

# Negative childhood experiences and risk aversion: evidence from children exposed to domestic violence

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## Abstract

Using a longitudinal study of over 2000 Peruvian children I show that domestic violence early in childhood is negatively associated with the cognitive development of children and with their willingness to take risks. In an incentivized experiment, children exposed to domestic violence behave more risk aversely than other children. The magnitude of this effect is as large as that of gender on lottery choices and it is boys who are the most affected. The effect of domestic violence on lottery choices is not due to its effect on cognitive development. Early experiences can directly influence the risk attitudes of children.

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## 1. Introduction

According to the United Nations Children’s Fund (UNICEF) 133 to 275 million children are exposed to domestic violence every year. Exposure to domestic violence is associated with a myriad of negative outcomes that includes impaired cognitive development (Koenen et al., 2003), an increase in externalizing and internalizing behaviors (Fantuzzo and Mohr, 1999; Kernic et al., 2003; Osofsky, 1999; Emery, 2011), and an increased likelihood of several health conditions (Felitti et al., 1998; Brown et al., 2009). Research suggests that adverse childhood experiences might not only be associated with lasting changes in the nervous, endocrine and immune systems (Danese and McEwen, 2012), but also with lifetime earnings through their effect on cognitive and non-cognitive abilities (Heckman et al., 2006; Gertler et al., 2013; Heckman et al., forthcoming; Currie and Tekin, 2006; Carrell and Hoekstra, 2010). In this paper, I show that domestic violence can alter the risk attitudes of children as well.

This means that another channel through which early adverse experiences can affect future outcomes is by changing the way children evaluate options. This is important due to the fact children make many consequential and unsupervised decisions (Castillo et al., 2011; Sutter et al., 2013; Segal, 2013; Bertrand and Pan, 2013) and these decisions have been found to be correlated with their preferences (Castillo et al., 2011; Sutter et al., 2013). All things constant, a child might either shy away from advantageous situations or engage in dangerous behavior whenever unsupervised.

This paper takes advantage of a unique longitudinal study of a random sample of over 2,000 Peruvian children whose households were surveyed when they were one, five, and eight years old.<sup>1</sup> In the last visit, the children’s risk attitudes were measured by their selection of one of six possible lotteries that increased in their mean and variance and included a sure payment option.<sup>2</sup>

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<sup>1</sup>The panel is part of the Young Lives study on childhood poverty (<http://www.younglives.org.uk/>).

<sup>2</sup>The study did not collect information on time preferences.

The experiment was conducted under ideal conditions: it used standardized procedures, children were allowed to make decisions without parental supervision, and they were paid in tokens that were redeemable in stickers of the child's choosing. (Harbaugh et al., 2002; Levin and Hart, 2003; Moreira et al., 2010; Weller et al., 2011; Schlottmann, 2001) show that children not only can handle these types of questions, but also that preferences can be elicited in this way. The present study investigates how the choices in this experiment relate to measures of domestic violence.

In this paper, I construct measures of domestic violence based on reports made by the child's mother in each of three surveys. While mothers' self-reports of domestic violence might be biased (Aizer, 2010; Ellsberg et al., 2001), they have the advantage of including events that the child was too young to remember and events that children less affected by the events might likely forget. According to these measures, 16.7% of the households in the sample reported domestic violence at least once and 3.3% reported it at least twice. Children are less likely to have either caused or selected into violence affecting their mothers. Adults, on the contrary, tend to choose living environments and jobs that suit their risk tolerance (Castillo et al., 2010; Dohmen et al., 2011).

Analyzing the effect of domestic violence on preferences rather than behavior is important due to the fact behavior can vary as opportunity sets and beliefs change, even if preferences remain constant. However, it is the knowledge of preferences that is necessary to extrapolate behavior to new contexts and therefore more important for policy design. This problem is highlighted by the fact that domestic violence is associated with opposite types of behavior (internalizing versus externalizing) (Fantuzzo and Mohr, 1999; Kernic et al., 2003; Osofsky, 1999; Emery, 2011). These behavioral patterns therefore provide us no guidance on the effect of domestic violence on preferences. Without observing children's choices from identical option sets, we cannot answer the question of how previous experiences affect preferences. Experimental methods have an advantage in this situation.

A second reason why it is important to study preferences directly is that

some behaviors are intrinsically more difficult to measure than others. For instance, externalizing behaviors might leave a record of disciplinary actions that can be used to evaluate their impact on life outcomes (Segal, 2013). However, risk averse preferences might be associated with a propensity to avoid taking action and/or to be noticed, making it difficult to evaluate their impact since inactions leave no record behind. The literature on gender differences in willingness to compete (Gneezy et al., 2003; Niederle and Vesterlund, 2007) and to bargain (Babcock and Laschever, 2003) illustrate the importance of directly measuring people’s willingness to act.

This paper aims to improve our understanding of the determinants of individual preferences and the role the household environment plays in this process. Despite the fact that the household appears to be the most important environment where children’s views, attitudes and capabilities are formed, we know little about how this environment relates to individual preferences. This vacuum is surprising given that it is known that early experiences are crucial for the development of the child (Huttenlocher, 1979; Thompson and Nelson, 2001; Gunnar and Quevedo, 2007; Cirulli et al., 2003; Davidson and McEwen, 2012) and that traumatic events can affect the risk attitudes of adults (Eckel et al., 2009; Malmendier and Nagel, 2011; Voors et al., 2012; Callen et al., forthcoming). Given that gender and race differences on children’s preferences have been previously detected (Levin and Hart, 2003; Gneezy and Rustichini, 2004; Cardenas et al., 2012; Bettinger and Slonim, 2007; Castillo et al., 2011), one can speculate that the effect of early experiences might be detectable as well.

First, I confirm that, consistent with other studies (Cirulli et al., 2003; Koenen et al., 2003), the measure of domestic violence is negatively correlated with the cognitive development of the child. Second, I confirm that the measured impact of domestic violence on cognitive development is not the result of omitted variables. Regarding cognitive development, children exposed to domestic violence in the first year of life performed significantly worse than other children in cognitive tests at ages 5 and 8. In the Peabody picture vocabulary test, exposed children at 5 years of age performed 18% of a standard devia-

tion worse than non-exposed children and at 8 years of age exposed children performed 15% of a standard deviation worse than non-exposed children. To rule out an omitted variable explanation, I confirm that if a child is exposed to domestic violence in the first year of life, but not his/her younger sibling, it is only the exposed children who performs worse in the cognitive test.

The main finding of the paper is that domestic violence is positively associated with risk averse behavior. The effect is large: children living in households experiencing domestic violence are 14 percent less likely to choose the riskiest option. To put this in perspective, girls are 9 percent less likely to choose the riskiest option than boys. The effect is robust to the inclusion of children's characteristics like weight and height in all three years of the study, as well as measures of cognitive ability (available in the last two waves of the study). It is also robust to the inclusion of a rich set of characteristics of the parents. In particular, the estimates do not change when including measures of variables such as medical care during pregnancy and early infancy, the mother's psychological well-being and self-perception, the parents' own experience with domestic violence during childhood, or alcohol consumption. In addition, the fact that reports of domestic violence were recorded in repeated occasions allows me to control for potential time-invariant unobservables at the household or child level. The estimated magnitude of the effect of domestic violence on children's lottery choices remains unchanged. The results are also robust to the inclusion of measures of changes in a household's structure and economic conditions. Importantly, while domestic violence affects children's cognitive development, cognitive development is not associated with their lottery choices. This is consistent with previous studies with children (Crone and van der Molen, 2004; Weller et al., 2011; Sutter et al., 2013), but contradicts studies on adults (Dohmen et al., 2010; Burks et al., 2009).

