripled. In the alternative case of a bad outcome, the money invested into the risky option is lost. Total earnings equal the payoff from the risky investment plus the amount kept in the safe option. The expected value of investing  $3 \cdot R \cdot \frac{1}{2} + (W - R)$  is increasing in the invested amount ( $R$ ). Therefore, a risk-neutral or risk-loving person should invest all the endowment, whereas a risk-averse person will invest a smaller amount. The amount invested into the risky option is a measure of risk tolerance. This elicitation task has been successfully used in a number of experimental studies both in the lab and in the field, and on different populations ranging from undergraduate students to financial investors and rural residents in different cultures (see Charness and Gneezy, 2012, for a review).

We use the same incentivized elicitation task for both mothers and children, with the main difference being that the mother's risk task involves monetary incentives, whereas the children's risk task uses toys to incentivize decisions. In the risk elicitation task of the mother, the mother is given an endowment of 10 tokens, each corresponding to 1 Turkish Lira (TL). She has the option of putting any number of tokens into a "risky bowl".<sup>4</sup> The earnings from the risky bowl are determined

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the survey, the sample has been subject to some attrition (about 20%), which seems to have occurred predominantly among higher socio-economic status households.

<sup>2</sup> Pretesting suggested that, in this population, attempting to survey fathers directly would not only generate limited responses but could also adversely impact the number of mothers that participated in the survey.

<sup>3</sup> See Charness et al. (2013) for a discussion of the advantages and disadvantages of different risk preference elicitation techniques. The authors argue that in terms of understanding individual differences, simple elicitation techniques as the one we use fair better. Theoretically, the disadvantage of the task is that it cannot distinguish between risk-neutral and risk-seeking individuals, since both types would invest all tokens into the risky option. In a sample of risk-averse individuals, however, higher risk aversion implies less investment. Given the prevalence of risk aversion in laboratory settings, the task works well to compare individuals in terms of their risk attitudes. The task has been used in many studies assessing individual and gender differences in risk preferences and has produced consistent results (see Charness et al., 2013). More recently, it has been successfully implemented in a large sample of elementary school children in Turkey (Alan and Ertac, 2014), which is comparable to the sample reported in the current paper.

<sup>4</sup> We used an actual bowl and actual tokens, and the mother physically placed the tokens into the bowl.

by the outcome of a draw from an opaque urn that has one yellow and one purple ball. If the yellow ball is drawn, the good outcome occurs and the tokens in the bowl are tripled. If the purple ball is drawn, the bad outcome occurs and the tokens in the bowl are lost.

We took great care to ensure that the procedures were transparent, in the sense that the mother could see that there were exactly two balls in the urn, that they were the same size etc. After making the decision of how many tokens to place in the risky bowl, the mother drew the ball herself, and was paid her earnings in cash immediately afterwards. In the mothers' risk game, participants could win up to 30 TL, which corresponds to about 17 US dollars. This constitutes about 15% of the median per capita monthly expenditure for participants in our study.

The risk elicitation of the child followed similar procedures but to ease the comprehension of the task and the calculation of potential payoffs the child was only given 4 tokens. Each of these tokens corresponded to a single "gift" of choice from a gift bag that had a variety of small items of value to children such as toys, stationery, beads, hair bands etc. The gift bag contained a good mix of toys that would appeal to both genders (this and other aspects of the task were carefully pretested). Tokens placed in the risky bowl were either tripled or lost, and the outcome was again determined by the draw of the yellow or purple ball from the opaque urn. The child drew the ball himself/herself.

To ensure that both mothers and children understand the task, the interviewers carefully explained the rules. After demonstrating the potential outcomes of two hypothetical investment choices, the interviewers asked the participants to calculate what the potential outcomes would be for several other hypothetical investment choices. The interviewers were instructed to only proceed with the task if the participants were able to answer the questions correctly.

To make sure that the child would not be affected by the mother's decision, the sequencing was such that the child went through the risk task first. Moreover, to prevent realized outcomes from affecting subsequent decisions, all realizations and payments took place after the choices of both the child and the mother were collected.<sup>5</sup> The interviewers were instructed to ensure that the child decides autonomously, and the presence of or any interference by the mother was recorded. In actuality, the mother was present in the room in 56% of the cases while the child was playing the risk game.<sup>6</sup>

To ensure that our estimation results are not confounded by the presence of the mother, we conduct robustness tests in which we directly control for the presence of the mother and the interaction of the presence of the mother with the mother's risk tolerance.<sup>7</sup> Neither do we find a direct effect of the mother's presence on the risk taking behavior of the child nor does the mother's presence moderate the relationship between her risk taking behavior and her child's risk taking behavior. The inclusion of these variables does not materially alter any of the results we report below. This is perhaps not surprising, given that the interviewers reported that in only 1.6% of the cases the mother said something during the game that might have potentially affected the child's choice. Our results are also robust to the exclusion of these few cases.

Our data contain the incentivized risk choices of 746 child–mother pairs. Out of their 4 tokens, the children choose to invest on average 2.14 tokens. We find boys to be more risk tolerant than girls. In particular, the mean investment of boys is 2.2 tokens, while it is 2.1 for girls. While this difference is not very large, it is statistically significant at the 5% level. Most studies that investigate gender differences in risk taking among adults find men to be more risk tolerant than women (e.g. [Eckel and Grossman, 2008](#); [Croson and Gneezy, 2009](#); [Borghans et al., 2009](#); [Charness and Gneezy, 2012](#)). [Sutter et al. \(2013\)](#) investigate the risk taking behavior of children and adolescents aged 10–18 and also find boys to be more risk tolerant than girls. [Fig. 1](#) displays the distribution of choices by gender. On average, the mothers choose to invest 4.5 tokens out of their 10 tokens. [Fig. 2](#) presents the distribution of the mothers' risk taking behavior in the task.

Risk taking in the Gneezy–Potters task has shown considerable variation across different populations. A comparison suggests that the mothers in our population are not atypically risk averse or risk tolerant. [Charness and Gneezy \(2012\)](#) report investments for females ranging from about 40% to 60% of the endowment in populations of students and traders, and ranging from 4% to 50% of the endowment in rural populations. [Ertac and Gurdal \(2012\)](#) employ the task on Turkish undergraduates, and document risk taking among women to be around 45–54%.<sup>8</sup> Finally, [Charness and Viceisza \(2011\)](#) use the task with the same parameterization as ours, and find the average investment level of a rural sample in Senegal to be 48.7%.

Previous studies have shown that behavior in the incentivized risk task is predicted by answers to hypothetical questions concerning risk ([Dohmen et al., 2011](#)). Our study additionally includes a hypothetical large stake investment question. In this hypothetical task, mothers were asked how much they would invest into a risky business if they won 50,000 TL in a lottery. The investment into the risky option would be either doubled or lost, with equal probability. The mother's risk taking behavior in the incentivized risk task, which involves fairly small stakes, correlates significantly with her responses to the large stake hypothetical investment question.<sup>9</sup>

<sup>5</sup> Translated verbatim instructions and procedures are provided in [Appendix B](#).

<sup>6</sup> Note that mothers' presence in the room was not significantly related to the gender of the child. Mothers were present in 55% of all cases in which the child was a girl, and she was present in 57% of all cases in which the child was a boy. The difference is not statistically significant ( $p$ -value = 0.26).