Research shows that gender differences in development and behavior appear early in life (McClure, 2000; Zahn-Waxler et al., 2008; Baron-Cohen et al., 2005; Bertrand and Pan, 2013). I find that there are gender differences in the effect of domestic violence on lottery choice, but not on the cognitive development of children. Domestic violence has a disproportionate effect on the

lottery choices of boys. The differential effect of domestic violence might be due to several and not necessarily exclusive reasons. Boys might be more sensitive to domestic violence due to the fact that: 1) they mature more slowly than girls; 2) they are worse than girls at reading their social environment; and/or 3) they are less able to control their impulses (McClure, 2000; Zahn-Waxler et al., 2008; Baron-Cohen et al., 2005). Any of these reasons might increase the likelihood that boys are exposed to domestic violence more frequently. These differences might also exist because mothers facing domestic violence customize their behavior according to the gender of the child. This paper presents evidence consistent with changes in the mother-child relationship due domestic violence. But, it also shows that changes do not eliminate the effect of domestic violence on the lottery choices of children. Another way domestic violence might influence the lottery choices of children is by altering the emotions and expectations they associate with uncertain environments (Loewenstein et al., 2001; Peters and Slovic, 2000). Consistent with this hypothesis, I find that children affected by domestic violence are more likely to report feeling unsafe and helpless than other children. This effect is larger for boys.

The paper is organized as follows. Section 2 describes the methods used in the study. Section 3 describes the results. Section 4 concludes.

## 2. Methods

This section describes the sample and estimation methods used in the paper.

### 2.1. Sample selection

The original sample included 2,052 children ages 6 to 18 months. The sample was selected in a series of steps. First, 1,818 districts were ranked according to the 2000 *Fondo Nacional de Compensacion y Desarrollo Social* (nacional de compensacion y desarrollo social, 2001) poverty index. The index aggregates information on infant mortality, housing, schooling, roads, and

access to services. Districts ranked at the top 5% of the distribution were excluded from the sample to over-represent poor districts. Each of the remaining districts was subdivided in geographical areas of similar population and then 20 of these units were selected for the study. Each of these 20 units was further subdivided in census tracks and one track was selected at random in each unit. All the households in the selected track were visited to identify if the household had a child in the desired age range. Finally, neighboring census tracks were visited until completing 100 eligible households. (Escobal and Flores, 2008) have compared the current sample with the 2000 Demographic and Health Survey, the 2001 Living Standard Measurement Survey and the 2005 Population census. They find that the sample of children are slightly richer than these other samples. While there is no information regarding refusals to participate in the study, (Outes-Leon and Dercon, 2008) find that attrition between the first and second round of the study is small and mostly random. The households were visited in 2002, 2006 and 2009.

## 2.2. *Experiment*

In the third wave of the study (2009), children were asked to choose one out of 6 possible lotteries that paid in tokens depending on a coin flip. The lotteries increased the mean and variance of payoffs (Binswanger, 1980) and were simple enough for the children to understand. The lotteries were paid to promote truthful revelation of preferences (Harbaugh et al., 2002) and the payments were made in tokens redeemable in stickers of the child's choosing. Only 24 children of a total of 1,943 interviewed in the third wave have missing data on the lottery task. Of these 24 children, only one is reported to have refused to answer the lottery question. The instrument the children faced is shown in Panel A of Figure 1. The first option was a sure payment; then, to distinguish between risk neutral and risk taking subjects, the last option only increased the variance of the lottery but kept the expected payoff constant.

## 2.3. *Measures of exposure to domestic violence*

The measure of domestic violence in the first survey is based on the mother's answer to the question: "When [your partner] gets drunk does he hit you?"

This question was answered in the affirmative 6 percent of the time. In the second and third survey, the measure of domestic violence is based on the mother's answer to the question: "When [a family member] gets drunk does he/she turn aggressive?" This question was answered in the affirmative 8 and 7 percent of the time in the second and third survey. The wording in the second and third survey has the advantage of being more inclusive. This might explain why the prevalence of events of domestic violence is slightly larger in the latter surveys. Information from the third survey suggests, however, that answers likely refer to the behavior of the mother's partner. According to the third wave of the survey, 12 percent of the adults in the household were grand or great-grand parents and 16.9% percent other adults (uncles/aunts, siblings, cousins, etc.). The percent of households ever reporting a case of domestic violence is 16.7% and the percent of households reporting cases at least 2 times is 3.3%. These numbers are comparable to those found in developed countries (Hedin and Janson, 2000; McFarlane et al., 1996).

To assess the reliability of the measures of domestic violence, I compare the answers to these questions with the answers to another question regarding domestic violence available in the third wave of the study. Mothers were asked if they needed help with issues regarding child abuse and family violence. This is a broader measure than the one I use in this study (12% versus 7%). Those answering this new question affirmatively are 3 times more likely to report a case of domestic violence than those responding negatively (16% versus 5%). Those answering positively to this question are twice as likely to ever report a case of domestic violence in any of the surveys than those responding negatively (31% and 15%). This suggests that the measures used in the study capture events of domestic violence, albeit with error.

According to the World Health Organization (WHO, a), women who have been physically or sexually abused by their partners are almost twice as likely to experience depression. I confirm a similar pattern in the data by comparing indicators of the mother's depression using a 20 Yes/No questionnaire developed by the World Health Organization (WHO, b) for this purpose. A mother is considered to be at risk of depression if she responds yes to at least 8 of these



20 questions. According to this measure, mothers reporting domestic violence were about twice as likely to show signs of depression than other mothers (50% v. 28%, p-value < 0.001 in the first survey and 24% v. 12%, p-value < 0.001 in the second survey).<sup>3</sup> The measure used in this paper reproduces previous results of the effect of domestic violence on mothers' depression. Importantly, the effect does not seem to be due to the existence of time-invariant omitted variables. A regression of the change in the index of depression on the change in the reports of domestic violence, the change in the wealth index, and the change in marital status shows that domestic violence is associated with a 12 percentage points increase (p-value = 0.002) in the likelihood of being depressed.

The total number of reports of instances of domestic violence is negatively correlated with the mother's years of education ( $r = -0.09$ , p-value < 0.001), wealth index ( $r = -0.08$ , p-value < 0.001), being a single mother during the first survey ( $r = -0.06$ , p-value = 0.004) and positively correlated with the number of children ( $r = 0.09$ , p-value = 0.001), the father's childhood experience of domestic violence ( $r = 0.08$ , p-value = 0.003), the mother's childhood experience of domestic violence ( $r = 0.09$ , p-value = 0.001), and the recent experience of a bad shock ( $r = 0.06$ , p-value = 0.009). Similar results are obtained using the disaggregated reports of instances of domestic violence.

A distinct advantage of longitudinal data on domestic violence is that we can evaluate the importance of the timing and consistency of domestic violence. Research suggests that challenges to the mother-child relationship during the first years of age might negatively impact cognitive development. To address this, I consider two alternative statistical models of the effect of domestic violence. One model allows for each instance of domestic violence to separately affect lottery choices and a second model evaluate the effect that the total number of reports of domestic violence has lottery choices.

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<sup>3</sup>Answers to these questions for the third survey are not available.

#### *2.4. Measures of cognitive development and controls*

Four measures of cognitive development can be used to test if domestic violence negatively impacts cognitive development (Koenen et al., 2003). Children were administered the Peabody Picture Vocabulary Test (PPVT) at 5 and 8 years of age. The test’s main objective is to measure vocabulary acquisition from 2.5 years of age to adulthood and consists in giving a person a stimulus word to be match with a picture. The questions are increasing in the level of difficulty. There is evidence that the PPVT is strongly correlated with measures of intelligence (Campbell et al., 2001). The average number of correct answers was 29.1 (s.d. 17.8) at 5 years of age and 46.7 (s.d. 13.5) at 8 years of age. (Cueto et al., 2009; Cueto and Leon, 2012) provides detailed information on the validity of all tests for the current sample of children.

Children were also administered the Cognitive Development Assessment (CDA) developed by the International Evaluation Association. The test has three components: spatial relations, quantity and time, but only the quantity portion of the test was used in the study. The quantity portion of the test requires the child to indicate which picture of a set of pictures best represents a description given by the examiner. Notions such as a few, most, half, many, equal, etc. are evaluated by asking questions such as: ‘point to the plate that has a few cupcakes.’ This test was administered in the second survey and had on average 8.4 (s.d. 2.2) correct answers.

Finally, a math test was administered in the third wave of the study. The test measures basic quantitative and number notions, including questions on counting, knowledge of numbers, number discrimination, and the use of basic operations. Questions were read by the field-worker with the aid of cards, so that no interference would result from poor reading skills. The second section of the test measures the ability to perform basic mathematics operations with numbers (addition, subtraction, multiplication and division). The average number of correct answers was 11.9 (s.d. 4.9).

The pairwise correlations of the instruments are all significantly different from 0. The smallest is 0.379 between the cognitive test and math test. The largest is 0.657 between the two PPVT tests. The Cronbach scale reliability

coefficient across all 4 measures is 0.6801. Factor analysis confirms this, and the corresponding eigenvalues are 2.0527, 0.0867, -0.1193 and -0.1993. The eigenvalues corresponding to parallel analysis (Horn, 1965) are 0.0177, 0.0099, -0.0029 and -0.0237. While parallel analysis suggests a second factor can be constructed, the analysis considers that only one factor exists when measuring cognitive development.

To control for pre-existing differences in the population, all regressions in the paper include a set of covariates (see Table 1). I include height and weight of the child in each of the surveys since research shows they are correlated with future outcomes (Case and Paxson, 2008b,a). The measurements were made by fieldworkers who received extensive training in the task. I also include a wealth index to control for the child’s socio-economic status. The index has been shown to be a good substitute, and sometimes a better alternative, to measures of household consumption (Filmer and Pritchett, 1999, 2001). The index has three main components: housing quality, consumer durables and services. The index is calculated according to the information in the first survey and has a mean of 0.42 (s.d. 0.19).

Additional controls include the (log) of the child’s age in months, the highest education degree completed, the mother’s (log) years of age, an indicator variable that equals 1 if the mother was single in the first survey, an indicator variable that equals 1 if the mother is Catholic (the dominant religion), an indicator variable that equals 1 if the mother’s language is not Spanish (the dominant language), the number of siblings of the child, the size of the household, an indicator variable that equals 1 if the household is in an urban area, an indicator variable that equals 1 if the mother reported (in the first survey) that she would have preferred the child to be of the opposite sex, and the number of times the mother reported cases of excessive drinking by a member of the household. I include this last variable to control for the possibility that excessive drinking, rather than violence, is correlated with cognitive development and preferences. Finally, I construct an indicator summarizing the cases of domestic violence in the household in which the child’s father and paternal grandparents lived and an indicator summarizing the cases of

domestic violence in the household in which the child’s mother and maternal grandparents lived. I include these variables because research shows that children exposed to domestic violence are more likely to engage in violent acts as adults themselves (Fantuzzo and Mohr, 1999).

### 3. Results

#### *3.1. Domestic violence, cognitive development and risk attitudes*

This section discusses the main results of the paper: domestic violence is negatively correlated with cognitive development and positively correlated with risk aversion.

Panel A of Figure 2 compares the mean of the measure of cognitive development based on factor analysis according to sex and exposure to domestic violence. The common factor has a mean of zero. Panel A shows that overall boys perform better in the cognitive development test than girls (t-test = 1.7198, p-value = 0.0856). Panel A also shows that instances of domestic violence are associated with poorer performance in the cognitive development tests (t-test = 4.7344, p-value < 0.0001 for domestic violence at age 1, t-test = 3.1663, p-value = 0.0018 for domestic violence at age 5 and t-test = 2.3883, p-value = 0.0182 for domestic violence at age 8). The graphs indicate that instances of domestic violence have a larger impact on cognitive development the earlier they occur. These results are consistent with previous research on the effect of domestic violence on cognitive development (Koenen et al., 2003).

Panel B of Figure 2 compares the mean decision in the lottery according to sex and exposure to domestic violence. The safest option is coded as 1 and the riskiest option is coded as 6. Lower numbers indicate more risk aversion. The average decision is 4.59 (s.d. 1.76) with the riskiest choice being chosen 52 percent of the time. Contrary to research with adults (Holt and Laury, 2002; von Gaudecker et al., 2011; Andersen et al., 2008), the modal choice by children is not risk averse. However, this is consistent with research showing that children are significantly less risk averse than adults (Harbaugh et al., 2002; Levin and Hart, 2003; Moreira et al., 2010; Weller et al., 2011).

First, as with adults (Croson and Gneezy, 2009), girls are more risk averse than boys. Boys' average decision is 4.72 and girls' average decision is 4.45 (t-test = 3.3557, p-value = 0.0008). This result is consistent with previous research (Cardenas et al., 2012).

Second, we observe that domestic violence is associated with risk averse behavior. The effect is greater for more recent events. The average decision of children whose mothers suffered domestic violence during their first year of age is 4.50 which is no different from that of other children (4.60, t-test = 0.5315, p-value = 0.5961). But, the average decision of children in households where domestic violence occurs later is significantly lower than other children (4.31 v. 4.61, t-test = 1.9076, p-value = 0.0580 for 5-year old and 4.16 v. 4.62, t-test = 2.7860, p-value = 0.0060 for 8-year old).

### *3.2. Regression analysis*

This section discusses the relation between indicators of exposure to domestic violence on cognitive development and lottery choices using regression analysis.

#### *3.2.1. Cognitive abilities*

I first confirm the negative relation between measures of domestic violence and cognitive development.

Table 2 shows regressions for the two measures of cognitive development: the common factor of the four cognitive tests and the mean of the standardized test scores. Since cognitive development is time sensitive (Huttenlocher, 1979; Thompson and Nelson, 2001; Gunnar and Quevedo, 2007), each regression includes an indicator variable that equals 1 if a report of domestic violence was made in one particular survey. All the regressions also include controls for family background and child characteristics as described in the previous section.

The first column in Table 2 shows that children whose mothers reported being physically abused by their partners when they were 1 year old have significantly lower measures of cognitive development. The effect is equivalent to 16 percent of a standard deviation of the common factor. Column 4 in Table

2 show that a similar effect is obtained using the mean of the standardized test scores (19 percent of a standard deviation). Columns 2, 3, 5 and 6 show that the effect of domestic violence during the first year of age is neither due to unobserved differences across localities where the study took place nor due to outliers. The results remain unaltered after including fixed effects for each locality and after bootstrapping the regressions. Table 2 also shows that instances of domestic violence later in infancy are also negatively correlated with cognitive development. However, these estimates are smaller and not always significant.

Previous research on the effect of domestic violence on the cognitive development of children show that this effect is robust even controlling for potential unobservable genetic propensities (Koenen et al., 2003). To test if the results are due to an omitted variables problem in this sample, in particular, I compare the score in the Peabody test of the child at age 5 with the score in the Peabody test of his/her younger sibling at age close to 5 (a sub-sample of 547 children). In particular, I test whether children in households reporting an act of violence *only* when the child was 1 year old have significantly lower test scores than their younger (*unaffected*) siblings. I do this to insure that only the older child could have possibly experienced domestic violence. Panel C and Panel D of Figure 2 provide such comparison. Panel C of Figure 2 compares the distribution of scores of children experiencing domestic violence only in the first year of age versus those children not affected. To secure comparability, the sample is restricted to those children who do have a younger sibling. Panel D of Figure 2 compares the distribution of scores of the younger siblings of these two groups. The graph shows that it is only the child affected by domestic violence, and not the younger sibling, who has lower test scores.

Column 8 in Table 2 presents a statistical test using regression analysis of paired siblings. The regression controls for the differences in age, sex, weight, height and family wealth (at age 1) in the pair as well. The parameter estimates of the effect of domestic violence on cognitive development are similar in size and significance to those from the simple regression analysis (-3.627 versus -4.909). Since this analysis relies on a smaller sample of children column

9 in Table 2 provides bootstrapped standard errors. The results are virtually identical. In sum, domestic violence is negatively associated with cognitive development and the effect is not likely due to a time-invariant omitted variable problem.