<sup>7</sup> The results of these robustness tests can be found in [Appendix C](#).

<sup>8</sup> It should be noted that the treatments and procedures in these studies show some variation.

<sup>9</sup> The Spearman rank correlation coefficient between the mothers' choices on the incentivized task and the choices on the hypothetical investment question is 0.23 and the correlation is significant at the 1% level.

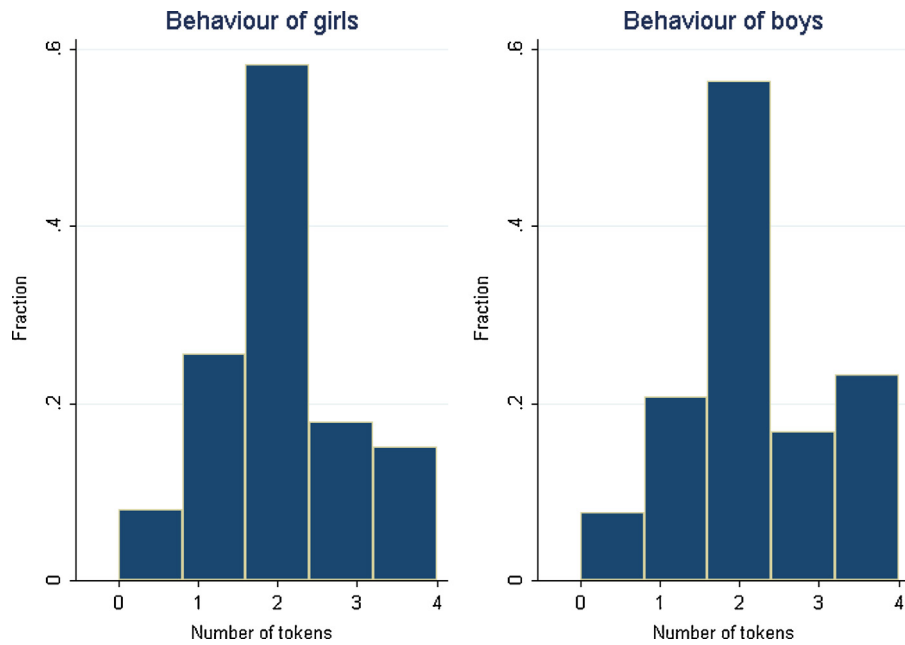


Fig. 1. Children's choices in risk task, by gender.

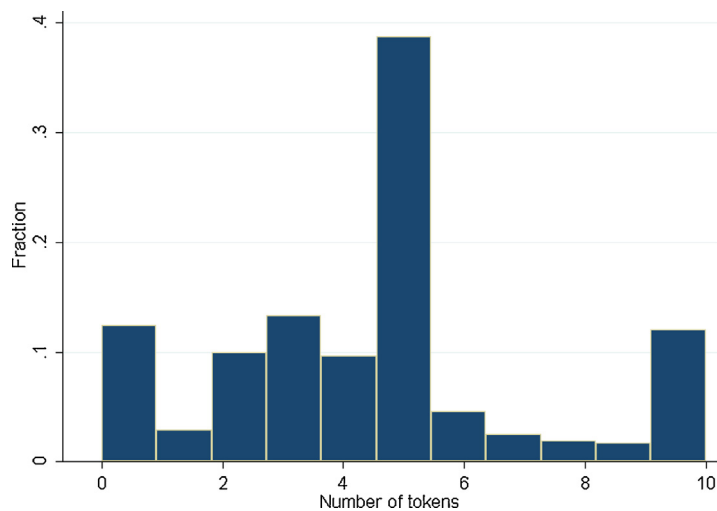


Fig. 2. Mothers' choices in the risk task.

#### 2.4. Parenting measures

As noted above, a key assumption in recent theoretical models is that the degree to which a parent's preferences are transmitted to the child might crucially depend on the degree of effort that the parent exerts to raise and socialize the child. The information in our dataset allows us to construct different measures of such parental effort. In particular, mothers were asked to report their own and their husband's involvement in the upbringing of the target child, i.e. the child which was part of the TECGE study.

Our first measure of parental effort is based on detailed information about how involved each parent is in activities that are related to the child's school life. More specifically, the mothers are asked to report how often they and their husbands engage in certain school-related activities. For example, questions include how often each parent helps the child with his/her homework and other school projects, to what extent the parent is interested in the child's problems at school, how often the parent shows interest in the child's activities by for example watching the child's performances, or how often the parent

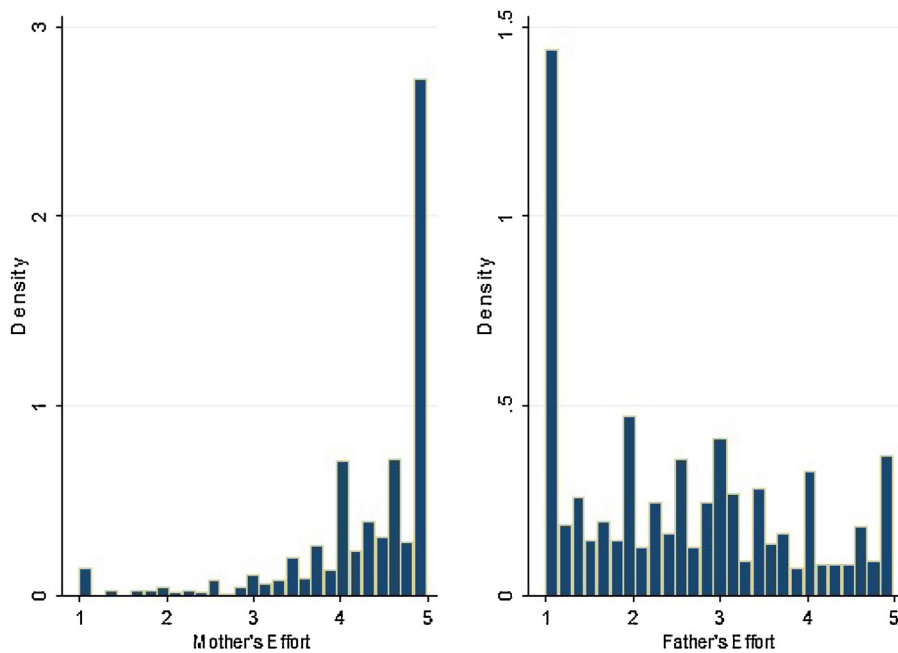


Fig. 3. Distributions of maternal and paternal effort.

gets involved in the child's school life by attending teacher–parent meetings.<sup>10</sup> Responses are recorded in five categories ranging from never (1) to always (5). Overall, mothers report that they are more involved in their children's school life than their husbands. While the average response mothers give for their own involvement is 4.3, the average response they give for their husbands is only 2.5. For both mother's and father's involvement there is considerable variation in the mothers' responses, which we will exploit in our analysis. Fig. 3 shows the distribution of the mothers' responses separately for mother's involvement and father's involvement.