### 3.2.2. Risk attitudes

Table 3 presents the regression analysis of the relationship between domestic violence and lottery choices. The dependent variable is an indicator variable of the riskiness of the option chosen by the child. It equals 1 if the child chose the safest option (5 stickers for sure) and 6 if the child chose the riskiest option (20 or zero stickers with equal probability).<sup>4</sup> The first result is that girls are more likely to choose safer choices than boys (-0.271, p-value = 0.003 in model 1 and -0.265, p-value = 0.003 in model 2). The second result is that domestic violence is correlated with risk averse decisions. A child living in a household experiencing domestic violence at the time of the experiment is less likely to choose riskier options (-0.410, p-value = 0.033).<sup>5</sup>

Column 2 through 4 of Table 3 evaluates if the measured impact of domestic violence on lottery choices is due to either correlated unobservables at the locality level and/or outliers at the individual or locality level. The estimated impact of domestic violence on lottery choices is robust to the inclusion of both locality level fixed effects and bootstrapping. Table 3 also shows that earlier experiences of domestic violence are associated with lottery choices. However, the measured impact of domestic violence at age 5 is less precisely estimated than the effect at age 8. Tables A1 and A2 in the appendix reproduce Table 3 in full detail. These tables show that cognitive development is not correlated with children’s lottery choices. This lack of correlation is true even using disaggregate measures of cognitive development (results available from the author upon request).

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<sup>4</sup>In other words, the indicator equals 1 if option A in Figure 1 is chosen, 2 if option B in Figure 1 is chosen, 3 if option C in Figure 1, etc.

<sup>5</sup>The corresponding coefficients using an ordered logit regression are -0.3249 (p-value = 0.001) for female and -0.4470 (p-value = 0.019) for contemporary domestic violence.

Table 4 shows that the effect of domestic violence is robust to the inclusion of additional covariates. Column 1 of Table 4 shows that the results are robust to controls for the father’s background.<sup>6</sup> Column 2 of Table 4 shows that the results are robust to controls for the child’s understanding of the lottery task. For instance, while children that passed a reading test tended to choose riskier choices and children that were presented the safe option first tended to behave more risk averse, the estimated effect of domestic violence on lottery choices is robust to these measures. Column 3 of Table 4 shows that the results are robust to measures of child’s care and mother’s attention. These measures include indicators of major injuries suffered by the child (falls, burns, broken bones), mother’s signs of depression during the first and fifth year of age, and whether the mother recently sought help about domestic violence and child abuse. Children that suffered major injuries, especially at an early age, are likely to have received less attention from their mothers than other children, as are the children of depressed mothers Ashman et al. (2002). Column 4 of Table 4 shows that the results are robust to measures of changes in family structure and economic conditions. This includes the wealth indices corresponding to the second and third survey (the index for the first survey is included in all regressions) and three variables that equal 1 if the household reported a bad event in the first, second and third survey respectively. The regression also includes three indicators that equal 1 if the mother reported divorce or separation in the first, second and third survey respectively. As Table 4 shows, the measured effect of domestic violence is robust to all these additional controls.

The robustness of the results to regression analysis parallels the robustness of results on cognitive development. However, absent of randomly assigning household environments to children, the possibility of a time-invariant omitted variable problem cannot be discarded *a priori*.

One way to check if the results are due to a time-invariant omitted variables problem is to check if the results are robust to instrumental variable

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<sup>6</sup>Fewer observations are due to lack of information on fathers in households with a single mother.



estimation (Wooldridge, 2002). This approach requires finding variables that are correlated with instances of domestic violence but are not correlated with the omitted variable explaining both lottery choices and domestic violence. To do this, I exploit the fact that instances of domestic violence were measured separately for each one of the surveys. In particular, I estimate the effect of contemporaneous domestic violence using as an instrument the difference between the measure of domestic violence at age 8 and at age 1 or the difference between the measure of domestic violence at age 8 and at age 5. This amounts to identifying the effect of domestic violence on lottery choices from the effect it has on children that ceased being exposed to it or that started experiencing it only recently. By construction, changes in the measures of domestic violence within a household are less likely to be correlated with time-invariant conditions associated with its prevalence. Table 5 shows the estimates using this approach. All the estimates are similar to previous ones. This suggests that the effect of domestic violence on lottery choices is not due to time-invariant omitted variables.

It is possible that domestic violence affects the lottery decisions of children because they capture parenting style or child abuse. To test for this possibility, I construct an indicator of the use of physical punishment based on the answers mothers gave to the following 3 questions: 1. “When [your child] does not obey you, ignores when you ask him/her to do something: How do correct him/her?” 2. “When [your child], breaks dishes, glasses or similar items: What do you do?” 3. “When [your child], behaves disrespectfully: What do you do?” Mothers were asked these questions when the children were 5 and 8 years old. For each question and each survey I create a variable that equals 1 if the mother responded she used physical punishment in these situations and 0 otherwise. The measure of parenting style for each survey is the mean of these 3 variables. Table 6 presents the relationship between these variables and the lottery choices. The estimates of the effect of domestic violence remains similar after including these measures. Albeit not significant, Table 6 shows that physical punishment is negatively associated with choosing riskier lotteries after controlling for potential time-invariant omitted variables. The regression

shows, however, that children's lottery choices are associated with the reports of domestic violence made by the mother.

Research shows that gender differences in development and behavior appear early in life (McClure, 2000; Zahn-Waxler et al., 2008; Baron-Cohen et al., 2005; Bertrand and Pan, 2013). Figure 3 and Table 7 explore the relationship between domestic violence and the cognitive development and lottery choices of boys and girls. Table 7 shows that there are no significant gender differences on the effect of domestic violence on cognitive development. Boys and girls are equally, and negatively, affected by domestic violence at age 1. However, Table 7 shows that there are gender differences on the effect of domestic violence on lottery choices. Boys are more affected by domestic violence than girls. Model 2 also shows that domestic violence at age 1 is associated with less risk averse girls. Overall, domestic violence has the effect of narrowing the gender gap in lottery choices.

There are several reasons why domestic violence might affects boys and girls differently. Boys might be at a disadvantage because they mature more slowly than girls (Zahn-Waxler et al., 2008). That is, boys might be sensitive to domestic violence for a longer period. Boys might also be at a disadvantage because they are worse than girls at reading their social environment (McClure, 2000; Zahn-Waxler et al., 2008; Baron-Cohen et al., 2005) and fail to avoid dangerous situations more frequently. Even if boys are as accurate at reading social cues as girls, boys might be more affected than girls because they are more impulsive and get in trouble more frequently (Zahn-Waxler et al., 2008). Finally, boys might be at a disadvantage not because they are different than girls, but because mothers affected by domestic violence adjust their behavior according to the gender of the child. Mothers might become more violent toward boys and become more nurturing towards girls or viceversa. This list is, of course, not exhaustive.

Table A4 in the appendix explores the relationship between domestic violence at age 1 and measures of child care. Column 1 shows that children in households experiencing domestic violence tend to be cared for by fewer adults. The mothers of these children are also more likely to say that the

child's pregnancy was not planned. The bottom panel of Table 8 shows that this is a common pattern among mothers of girls. Indeed, reports of domestic violence at age 1 are slightly higher for mother of girls than mothers of boys (6.9% versus 5.1%,  $t\text{-test} = -1.7277$ ,  $p\text{-value} = 0.0842$ ). Mothers reporting domestic violence at age 1 are also more likely to say that their child cried more often than other children. Finally, mothers experiencing domestic violence reported responding differently to their babies' crying. Mothers experiencing domestic violence were less likely to report calming the babies by holding or breastfeeding them. Incidentally, the way mothers respond to the baby's crying is correlated with the child lottery choices. For instance, children that were carried by their mothers when they cried are 5.2% ( $p\text{-value} = 0.0464$ ) more likely to choose the riskiest lottery. This suggests that the mother-child relationship at age 1 might have been affected by domestic violence.<sup>7</sup> However, these variables do not alter the measured impact of domestic violence on children's lottery choices.

Table A5 presents child-level fixed effect regressions of the effect of domestic violence on the likelihood of suffering major injuries (falls, burns, broken bones) and the use of physical punishment by mothers. Girls in households experiencing domestic violence are less likely to experience major injuries and mothers experiencing domestic violence are more likely to use physical punishment. By construction, these results cannot be due to girls in households experiencing domestic violence being less prone to accidents or to mothers in households experiencing domestic violence being more likely to use physical punishment on their children. It is domestic violence, and not time-invariant omitted variables, that explains these patterns. This is consistent with a change in the household dynamics due to the presence of domestic violence.

Finally, I investigate whether domestic violence affects the child's use of time and perceptions of his/her environment. Table A6 and A7 in the appendix show child-level fixed effects regressions of the effect of domestic violence on

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<sup>7</sup>The estimates of the effect of domestic violence on lottery choices are not altered by controlling for these variables. See Table 4.

time allocation. There is no evidence that domestic violence affects these patterns. Table A8 shows the children’s perceptions of their environment as a function of domestic violence. These are questions that the children answered when they were 8. Children exposed to domestic violence are more likely to say that their environment is not safe and that no help would be available if they needed it. Table A8 also shows that these perceptions are more likely among boys exposed to domestic violence.

In sum, domestic violence seems to affect the mother-child relationship, the dynamics of the household and the perceptions of their environment held by children. It also has a direct and separate effect on children’s risk attitudes.

#### **4. Conclusions**

Using a longitudinal study of a random sample of Peruvian children, I investigate the relationship between events of domestic violence early in childhood, and the cognitive development and risk attitudes of children. I confirm that cognitive development is negatively affected by domestic violence and that this effect is unlikely due to omitted variables. I also find that domestic violence is associated with risk averse behavior. While domestic violence affects cognitive development and risk attitudes, these last two variables are themselves not correlated. Bad early experiences can have multiple and separate effects.

It is in general difficult to establish causality between domestic violence and children’s risk attitudes. However, the relationship between domestic violence and lottery choices presented here is robust to controls for time-invariant omitted variables and a rich set of measures of family background, child care and changes in household’s structure and economic conditions. I also find that there are important gender differences in the effect of domestic violence on lottery choices: the effect is largest among boys. The analysis suggests that domestic violence is associated with changes in the way mothers relate to their children and the perceptions children hold of their environment. However, the effect of domestic violence remains after controlling for these factors.

Some research shows that exposure to domestic violence during childhood increases the likelihood of committing crimes and engaging in risky activities

(Currie and Tekin, 2006; Carrell and Hoekstra, 2010). I find instead that children growing up in households experiencing domestic violence are more risk averse. This apparent contradiction might be due to the fact that children exposed to domestic violence are more likely to have higher costs to human capital accumulation, by its effect on cognitive abilities and household dynamics, and not necessarily due to a change in preferences (Freeman, 1999). This result highlights the complementarity between experimental and survey methods in the identification of the reasons why past experiences affect future behavior.

There is recent evidence showing that interventions during infancy can produce behavioral changes later in life (Gertler et al., 2013; Heckman et al., forthcoming). This paper shows that individual preferences themselves might be altered as well. This suggests that policies aimed at improving the child's condition in the household might be a necessary complement for the success of interventions at the school level.

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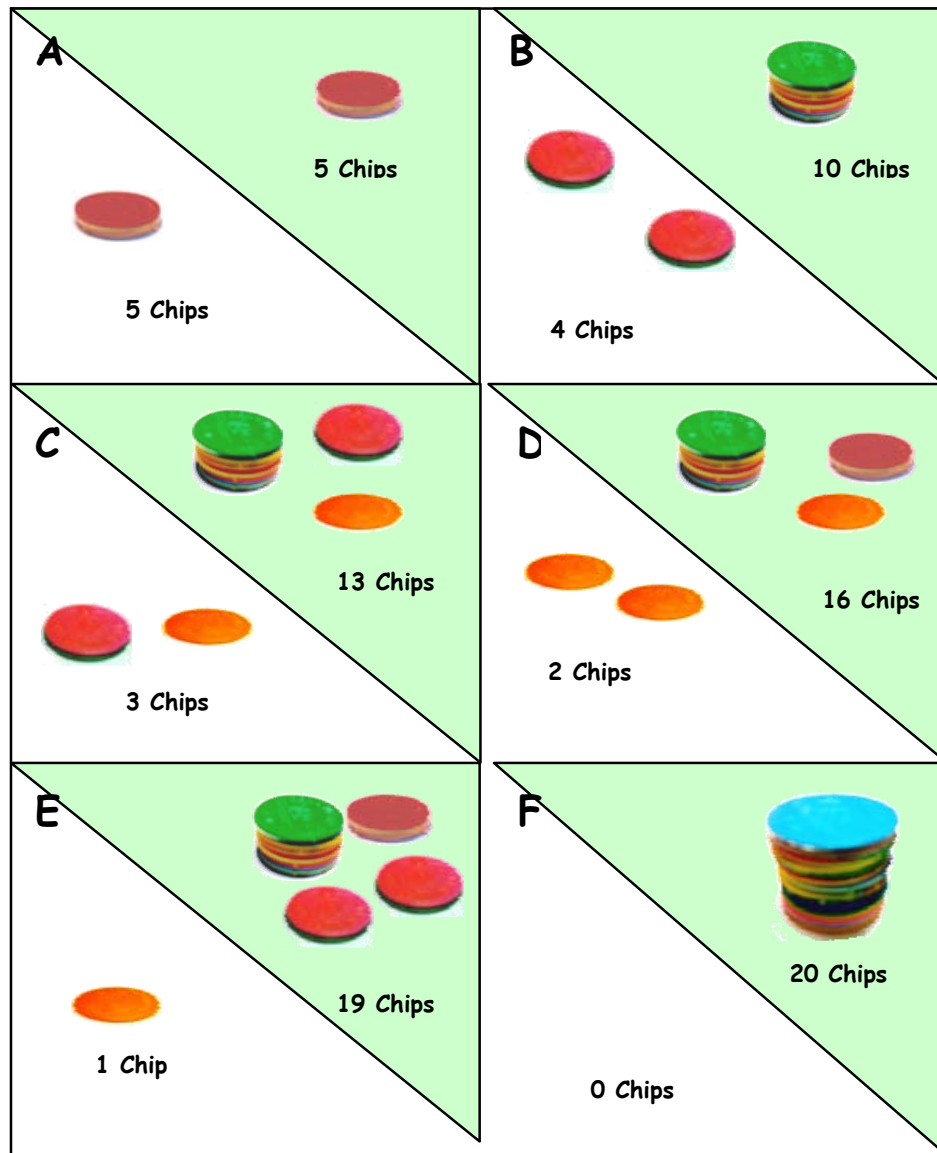
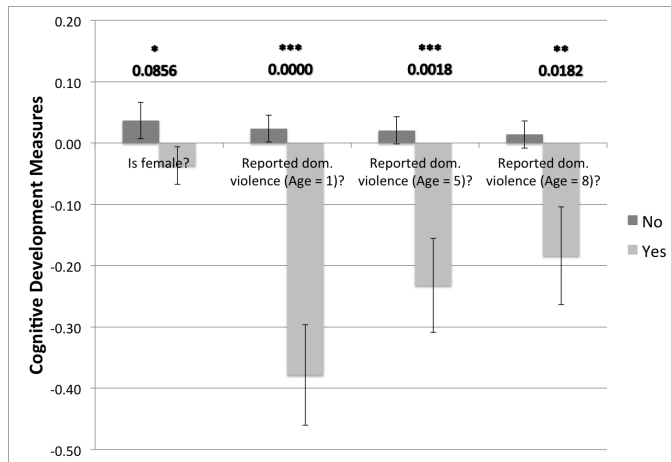
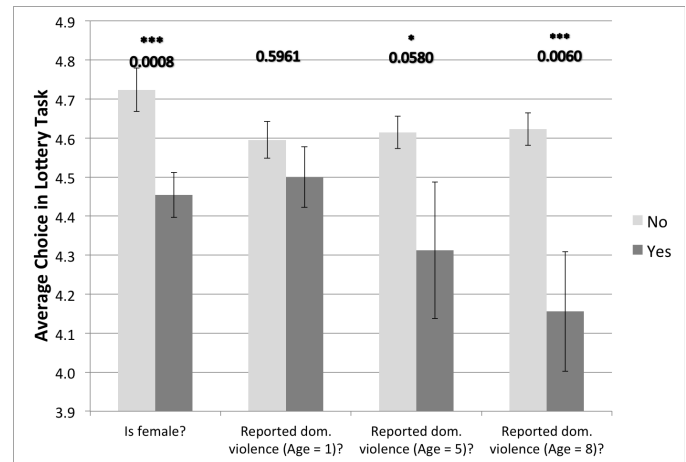