Mothers exert slightly more effort when raising a daughter (average response of 4.39 compared to 4.30), while fathers' effort when raising a son or daughter is not statistically different. There is a small but statistically significant positive correlation between the mother's and the father's effort choices.<sup>11</sup>

Our second measure of effort additionally includes information about activities that are unrelated to schooling.<sup>10</sup> For example, the additional questions include whether the parent helps the child learn new skills such as swimming, whether the parent engages in different activities together with the child like playing indoors or outdoors, and whether the parent takes the child to children's theaters or other performances. Since the responses are coded in different ways, instead of calculating an average we extract a common factor from all item responses including the questions in the schooling questionnaire. Since the mothers were not asked these additional questions about the involvement of fathers but only themselves, we can construct this second measure of effort only for mothers. The extracted factor explains about 32% of all the variation in item responses. Fig. 4 shows the distribution of this measure of effort.

Finally, the rich nature of the dataset allows us to investigate the potential effect different parenting behaviors have on the risk taking behavior of the child. In the ECDET survey parenting behaviors are measured by the Turkish adaptation of "The Child Rearing Questionnaire" (Paterson and Sanson, 1999; Yagmurlu and Sanson, 2009). From these items we extract four different subscales: (i) whether the mother is obedience demanding, (ii) whether the mother uses physical punishment, (iii) the degree of maternal warmth, and (iv) the degree of inductive reasoning. The inductive reasoning subscale score measures the degree to which the mother explains the rationale of the rules and the reasons for disciplining the child.

## 2.5. Cognitive measures

Studies conducted with adult participants have found more cognitively able individuals to be more risk tolerant (Frederick, 2005; Burks et al., 2009; Dohmen et al., 2010). To control for cognitive ability and to assess whether this relationship also holds in our sample of young children we employ several measures of cognitive ability.

<sup>10</sup> The full list of questions used for the different measures of effort can be found in Appendix A.

<sup>11</sup> The Spearman rank correlation is 0.13 and it is significant at the 1% level.

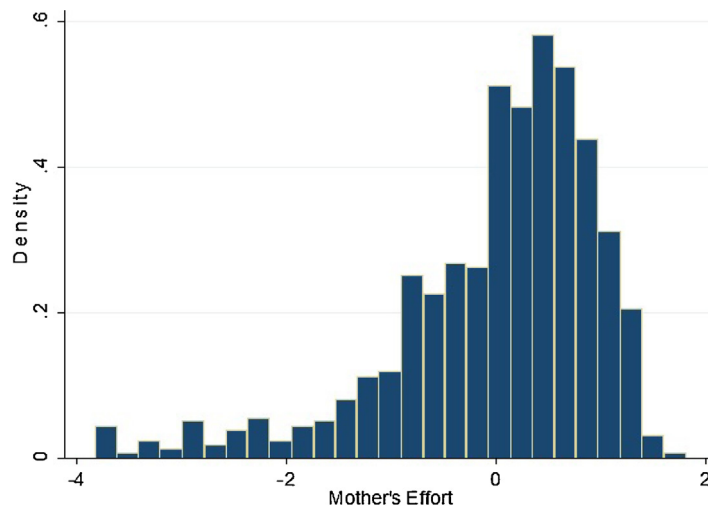


Fig. 4. Distribution of broader measure of maternal effort.

One cognitive measure we employ is The Turkish Receptive Language Test (Berument and Guven, 2010). Receptive language is widely known as a strong indicator of general cognitive abilities and school achievement. In this test, children are presented with several pictures of objects and they need to point to the picture that displays the object announced by the interviewer. The scores used in the regressions are estimates of receptive language ability that are obtained by fitting a three-parameter logistic Item Response Theory model standardized for the child's age (Baydar et al., 2014).

The second cognitive measure that is used as a control is the Corsi visual-spatial memory score (Corsi, 1972), which is obtained by a "game" of remembering sequences of locations. The test involves mimicking the interviewer as he/she taps sequences of spatially separated blocks. It is measured in Round 4 of the ECDET survey when the children were approximately 6 years old. The scores used in the present analyses are age-standardized.

Finally, in order to control for impulsivity of the children, we use a test of inhibitory control, referred to as the "head-to-toes" test (Ponitz et al., 2008). The task involves asking the child to touch his/her head when the interviewer says toe and vice versa, and recording response times. This test was given to the children when they were approximately 4 years old, in Round 2 of the ECDET study. A higher score indicates a higher ability of the child to use inhibition to suppress a prevailing response. Inhibitory control is one of a subset of cognitive abilities labeled executive function.

### 3. Results

The child's risk taking behavior correlates positively and significantly with the mother's risk taking behavior in the incentivized risk task ( $\text{corr} = 0.14$ ,  $p\text{-value} = 0.023$ ).<sup>12</sup> This observation is consistent with the evidence presented in Dohmen et al. (2012), who find parents' risk preferences to be correlated with their adult children's risk preferences. Our data demonstrate that the positive correlation is already present at very young ages, which suggests that the preference transmission process starts very early in life. The result contrasts with evidence on the intergenerational transmission of patience. In particular, Bettinger and Slonim (2007) find that there is no significant correlation between the patience of parents and children, which suggests that the family environment plays a different role in the formation of different preferences in childhood. Fig. 5 shows the proportion of girls and boys who put each possible number of tokens into the risky bowl, given the choices made by their mothers. To ease interpretation, mothers' choices are grouped into five categories. While the correlation between mother's and daughter's risk preferences is very strong and significant for girls ( $\text{corr} = 0.23$ ,  $p\text{-value} = 0.002$ ), it is much weaker and statistically insignificant for boys ( $\text{corr} = 0.08$ ,  $p\text{-value} = 0.293$ ).

We perform a number of regression analyses to investigate the relationship between mothers' and children's preferences in greater detail. To facilitate the interpretation of the coefficients we express mothers' and children's investment choices as fractions of the total numbers of tokens. The regression results confirm that the risk taking behavior of the mother in the incentivized risk task significantly predicts the risk taking behavior of the child. In particular, if the mother invests 10 percentage points more, the child's investment is on average 1.4 percentage points higher (Table 1, Column 1). This relationship is robust to the inclusion of region fixed effects (Column 2), and to the inclusion of the gender of the child as a control variable (Column 3). Since Turkey is a large country with significant regional variation in levels of development, conservatism, religiosity and ethnicity, it is natural to explore whether there is significant regional variation in risk aversion. We find that regional fixed effects capture significant variation in children's choices (note the increase in  $R^2$  from Column

<sup>12</sup> All  $p$ -values reported in this section account for clustering at the regional level.

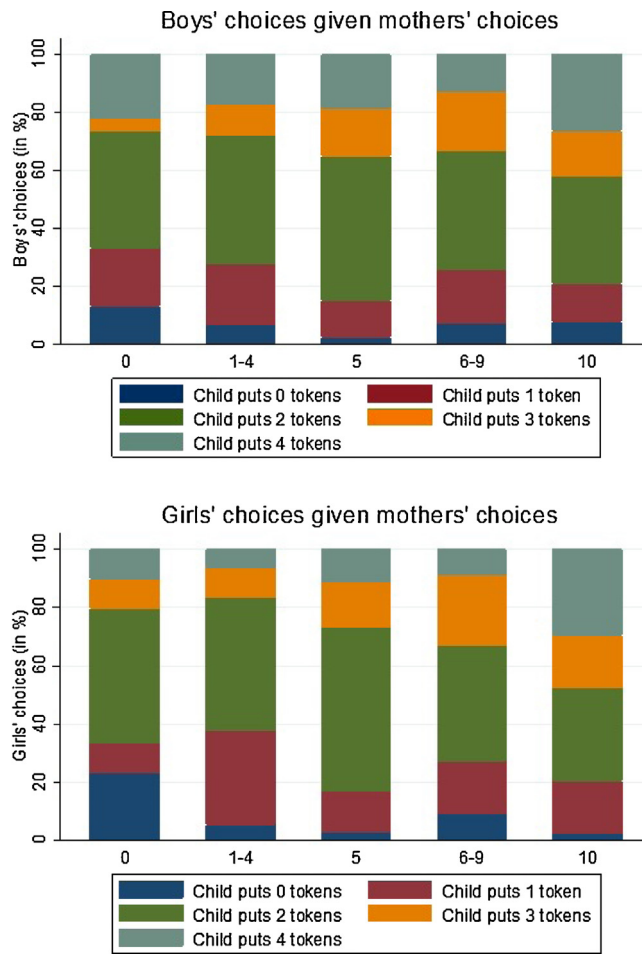


Fig. 5. Children's choices conditional on mother's choice.