Figure 1. Lottery Instrument

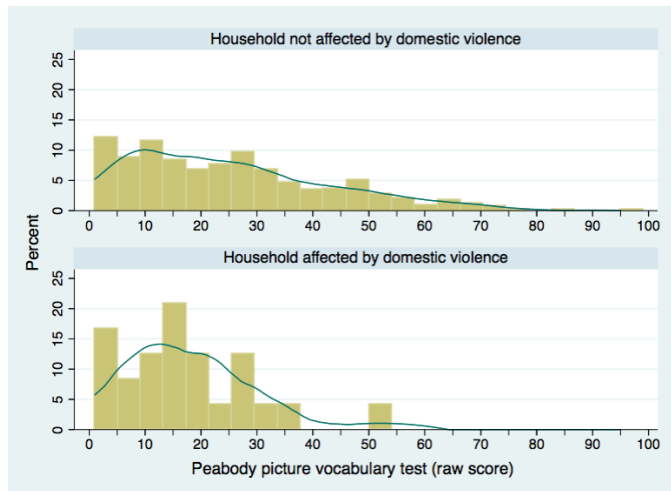


**A. Average cognitive measure by mentioned condition**

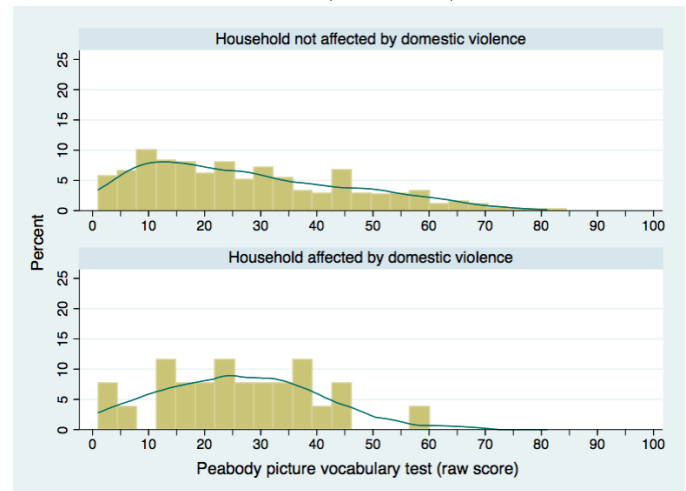


**B. Lottery choices of 8 year olds by mentioned condition**

Peabody test as a function of exposure to domestic violence in the first year of life  
Sample restricted to children that have a younger sibling (N = 547)

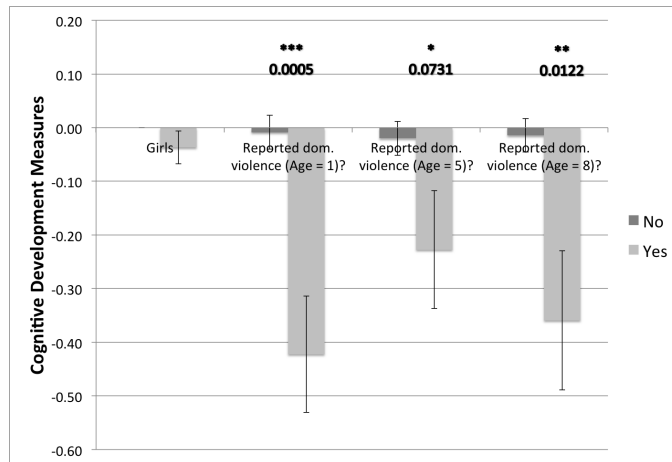


**C. Child in the original sample**  
Age at time of test = 62.8 months (s.d. 4.8)

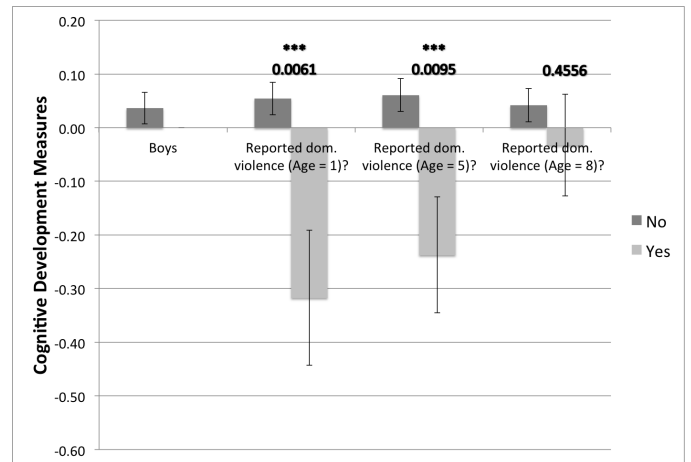


**D. Younger sibling of child in original sample**  
Age at time of test = 64.2 months (s.d. 8.9)

**Figure 2. Results**

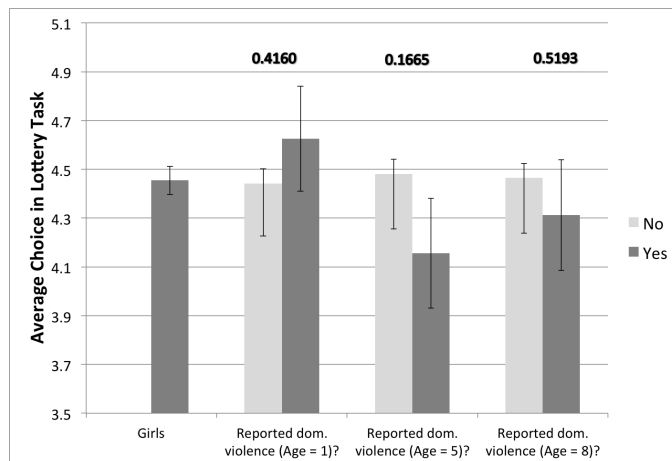


A. Girls

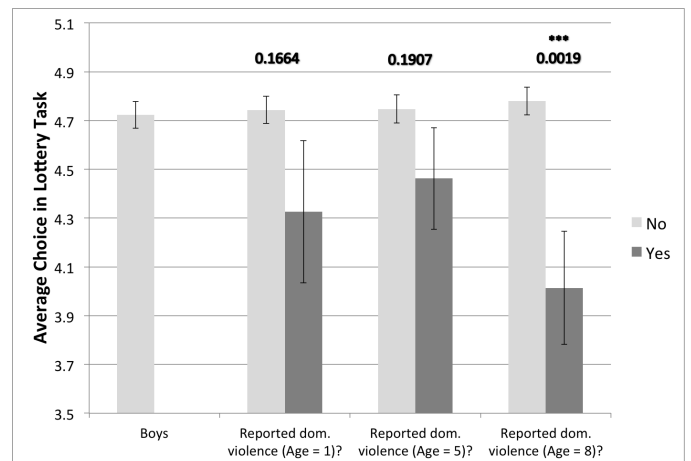


B. Boys

Cognitive development measure by mentioned condition



C. Girls



D. Boys

Lottery choices of 8 year olds by mentioned condition

Figure 3. Gender differences on the effect of domestic violence

Table 1. Descriptive statistics

VARIABLE	Observations	Mean	Std. Dev.
Female	1943	0.496	0.500
Event of dom. violence reported at age 1	1943	0.058	0.234
Event of dom. violence reported at age 5	1943	0.082	0.274
Event of dom. violence reported at age 8	1943	0.070	0.255
Lottery Choices (1=safest,...,6=riskiest)	1919	4.59	1.76
Number of reports of dom. violence	1943	0.210	0.501
Age of child (in months)	1941	94.90	3.63
Highest school grade attained	1917	2.308	0.585
Mother's age	1929	26.82	6.79
Mother's years of schooling	1940	7.85	4.53
Father's age	1625	30.96	7.62
Father's years of schooling	1894	9.148	3.940
Single mother	1943	0.154	0.361
Catholic	1943	0.808	0.394
Non Spanish speaker	1943	0.151	0.358
Number of siblings	1943	1.648	1.719
Household size	1943	5.708	2.331
Wealth index	1943	0.421	0.193
Urban area	1943	0.657	0.475
Weight of child at 1 (Kg)	1932	9.11	1.41
Height of child at 1 (cm)	1932	71.37	4.66
Weight of child at 5 (Kg)	1908	17.84	3.02
Height of child at 5 (cm)	1907	104.12	6.48
Weight of child at 8 (Kg)	1937	24.46	4.96
Height of child at 8 (cm)	1938	119.95	6.22
Peabody test at age 5	1855	29.15	17.88
Cognitive dev. test	1901	8.38	2.16
Peabody test at age 5	1842	46.73	13.54
Math test	1884	11.90	4.93