Table 1  
Mothers' and children's risk tolerance (0–1).

	(1)	(2)	(3)	(4)
Mother's risk (0–1) ( $\beta_1$ )	0.142** (0.0568)	0.124** (0.0511)	0.127** (0.0512)	
Male ( $\beta_2$ )			0.0539*** (0.0184)	0.114* (0.0404)
Mother's risk $\times$ male ( $\beta_3$ )				0.0600 (0.0764)
Mother's risk $\times$ female ( $\beta_4$ )				0.194*** (0.0497)
N	746	746	746	746
Regional FE	No	Yes	Yes	Yes
R <sup>2</sup>	0.02	0.09	0.10	0.10
Test $\beta_3 = \beta_4$ (p-value)				0.11

Both mother's and child's risk tolerance is measured on a 0–1 scale. Standard errors in parentheses (clustered at the region level).

\*  $p < .1$ .  
 \*\*  $p < .05$ .  
 \*\*\*  $p < .01$ .

1–2 of Table 1) and therefore control for regional fixed effects in all of the following regressions. As noted previously, boys are more risk tolerant than girls, and invest 5 percentage points more on average. Interestingly, while the mother's risk taking behavior has substantial predictive power for the behavior of girls, this is not the case for boys (Column 4), although here the two coefficients do not differ statistically significantly ( $p$ -value = 0.11).



**Table 2**  
Predictors of children's risk tolerance (0–1).

	(1) Girls	(2) Boys
Mother's risk (0–1) ( $\beta_1$ )	0.225*** (0.0632)	0.0139 (0.0832)
Corsi test	0.00215 (0.00213)	0.00186 (0.00212)
Turkish receptive language test	–0.0000321 (0.00143)	0.00116 (0.00104)
Head–toe task	–0.00210 (0.00158)	–0.00659*** (0.00145)
Child age (months)	–0.000344 (0.00483)	0.00739* (0.00325)
Height	0.00267 (0.00204)	0.00420 (0.00245)
Religiosity	0.000215 (0.000690)	0.000299 (0.000580)
Household size	–0.0137* (0.00666)	–0.0149 (0.00984)
Mother's education (years)	0.00683 (0.00654)	0.00117 (0.00433)
Father's education (years)	–0.00447 (0.000520)	0.00253 (0.00351)
SES 1st quartile (low)	0.142** (0.0641)	0.0436 (0.0748)
SES 2nd quartile	0.190*** (0.0516)	0.0391 (0.0694)
SES 3rd quartile	0.0448 (0.0396)	0.0188 (0.0457)
N	311	375
Regional FE	Yes	Yes
R <sup>2</sup>	0.19	0.17
Test $\beta_{1(girls)} = \beta_{1(boys)}$	0.03	

Both mother's and child's risk tolerance is measured on a 0–1 scale.  
Standard errors in parentheses (clustered at the region level).

\*  $p < .1$ .

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

In the following analyses, we allow all coefficients to differ for boys and girls by estimating two separate equations (Table 2). We add a number of control variables that have previously been shown to be important correlates of risk preferences. In particular, we control for individual characteristics such as the child's cognitive ability test scores, age (in months), and height. Moreover, we control for household characteristics such as household size, religiosity of the family and the parents' education levels (in years), and we include dummies for the three lowest socio-economic status quartiles. The results reveal that an increase in the mother's investment by 10 percentage points increases her daughter's investment by 2.3 percentage points, controlling for these predictors. This effect is significant at the 1% level. At the same time, the mother's investment has no predictive power for the risk tolerance of her son.<sup>13</sup> When we test for equality of coefficients, we find that there is a significant difference between the coefficient on mother's risk in the regression for girls and the coefficient on mother's risk in the regression for boys ( $p$ -value = 0.03). This finding suggests that mothers' preferences are differentially transmitted to the next generation depending on the gender of the child.<sup>14</sup>

The literature reports that risk-tolerance is significantly related to cognitive ability (Frederick, 2005; Burks et al., 2009; Dohmen et al., 2010). We find that neither working memory nor receptive language performance predicts risk-tolerance for either gender, but inhibitory control as measured by the head-to-toes task is associated with lower risk tolerance in boys. While the age of the child has no predictive power for girls, there seems to be a significant relationship for boys. A boy who is 1 year older invests on average 7.4 percentage points more. Note, however, that since all children in this sample are between 6.8 and 8.9 years old, this estimate is based on limited age variation. Among girls, household size is negatively related to risk tolerance. Girls in families with one additional household member invest on average 1.4 percentage points less.

<sup>13</sup> In 59% of all cases, either the mother or the child (or both) invest half of their tokens. When we re-estimate the specification presented in Table 2 excluding these observations, we find qualitatively similar results. For girls, the coefficient on mother's risk taking behavior remains positive and significant ( $\beta = 0.41$ ,  $p$ -value = 0.001), while for boys the coefficient remains small and statistically insignificant ( $\beta = 0.07$ ,  $p$ -value = 0.57). This allows us to rule out that the results are driven by similarity in terms of heuristic use.

<sup>14</sup> This result stands in contrast with Kimball et al. (2009), who find no evidence of differential transmission across gender. Their subjects are adult children and they use a non-incentivized risk tolerance measure.

**Table 3**  
Mother's effort and children's risk tolerance (0–1).

	Linear specification		Dummy variable specification		Broader effort measure	
	(1) Girls	(2) Boys	(3) Girls	(4) Boys	(5) Girls	(6) Boys
Mother's risk (0–1)	–0.469** (0.202)	–0.110 (0.377)	0.0391 (0.0675)	0.0132 (0.133)	0.0176 (0.0797)	0.0280 (0.130)
Mother's effort	–0.0447 (0.0288)	–0.0522 (0.0425)				
Mother's effort × mother's risk	0.158** (0.0482)	0.0276 (0.0821)				
Medium effort			–0.0905 (0.0578)	–0.0313 (0.0893)	–0.0678 (0.0548)	–0.0293 (0.0735)
High effort			–0.0989* (0.0494)	–0.0988 (0.0626)	–0.124** (0.0560)	–0.0349 (0.0996)
Medium effort × mother's risk			0.265* (0.128)	–0.0559 (0.144)	0.267** (0.115)	0.0320 (0.127)
High effort × mother's risk			0.301** (0.0855)	0.0345 (0.173)	0.355** (0.117)	–0.0835 (0.224)
N	307	371	307	371	306	368
Regional FE	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.21	0.18	0.22	0.18	0.22	0.18

Both mother's and child's risk tolerance is measured on a 0–1 scale.

Household and individual controls as in Table 2.

Standard errors in parentheses (clustered at the region level).

\*  $p < .1$ .

\*\*  $p < .05$ .

\*\*  $p < .01$ .

While the socio-economic status of the family does not affect the risk tolerance of boys, it has large effects on girls. Compared to girls in the highest wealth quartile, girls in the lowest quartile invest on average 14.2 percentage points more. This result is interesting, given that most studies of adults find that wealthier individuals are more risk tolerant. The degree of religiosity and the mothers' and fathers' years of education are not associated with children's behavior.

To investigate which characteristics of the regions may be relevant to risk tolerance, we estimate the same regressions excluding regional fixed effects but including average wealth, average religiosity and the percentage of right-wing votes in the region in the previous election. None of these variables are significant predictors of children's risk tolerance, therefore remaining results in this section are generated by models including regional fixed effects.

To shed more light on the transmission mechanism, we investigate whether the transmission of preferences is affected by the level of effort the mother exerts in raising her child.<sup>15</sup> If the positive transmission coefficient we find for girls is due to a socialization process, we would expect the coefficient to be higher for those daughters whose mothers exert higher effort in their child's upbringing. To test this, we allow the mother's effort measure, which is based on the questions that elicit maternal involvement in child's academic activities, to affect the degree to which preferences are transmitted. Consistently with a model in which socialization matters for the transmission of preferences, the risk tolerance of more involved mothers is more closely associated with the risk tolerance of their daughters (Table 3, Column 1). A similar interaction effect is not detected for sons (Table 3, Column 2).

In order to investigate the robustness of this relationship, we estimate several alternative specifications. First, to check for possible nonlinearities, we divide the mothers into three groups of equal size, depending on the degree of effort they exert when raising their child (Table 3, Columns 3 and 4). This specification confirms that the association between the mothers' risk preferences and the daughters' risk preferences is significantly higher for high-effort and medium-effort mothers than for mothers who exert low effort. For a high-effort mother, an increase in her risk tolerance by 10 percentage points is associated with an additional 3.4 percentage points of risk tolerance in her daughter. The corresponding figure for low effort mothers is 0.4 percentage points (which is positive, but not statistically different from zero).<sup>16</sup> While the transmission coefficient of medium-effort mothers does not differ significantly from the transmission coefficient of high-effort mothers, the point estimate is smaller in magnitude, which suggests a monotonic association between the mother's level of effort and the degree to which her preferences are transmitted. Again, no such effect can be found for boys. Second, we conduct the analysis using the broader definition of effort, which includes responses to questions unrelated to academic involvement.

<sup>15</sup> Note that since we do not have a reliable measure for paternal effort, our focus is only on maternal effort.

<sup>16</sup> Note that in the linear specification (Column 1) the direct association between mother's and child's choices is negative due to extrapolation. Put another way, this is for a mother with zero effort, which is outside the range of the data. Column (3) makes clear that for all ranges of effort observed in the data, the association is positive (though not statistically different from zero for the lowest effort tercile).

**Table 4**  
Robustness tests (1).

	Additional parenting controls		Employment status	
	(1) Girls	(2) Boys	(3) Girls	(4) Boys
Mother's risk (0–1)	0.0493 (0.0705)	0.0158 (0.144)	0.239*** (0.0722)	0.0219 (0.0796)
Medium effort	–0.0721 (0.0575)	–0.0200 (0.0969)		
High effort	–0.0829 (0.0493)	–0.0971 (0.0727)		
Medium effort × mother's risk	0.257** (0.116)	–0.0730 (0.155)		
High effort × mother's risk	0.301*** (0.0847)	0.0463 (0.180)		
Mother works			0.0408 (0.0633)	0.0263 (0.105)
Mother works × mother's risk			–0.00154 (0.131)	–0.0434 (0.219)
<i>Parenting behaviours</i>				
"Obedience demanding"	0.000668 (0.0220)	–0.0110 (0.0184)	0.00616 (0.0239)	–0.0117 (0.0191)
"Punishment"	–0.0312 (0.0338)	0.0245 (0.0164)	–0.0359 (0.0341)	0.0226 (0.0174)
"Parental warmth"	0.0124 (0.0215)	0.0207 (0.0219)	0.0124 (0.0232)	0.0191 (0.0192)
"Inductive reasoning"	–0.0480*** (0.0137)	–0.0245 (0.0273)	–0.0444*** (0.0138)	–0.0285 (0.0262)
<i>N</i>	307	371	310	375
Regional FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes
<i>R</i> <sup>2</sup>	0.24	0.19	0.21	0.18

Both mother's and child's risk tolerance is measured on a 0–1 scale.

Household and individual controls as in Table 2.

Standard errors in parentheses (clustered at the region level).

\*  $p < .1$ .

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

The results obtained with this broader definition of effort are remarkably similar to the previous estimates (Table 3, Columns 5 and 6).

We next check whether our results are robust to the inclusion of other controls related to parenting. The regression results in Table 4 use the mother's effort measure based on academic involvement and additionally control for parenting behaviors (Columns 1 and 2). The results reveal that girls whose mothers score high on a measure which captures the degree to which she promotes inductive reasoning are less risk tolerant, a finding that is similar to that found for inhibitory control among boys. More importantly, our results regarding the transmission of maternal preferences and the moderation of that transmission by maternal effort are robust to the inclusion of these parenting behaviors. Additionally, none of these parenting behaviors significantly interact with maternal risk tolerance, indicating that transmission is not influenced by the approach to parenting, but rather by involvement.

Next we investigate whether we would find a similar result if we used the employment status of the mother as a proxy for the degree of interaction between the mothers and their children. Maternal employment proxies time available for children, whereas the measures described above capture active involvement. Interestingly, whether the mother works does not have a significant effect on the degree to which her preferences are transmitted (Table 4, Columns 3 and 4). This observation is consistent with the finding in the literature that working mothers do not spend less quality time with their children (Carneiro et al., 2013). This suggests that it is the degree of involvement rather than mere presence that matters for preference transmission; however, the percentage of working mothers being small in our sample (17%) may limit the power of this test.<sup>17</sup>

<sup>17</sup> We also explore other specifications with interactions such as the mother's education and the child's cognitive ability, measured by the Corsi test, the head-to-toe test as well as the Turkish receptive language test. We do not find any moderating effect of these measures in the transmission of risk preferences. More importantly, adding these interactions to our main specification does not change the result that the association between the mothers' risk preferences and the daughters' risk preferences is significantly higher for higher effort mothers.

**Table 5**  
Predictors of mother's effort.

	(1)	(2)
Mother's education (years)	0.0277** (0.0113)	0.0316** (0.0123)
Mother's Turkish test score	0.00183 (0.00723)	0.00360 (0.00669)
Mother's memory test score	0.0211*** (0.00680)	0.0230*** (0.00692)
Age	−0.00816 (0.00567)	−0.00827 (0.00540)
Number of kids	−0.0706 (0.0476)	−0.0835* (0.0438)
SES 1st quartile (low)	−0.0339 (0.122)	−0.0872 (0.115)
SES 2nd quartile	0.0736 (0.0517)	0.0408 (0.0584)
SES 3rd quartile	0.112* (0.0592)	0.0929 (0.0617)
Male	−0.0595 (0.0423)	
Mother works	−0.117* (0.0624)	
<i>Parenting behaviours</i>		
“Obedience demanding”	−0.0178 (0.0505)	
“Punishment”	−0.00222 (0.0311)	
“Parental warmth”	0.0631 (0.0419)	
“Inductive reasoning”	0.130** (0.0470)	
<i>N</i>	771	771
Regional FE	Yes	Yes
<i>R</i> <sup>2</sup>	0.36	0.32

Standard errors in parentheses (clustered at the region level).