Table 2. Cognitive development and domestic violence

VARIABLES	Common factor <sup>1</sup>			Mean standardized scores <sup>1</sup>			Peabody <sup>2</sup>		Paired analysis <sup>3</sup>	
	Linear reg.	Fixed effects	F.E. & btsp.	Linear reg.	Fixed effects	F.E. btsp.	F.E. & btsp.	Linear reg.	btsp.	
Female	-0.016 [0.028]	-0.015 [0.029]	-0.015 [0.029]	-0.009 [0.025]	-0.008 [0.026]	-0.008 [0.025]	-0.123 [0.605]			
Event at age 1	-0.147*** [0.057]	-0.217*** [0.062]	-0.217*** [0.061]	-0.144*** [0.052]	-0.204*** [0.056]	-0.204*** [0.059]	-3.627*** [1.220]			
Event at age 5	-0.053 [0.053]	-0.078 [0.054]	-0.078 [0.054]	-0.061 [0.048]	-0.085* [0.048]	-0.085* [0.051]	-1.489 [1.165]			
Event at age 8	-0.030 [0.056]	-0.025 [0.060]	-0.025 [0.057]	0.000 [0.050]	0.006 [0.054]	0.006 [0.052]				
Event at age 1 not at age 5								-4.909* [2.809]	-4.909* [2.978]	
Observations	1,728	1,728	1,728	1,728	1,728	1,728	1,825	520	520	
R-squared	0.592	0.399	0.399	0.576	0.390	0.390	0.295	0.280	0.280	
No. of sites		118	118		118	118	118			
Robust p-values in brackets. *** p<0.01, ** p<0.05, * p<0.10										

<sup>1</sup>**Included regressors:** Age of child in months (ln), child's highest school grade comp., mothers years of age (ln), mother's years of education, single mother, mother is Catholic, mother language is not Spanish, No. of siblings, household size, household wealth index, urban area, indicator that the mother would have liked a child of opposite gender, No. of reports of excessive drinking, No. of reports of domestic violence/child abuse in child's father's household, No. of reports of domestic violence/child abuse in child's mother's household, child's height and weight in all surveys. <sup>2</sup> Height and weight at 8 excluded from the regression. <sup>3</sup> **Included regressors:** Difference in indicator for being a female, difference in age in months, difference in heights and differences in household wealth at age 1.

Table 3. Lottery decisions and domestic violence

VARIABLES	Dependent variable: 1 = safest,..., 6 = riskiest			
	Linear	F.E.	F.E & Bootstrap	
	regression	no boots.	at ind. level	at site level
Model 1				
Female	-0.271*** [0.089] (0.003)	-0.286*** [0.103] (0.006)	-0.286*** [0.097] (0.003)	-0.286*** [0.107] (0.007)
Event reported at age 1	0.028 [0.191] (0.882)	0.156 [0.197] (0.429)	0.156 [0.200] (0.435)	0.156 [0.196] (0.426)
Event reported at age 5	-0.266 [0.176] (0.132)	-0.256 [0.167] (0.128)	-0.256 [0.186] (0.168)	-0.256 [0.169] (0.130)
Event reported at age 8	-0.410** [0.192] (0.033)	-0.440** [0.186] (0.020)	-0.440** [0.205] (0.032)	-0.440** [0.193] (0.022)
R-squared	0.026	0.024	0.024	0.024
Model 2				
Female	-0.265*** [0.089] (0.003)	-0.280*** [0.103] (0.007)	-0.280*** [0.093] (0.003)	-0.280*** [0.104] (0.007)
Number of reports	-0.223** [0.106] (0.036)	-0.193* [0.099] (0.052)	-0.193* [0.112] (0.084)	-0.193* [0.101] (0.057)
Observations	1,726	1,726	1,726	1,726
R-squared	0.024	0.021	0.021	0.021
Number of sites		118	118	118

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

**Regressors:** Age of child in months (ln), child's highest school grade comp., mothers years of age (ln), mother's years of education, single mother, mother is Catholic, mother language is not Spanish, No. of siblings, household size, household's wealth index, urban area, indicator that the mother would have liked a child of opposite gender, No. of reports of excessive drinking, No. of reports of domestic violence/child abuse in child's father's household, No. of reports of domestic violence/child abuse in child's mother's household, child's height and weight in all surveys.

Table 4. Robustness check of the effect of domestic on children's risk attitudes

VARIABLES	Father's background	Child's comprehension	Child care	Family strct. & cond.	Full Model
Female	-0.232** [0.115] (0.046)	-0.290*** [0.101] (0.005)	-0.271** [0.106] (0.012)	-0.286*** [0.101] (0.005)	-0.230** [0.115] (0.048)
Event reported at age 1	0.133 [0.201] (0.508)	0.108 [0.196] (0.583)	0.134 [0.196] (0.496)	0.147 [0.198] (0.460)	0.058 [0.204] (0.776)
Event reported at age 5	-0.326* [0.176] (0.066)	-0.242 [0.163] (0.141)	-0.277 [0.173] (0.111)	-0.244 [0.163] (0.137)	-0.300* [0.167] (0.075)
Event reported at age 8	-0.460** [0.209] (0.030)	-0.435** [0.190] (0.024)	-0.458** [0.186] (0.015)	-0.439** [0.181] (0.017)	-0.459** [0.203] (0.026)
Index of mother's depression at age 1			0.012 [0.012] (0.311)		0.016 [0.014] (0.250)
Index of mother's depression at age 5			-0.002 [0.013] (0.868)		0.000 [0.013] (0.974)
Child suffered a major injury at age 1			-0.234* [0.130] (0.074)		-0.096 [0.129] (0.459)
Child suffered a major injury at age 5			0.054 [0.157] (0.730)		0.006 [0.186] (0.974)
Child suffered a major injury at age 8			0.082 [0.172] (0.632)		0.120 [0.181] (0.507)

*continues in next page...*

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

Table 4. Robustness check of the effect of domestic on children's risk attitudes

VARIABLES	Father's background	Child's comprehension	Child care	Family strct. & cond.	Full Model
			<i>...continued</i>		
People caring for child at age 1			0.015*** [0.005] (0.001)		0.013*** [0.004] (0.003)
Mother sought help for dom. viol			0.308** [0.154] (0.047)		0.132 [0.183] (0.472)
Child can read		0.283 [0.179] (0.116)			0.187 [0.175] (0.288)
Child can write		0.013 [0.107] (0.902)			0.057 [0.129] (0.662)
Lotteries presented from safe to risky		-0.367*** [0.094] (0.000)			-0.332*** [0.108] (0.003)
Child has poor vision		-0.289 [0.202] (0.155)			-0.264 [0.231] (0.257)
ln(Father's age)	-0.399 [0.292] (0.174)				-0.297 [0.288] (0.305)
Father's years of schooling	0.012 [0.018] (0.510)				0.014 [0.018] (0.427)
			<i>continues in next page...</i>		

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

Table 4. Robustness check of the effect of domestic on children's risk attitudes

VARIABLES	Father's background	Child's comprehension	Child care	Family stret. & cond.	Full Model
<i>...continued</i>					
Wealth index at age 5				-0.815** [0.401] (0.044)	-0.907** [0.369] (0.016)
Wealth index at age 8				0.326 [0.351] (0.355)	0.443 [0.394] (0.263)
Mother divorced/separated at age 1				0.179 [0.234] (0.445)	0.440 [0.494] (0.375)
Mother divorced/separated at age 5				0.233 [0.147] (0.115)	0.211 [0.170] (0.217)
Mother divorced/separated at age 8				0.274 [0.208] (0.190)	0.423** [0.182] (0.022)
HH experienced bad shocks at age 1				-0.093 [0.104] (0.373)	-0.149 [0.122] (0.223)
HH experienced bad shocks at age 5				-0.135 [0.106] (0.203)	-0.099 [0.108] (0.361)
HH experienced bad shocks at age 8				0.004 [0.077] (0.961)	-0.007 [0.093] (0.943)
Observations	1,461	1,726	1,726	1,726	1,461
R-squared	0.022	0.038	0.029	0.029	0.044
Number of localities	115	118	118	118	115