\*  $p < .1$ .

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

Overall, our results are consistent with the hypothesis that socialization plays a crucial role in the intergenerational transmission of preferences. However, we have no plausible instruments for parental effort. One of several threats to a causal interpretation of our findings (from parental effort to preference transmission) is that there may be reverse causality running from the child to the effort of the mother. For example, daughters who are more similar to their mother may induce their mother to be more engaged in parenting. To investigate whether our results are driven by reverse causality, we examine whether the transmission of preferences is also increasing in the mother's effort if we use a measure of effort that is unlikely to be responsive to the child's characteristics. In particular, we only use that part of the variation in maternal effort that can be predicted by variables that are predetermined or unlikely to be affected by the characteristics of the child.

First, we estimate a model that predicts the measure of mother's effort. We find that the mother's years of education and her score on a cognitive ability test are significant predictors of effort (Table 5, Column 1). Cognitively skilled and highly educated mothers exert a higher level of effort. In terms of parenting behaviors, the degree to which the mother uses inductive reasoning is positively related to her effort. To obtain a measure of effort that is not responsive to the child's characteristics, we predict effort based on a subset of the variables used in Column 1 of Table 5. In particular, we use stable maternal characteristics to obtain predicted values for maternal effort. These maternal characteristics, which are unlikely to be altered in response to child characteristics, include cognitive ability, education and socioeconomic status (Column 2). These variables explain 32% of the variation in actual effort.<sup>18</sup>

We use this predicted effort measure to redo the analysis from Columns 1 and 2 of Table 3, interacting the mother's risk tolerance with predicted, rather than measured, effort. The results are presented in Columns 1 and 2 of Table 6 and reveal that just as in the benchmark model, mothers who have higher predicted values of effort are better able to transmit their preferences. We are emphatically *not* claiming that our predictors of maternal effort are valid instruments, but only that they are predetermined. Thus the association of higher predicted effort with greater mother–daughter correlation in risk

<sup>18</sup> If we use the broader definition of maternal effort, which was used in Columns 5 and 6 of Table 3, we can explain even more of the variation in effort, and socioeconomic status becomes a more significant predictor of maternal effort.

**Table 6**  
Robustness tests (2).

	Predicted mother's effort		Father's effort	
	(1) Girls	(2) Boys	(3) Girls	(4) Boys
Mother's risk (0–1)	–1.246*** (0.345)	0.954 (0.839)	0.0542 (0.0569)	0.0767 (0.0783)
Predicted mother's effort × mother's risk	0.346*** (0.0829)	–0.211 (0.205)		
High mother's effort/high father's effort			–0.0677 (0.0818)	0.0754 (0.250)
High mother's effort/low father's effort			–0.139*** (0.0454)	–0.0276 (0.0554)
High/high × mother's risk			0.258* (0.127)	–0.228 (0.484)
High/low × mother's risk			0.346*** (0.0743)	–0.0898 (0.132)
N	310	373	296	350
Regional FE	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.22	0.20	0.23	0.21

Both mother's and child's risk tolerance is measured on a 0–1 scale.

Household and individual controls also include all additional variables used.

To predict the effort of the mother.

Standard errors in parentheses (clustered at the region level).

\*\*  $p < .05$ .

\*  $p < .1$ .

\*\*\*  $p < .01$ .

tolerance is evidence against reverse causality from child characteristics to maternal effort, but it does not preclude other sources of endogeneity in maternal effort.

Indeed, the high correlations between maternal effort and measures of maternal ability, education, and parenting behaviors highlight the possibility that it is not effort per se that moderates attitude transmission but some other variable in this highly correlated set of parental characteristics and behaviors. Given the degree of correlation between these variables, it is difficult to disentangle the attributes that underlie the interaction between maternal effort and maternal risk tolerance. What we can report, however, is that if we test the specification in Columns 1 and 2 of Table 6 against more general specifications with multiple interaction effects, the restrictions implied by our preferred specification (with predicted effort as the only moderating variable) are never rejected.<sup>19</sup>

Finally, we investigate whether the degree to which the mother's preferences are transmitted depends on how involved she reports the father to be in the child's upbringing, while being cautious in interpreting the results as the father's involvement is reported by the mother in our data. For this purpose, we divide the children into three groups: children whose parents are both reported to exert high effort (6.3% of the sample), children whose mothers report to exert high effort but whose fathers are reported to exert little effort (42.1%), and children whose parents are both reported to exert low effort (50.4%).<sup>20</sup> We then repeat our regression analysis, but allow the transmission of preferences to differ across these three different groups.

Compared to mothers who exert little effort, mothers who are highly involved are found to be better able to transmit their preferences to their daughters, irrespective of how highly involved they report the father to be (Columns 3 and 4 of Table 6). The point estimate of the transmission coefficient is slightly lower if the father is also highly involved, which suggests some substitutability, although the difference between the two coefficients is not statistically significant. Again we find no significant associations for boys. Since household composition and parental effort are both likely to be endogenous, and given that we do not have any information on fathers' risk preferences, and their self-reported parental effort, we cannot draw strong conclusions about the role of fathers from this analysis. More research is needed to understand how the preferences of fathers play a role in the formation of children's preferences.

<sup>19</sup> Full results are available from the authors.

<sup>20</sup> We choose the cut-off for mothers such that we obtain two equally sized groups. We then apply the same cut-off value to categorize fathers. For the purpose of this analysis we exclude observations from the fourth group (mother exerts little effort, father exerts high effort) because there are very few observations in this category (1.2%).

#### 4. Discussion

In this study we utilize a unique survey of mothers and their children to examine risk tolerance in children and to document the intergenerational correlation in risk attitudes. In this survey, both mothers and their children participated in an incentivized risk preference elicitation task. We find that risk tolerance is associated with gender even among young children. This suggests either that risk tolerance is biologically dependent on sex, or that socialization processes that influence gender differences in risk tolerance act very early in life.

One of the key findings of the literature on risk tolerance in adults is a strong positive association with cognitive ability. In 7–8 year-old children we find no association of risk tolerance with cognitive measures including verbal and non-verbal abilities. However, in these children we find a *negative* association between a measure of inhibitory control and risk tolerance in boys. Thus, boys with better ability to regulate their reactions or responses were less risk tolerant, likely because they considered the consequences of losing alongside the possibility of winning. Inhibitory control is considered to be an important component of a set of cognitive abilities labeled executive function. Executive function is a key cognitive ability that allows individuals to coordinate thoughts and actions, facilitating capacities such as planning, prioritizing goals and orchestrating behavior accordingly. These results suggest that the association between different aspects of cognitive ability and risk tolerance may change over individual lifetimes. It is likely that risk tolerance is closely associated with the abilities to analyze and synthesize, as well as regulatory abilities. A high level of regulatory abilities without analytic abilities (as in children) may result in risk aversion, while a low level of regulatory abilities may result in greater risk tolerance regardless of analytic abilities. Nevertheless, the link between risk tolerance and cognitive abilities clearly requires further study from a developmental perspective.

Turning to intergenerational transmission, our main finding is that risk preferences are correlated between mothers and children when the children are just 7–8 years old, a much younger cohort than studied in previous research on intergenerational correlations in risk preferences. Interestingly, in this sample only the daughters' risk preferences are correlated with their mothers' risk preferences.<sup>21</sup> Differential transmission of mothers' preferences to daughters and sons may support a role for socialization in the transmission of preferences, if girls are more likely to take mothers as role models than boys. However, differential transmission could also be genetic, or more specifically, sex-linked.

We further document that the strength of the intergenerational transmission of risk tolerance appears to depend on maternal effort. We find a robust relationship between the mother's effort and the degree to which her preferences are transmitted to the daughter. While we cannot rule out all possible sources of endogeneity, we find evidence against reverse causality (from child behavior or characteristics to maternal effort) as an explanation for this association. The moderation of the mother–daughter correlation in risk preferences by parental effort is consistent with the hypothesis that socialization plays a key role in the intergenerational transmission of attitudes. This hypothesis – that parents can influence the transmission of preferences through socialization effort – is a key assumption in recent theoretical models of the intergenerational persistence of outcomes. An important caveat is worth re-emphasizing. While we do have rich data on maternal effort and show that this effort seems to moderate the association between the risk attitudes of mothers and daughters, the evidence we provide is only suggestive of a socialization mechanism. Designs with the power to identify possible transmission mechanisms will do especially well in future research in this fast-growing area.

The study is a contribution to the literature on the role of the family in the formation of preferences that predict economic behavior. The result that preferences of mothers and their children are correlated when the children are still young as well as the possible role of maternal effort in shaping children's preferences suggest that the formation of preferences occurs very early in life. Assessing the possibility that preferences are malleable and can be shaped, not only in the home but potentially also through schools and other educational interventions is an important part of our continuing research agenda.

#### Appendix A. Questionnaires

##### A.1. Parental involvement in the child's school life

In two separate sets of questions, mothers are asked to report how often they and their husbands engage in the following activities with their child:<sup>22</sup> (1: never, 2: rarely, 3: sometimes, 4: often, 5: always)

- 1 Meet with the child's teachers.
- 2 Watch the child's performances at school.
- 3 Accompany the child to school on the first and last day of classes.
- 4 Help the child with his/her school projects.

<sup>21</sup> Unpublished work by Zumbuehl et al. (2013) documents a similar relationship using adult children (ages 17+), retrospective rather than contemporaneous parental involvement questions, and self-assessed risk measures rather than an incentivized task. Their results provide support that the early transmission we document persists into adulthood.

<sup>22</sup> Note that the mother was asked to report her own and her husband's involvement in the upbringing of the target child only, i.e. the child which was part of the TECGE study.

- 5 Help the child with his/her Turkish writing/reading homework.
- 6 Help the child with his/her math homework.
- 7 Show interest/get involved if the child has problems with his/her teachers.
- 8 Inform the school when the child is sick.
- 9 Do the shopping for items which are necessary for school.
- 10 Follow the child's school work by checking workbooks etc.

#### A.2. Maternal involvement in other activities

Mothers are also asked to report how often they engage in the following activities with their child.

- 1 Do you help your child gain skills, such as skipping rope or swimming? (1: always, 2: sometimes, 3: never)
- 2 How often did you engage in any family activity during the last week (like playing something indoors or doing some activity outdoors)? (1: a couple of times, 2: once, 3: never)
- 3 Did you take your child to any show, like a concert, a children's theater, or a puppet show within the last year? (1: a couple of times, 2: once, 3: never)
- 4 Did you go on a bus, plane or train ride with your child within the last year? (1: a couple of times, 2: once, 3: never)
- 5 Did you visit a museum or art gallery with your child within the last year? (1: a couple of times, 2: once, 3: never)
- 6 Did you travel to any other place (village, another town etc.) with your child for leisure, within the last year? (1: a couple of times, 2: once, 3: never)
- 7 Within the past month, how many times did you take your child somewhere just because your child enjoys going there? (provide number of times)
- 8 Within last year, did your child accompany you or your husband to your/his workplace? (1: a couple of times, 2: once, 3: never)
- 9 Do you, as a family, meet with your friends and relatives at least two times every month? (1: yes, 2: no)
- 10 Do you encourage your child to get/keep a hobby, such as sports or music? (1: always, 2: sometimes, 3: rarely)
- 11 Do you encourage your child to read? (1: always, 2: sometimes, 3: rarely)
- 12 Do you make your child participate in activities which improve his/her skills? (1 yes, 2 no)
- 13 Do you comfort your child when he/she is worried? (1: always, 2: sometimes, 3: never)

### Appendix B. Verbatim instructions and procedures

#### B.1. Children's risk task

[Instructions given to interviewer: If possible, the child should be alone when playing this game. In case this is not possible, any intervention or comments by the mother should be prevented to the extent possible. If this occurs, please take note.]

[Record: Was the mother present while the child was playing the game?]

[Instructions to be given to the child:]

We will now play a game with you. [Show the child the prize bag.] See, this bag contains many gift items. You can earn prizes out of this gift bag at the end of the game. How many gifts you will get will depend on a decision you make during the game. Now I will explain the rules. Please listen very carefully, OK?

Here are 4 tokens. Each one of these tokens corresponds to a gift of your choice from the gift bag. The more tokens you have at the end of the game, the more gifts you can choose out of the gift bag.

Now, here is a bowl [point to the bowl]. Out of the 4 tokens that you have, you can put as many tokens into this bowl as you want. You can keep the tokens you do not put in the bowl. They are yours. Now, what will happen to the tokens you put in the bowl depends on chance. They will either multiply, or be lost. But what will this depend on?

There are two balls in this bag. [Show opaque bag and the two balls.] You will pick one of them without looking. The yellow one is the good ball. If you draw the yellow ball from the bag, the tokens you put in the bowl will triple, which means that you will win three times the number of tokens you had put in the bowl. The purple ball is the bad ball. If the purple ball comes out of the bag, you will lose the tokens you had put in the bowl. So the probability of winning–losing is half–half. It will depend on which ball you draw out of the bag.

Now let us do an example:

Say you put one token into the bowl, and kept the remaining three [demonstrate by putting one token into the bowl]. Suppose the yellow ball came out. In that case, each token in the bowl becomes three tokens [put two more tokens in the bowl], and you kept three tokens, so see, it adds up to six in total. You get to take six gifts from the prize bag. Suppose the purple ball came out. Then you lose the token you had put in the bowl. The 3 tokens you kept are yours though. So, you get three gifts.

Let us do another example. Suppose you put three tokens into the bowl and kept one [demonstrate by putting three tokens into the bowl]. Say you drew the yellow ball. Then each token in the bowl becomes three tokens [put six more tokens into the bowl], and you kept one token, so this makes ten tokens in total. You get to choose ten gifts from the prize bag. Say you draw the purple ball. Then you lose the tokens you put into the bowl. You choose one gift for the one token that you kept. Are the rules of the game clear?

[Answer any questions the child has about the game. Then ask the child the following questions. Do not start the game before the child answers these questions correctly.]

Suppose you kept all four tokens, and put none of the tokens into the bowl. How many gifts do you get? [Right answer: four.]

Suppose you put all four tokens into the bowl, and keep none of the tokens. How many gifts do you get? [Right answer: If the yellow ball comes out, the tokens in the bowl triple, i.e.  $4 \times 3 = 12$ , and the number of gifts is 12. If the purple ball comes out, the number of gifts is zero.]

Suppose you put two tokens into the bowl, and keep two tokens. The yellow ball comes out. How many gifts do you get? [Right answer:  $6 + 2 = 8$ ] Suppose the purple ball comes out. How many gifts do you get? [Right answer:  $0 + 2 = 2$ .]

[Begin the game once you are sure that the child has understood the game.]

Now please think carefully and decide how many of your tokens you want to put into the bowl. Keep in mind that we will only play this game once.

[Record: How many tokens did the child put into the bowl? How many did the child keep?]

[Record: Did the mother say anything that might have affected the child's decision?]

## B.2. Mother's risk task

[Instructions given to interviewer: This game should be played after the child has made his/her choices.]

[Instructions to be given to the mother:] Now we will play a game. You can earn money in this game and we will pay you immediately after the game is completed. How much you earn will depend on a decision you will make during the game.

The rules are simple. Here are 10 tokens [show tokens]. Each one of these tokens corresponds to 1 TL. So, you have 10 TL. Here is a bowl. You will decide how many of your 10 tokens to put into the bowl. You will be able to keep the tokens you decide not to put into the bowl. They are yours no matter what. Concerning the tokens you put into the bowl, you can think of it as a lottery. The money you put into the bowl will either multiply, or be lost. So there is the possibility of a good outcome and the possibility of a bad outcome. If the good outcome occurs, any money you put into the bowl will triple, so you will have three times the amount of money you had put into the bowl. If the bad outcome occurs, you will lose the money you had put into the bowl.

Here is how the outcome – whether the money in the bowl will multiply or disappear – will be determined. Once you have decided how many tokens to put into the bowl, you will draw a ball from this bag. There are two balls in this bag. One yellow, and one purple. [Show opaque bag and the balls.] If you draw the yellow ball, the tokens you had put into the bowl will triple. If you draw the purple ball, the tokens you had put into the bowl will be lost. Since there is exactly one yellow ball and one purple ball in the bag, you have a 50–50 chance of drawing each of the balls. If you draw the yellow ball, i.e. if the good outcome occurs, the money you will earn is three times the money you put into the bowl, plus the money you had decided to keep. If you draw the purple ball, i.e. if the bad outcome occurs, you will only earn the money you had decided to keep, since the money you had decided to put into the bowl will be lost. Do you have any questions?

Now let us do some examples. If you do not put any of the tokens into the bowl, what happens? You get to keep all of them, and earn 10 TL. You could also put all of the ten tokens into the bowl. In this case, your 10 tokens, meaning your 10 TL, will become  $10 \times 3 = 30$  TL if you draw the yellow ball. If instead you draw the purple ball, you will lose all of the tokens. Remember that you can put as many tokens into the bowl as you want.

For example, suppose you put 7 of the 10 TL into the bowl, and kept 3. The 3TL that you decided to keep are yours, no matter what. If you draw the yellow ball, the money you put into the bowl will be tripled and becomes:  $7 \times 3 = 21$  TL. Since you kept 3 tokens, your total earnings would be  $3 + 21 = 24$  TL. If you draw the purple ball, you lose the money you had put into the bowl. You get the 3TL that you had decided to keep.

Let us do another example. Suppose you put 3 tokens into the bowl and decided to keep 7. How much money do you earn if you draw the yellow ball? [Let mother answer first.] If you draw the yellow ball, the money you have put into the bowl will be tripled:  $3 \times 3 = 9$  TL. And since you decided to keep 7 tokens, you will earn  $9 + 7 = 16$  TL in total. How much do you earn if you draw the purple ball? [Let mother answer first.] If you draw the purple ball, then you lose the money you put into the bowl. You get the 7TL you decided to keep. Do you have any questions? [Answer any questions the mother has about the game.]

We will play this game only once. Each token you do not put into the bowl is 1TL that you keep. Each token you put into the bowl will either triple or be lost. What happens to the amount in the bowl will depend on the color of the ball that you draw. Please think carefully and put as many tokens into the bowl as you wish.

[Record: How many tokens did the mother put into the bowl? How many did she keep?]

[Once the child and the mother have made their choices and their choices are recorded, the interviewer asks the child and the mother to draw a ball from the bag, on the basis of which their payoffs are calculated. The child is then asked to choose the corresponding number of toys from the gift bag, while the mother is given her payment in TL.]

## Appendix C. Robustness analyses

See [Tables A.1 and A.2](#).



**Table A.1**  
Predictors of children's risk tolerance (0–1).

	(1) Girls	(2) Boys
Mother's risk (0–1) ( $\beta_1$ )	0.228** (0.0628)	0.0149 (0.0830)
Mother present	0.0133 (0.0296)	–0.0137 (0.0177)
Corsi test	0.00225 (0.00217)	0.00187 (0.00212)
Turkish receptive language test	–0.0000382 (0.00143)	0.00113 (0.00103)
Head–toe task	–0.00202 (0.00164)	–0.00655** (0.00146)
Child age (months)	–0.000384 (0.00485)	0.00750** (0.00325)
Height	0.00270 (0.00205)	0.00413 (0.00243)
Religiosity	0.000213 (0.000687)	0.000274 (0.000581)
Household size	–0.0137* (0.00659)	–0.0151 (0.00978)
Mother's education (years)	0.00666 (0.00657)	0.00108 (0.00432)
Father's education (years)	–0.00449 (0.00529)	0.00254 (0.00347)
SES 1st quartile (low)	0.141** (0.0653)	0.0445 (0.0750)
SES 2nd quartile	0.190*** (0.0527)	0.0395 (0.0695)
SES 3rd quartile	0.0439 (0.0403)	0.0192 (0.0456)
N	311	375
Regional FE	Yes	Yes
R <sup>2</sup>	0.19	0.17
Test $\beta_{1(girls)} = \beta_{1(boys)}$	0.03	

Both mother's and child's risk tolerance is measured on a 0–1 scale.  
Standard errors in parentheses (clustered at the region level).

\*  $p < .1$ .

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

**Table A.2**  
Mother's effort and children's risk tolerance (0–1).

	(1) Girls	(2) Boys
Mother's risk (0–1)	–0.552** (0.215)	–0.175 (0.393)
Mother's effort	–0.0442 (0.0297)	–0.0514 (0.0418)
Mother's effort $\times$ mother's risk	0.160*** (0.0493)	0.0240 (0.0805)
Mother present	–0.0654 (0.0701)	–0.0841 (0.0497)
Mother present $\times$ mother's risk	0.146 (0.131)	0.161 (0.102)
N	307	371
Regional FE	Yes	Yes
Household controls	Yes	Yes
Individual controls	Yes	Yes
R <sup>2</sup>	0.219	0.186

Both mother's and child's risk tolerance is measured on a 0–1 scale.  
Household and individual controls as in Table 2.

Standard errors in parentheses (clustered at the region level).

\*  $p < .1$ .

\*\*  $p < .05$ .

\*\*\*  $p < .01$ .

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