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

Table 5. Lottery decisions and domestic violence - Instrumental variables estimations

VARIABLES	Dependent variable: 1 = safest,..., 6 = riskiest					
	Fixed effects	$z = dv_5 - dv_1$	Fixed effects	$z = dv_8 - dv_1$	Fixed effects	$z_1 = dv_5 - dv_1$ $z_2 = dv_8 - dv_5$
Female	-0.283*** [0.101] (0.006)	-0.283*** [0.093] (0.002)	-0.285*** [0.104] (0.007)	-0.285*** [0.093] (0.002)	-0.284*** [0.104] (0.007)	-0.283*** [0.093] (0.002)
Event at age 5 ( $dv_5$ )	-0.273 [0.173] (0.117)	-0.388 [0.249] (0.119)			-0.249 [0.166] (0.137)	-0.366 [0.239] (0.126)
Event at age 8 ( $dv_8$ )			-0.454** [0.191] (0.019)	-0.587** [0.263] (0.026)	-0.401* [0.238] (0.092)	-0.584** [0.262] (0.026)
Observations	1,726	1,721	1,726	1,721	1,726	1,721
R-squared	0.020	0.020	0.022	0.022	0.023	0.023
Number of sites	118	113	118	113	118	113

Robust standard errors in brackets, p-values in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10

**Included regressors:** Age of child in months (ln), child's highest school grade comp., mothers years of age (ln), mother's years of education, single mother, mother is Catholic, mother language is not Spanish, No. of siblings, household size, household's wealth index, urban area, indicator that the mother would have liked a child of opposite gender, No. of reports of excessive drinking, No. of reports of domestic violence/child abuse in child's father's household, No. of reports of domestic violence/child abuse in child's mother's household, child's height and weight in all surveys.

Table 6. Domestic violence and parenting style

VARIABLES	Dependent var.: 1 = safest,..., 6 = riskiest		
	Fixed effects	Fixed effects	$z_1 = dv_5 - dv_1$
			$z_2 = dv_8 - dv_5$
			$z_3 = pp_8 - pp_5$
Female	-0.284*** [0.104] (0.007)	-0.265** [0.101] (0.010)	-0.297*** [0.094] (0.002)
Event reported at age 5 ( $dv_5$ )	-0.249 [0.166] (0.137)	-0.285* [0.169] (0.094)	-0.369 [0.240] (0.124)
Event reported at age 8 ( $dv_8$ )	-0.437** [0.185] (0.020)	-0.432** [0.181] (0.018)	-0.599** [0.265] (0.024)
Mother used corporal punishment at age 5 ( $pp_5$ )		0.385 [0.265] (0.149)	
Mother used corporal punishment at age 8 ( $pp_8$ )		0.111 [0.156] (0.480)	-0.410 [0.286] (0.151)
Observations	1,726	1,725	1,720
R-squared	0.023	0.028	0.016
Number of sites	118	118	113

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

<sup>1</sup>**Included regressors:** Age of child in months (ln), child's highest school grade comp., mothers years of age (ln), mother's years of education, single mother, mother is Catholic, mother language is not Spanish, No. of siblings, household size, household's wealth index, urban area, indicator that the mother would have liked a child of opposite gender, No. of reports of excessive drinking, No. of reports of domestic violence/child abuse in child's father's household, No. of reports of domestic violence/child abuse in child's mother's household, child's height and weight in all surveys.

Table 7. Gender differences on the effect of domestic violence

VARIABLES	Cognitive development (Common factor)			Lottery choices (1=safest...6=riskiest)		
	Model 1			Model 2		
	F.E.	F.E. & btspt.	F.E.	F.E. & btspt.	F.E.	F.E. & btspt.
Female	-0.025 [0.035]	-0.025 [0.029]	-0.025 [0.035] -0.204**	-0.025 [0.031] -0.204**	-0.357*** [0.106]	-0.358*** [0.106] -0.285
Event at age 1			[0.103]	[0.098]	[0.300]	[0.286]
Event at age 5			-0.137**	-0.137*	-0.157	-0.157
Event at age 8			[0.061]	[0.083]	[0.213]	[0.236]
Event at age 1×Female			-0.041	-0.041	-0.776***	-0.776***
Event at age 5×Female			[0.056]	[0.074]	[0.246]	[0.282]
Event at age 8×Female			-0.026	-0.026	0.745*	0.745**
			[0.141]	[0.123]	[0.421]	[0.379]
			0.119	0.119	-0.205	-0.205
			[0.087]	[0.108]	[0.377]	[0.356]
			0.032	0.032	0.720**	0.720*
			[0.093]	[0.109]	[0.358]	[0.381]
Total number of reports	-0.123*** [0.037]	-0.123*** [0.043]			-0.396*** [0.144]	
No. of reports×Female	0.040 [0.049]	0.040 [0.054]			0.387** [0.181]	
			<i>Same covariates used in previous tables included</i>			
Observations	1,728	1,728	1,728	1,728	1,726	1,726
R-squared	0.397	0.397	0.400	0.400	0.024	0.029
Number of localities	118	118	118	118	118	118

robust standard errors in brackets  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.10



## 6. Appendix. For only publication.

Table A1. Lottery decisions and domestic violence

Dependent variable: 1 = safest,..., 6 = riskiest								
VARIABLES	Fixed effects							
	Linear regression		Fixed effects		bootstrapped			
					individual level		locality level	
Model 1								
Child's age (ln)	1.973	(0.250)	1.782	(0.196)	1.782	(0.367)	1.782	(0.243)
Child's years of school.	-0.058	(0.557)	-0.022	(0.835)	-0.022	(0.843)	-0.022	(0.844)
Mother's age (ln)	-0.091	(0.632)	-0.149	(0.420)	-0.149	(0.450)	-0.149	(0.444)
Mother's years of school.	0.014	(0.314)	0.019	(0.219)	0.019	(0.230)	0.019	(0.254)
Single mother	0.058	(0.653)	0.144	(0.198)	0.144	(0.296)	0.144	(0.240)
Catholic	-0.064	(0.567)	-0.059	(0.629)	-0.059	(0.634)	-0.059	(0.662)
Non Spanish speaker	-0.320**	(0.032)	0.091	(0.627)	0.091	(0.688)	0.091	(0.648)
No. of siblings	0.024	(0.418)	0.032	(0.256)	0.032	(0.333)	0.032	(0.277)
Household size	-0.011	(0.564)	-0.010	(0.585)	-0.010	(0.623)	-0.010	(0.595)
Wealth index	-0.798**	(0.015)	-0.852***	(0.008)	-0.852**	(0.027)	-0.852**	(0.013)
Urban area	-0.090	(0.462)	-0.044	(0.794)	-0.044	(0.822)	-0.044	(0.849)
Gender mismatch	-0.079	(0.363)	-0.086	(0.278)	-0.086	(0.309)	-0.086	(0.292)
Drinking propensity	-0.005	(0.926)	0.014	(0.801)	0.014	(0.802)	0.014	(0.808)
Father exper. dom. viol.	0.055	(0.318)	0.035	(0.493)	0.035	(0.533)	0.035	(0.506)
Mother exper. dom. viol.	-0.048	(0.359)	-0.067	(0.160)	-0.067	(0.241)	-0.067	(0.143)
Weight at age 1	-0.009	(0.855)	0.006	(0.921)	0.006	(0.911)	0.006	(0.919)
Height at age 1	-0.007	(0.699)	-0.016	(0.383)	-0.016	(0.421)	-0.016	(0.380)
Weight at age 5	0.014	(0.673)	0.024	(0.535)	0.024	(0.505)	0.024	(0.559)
Height at age 5	-0.006	(0.649)	-0.011	(0.454)	-0.011	(0.487)	-0.011	(0.475)
Weight at age 8	0.009	(0.636)	0.010	(0.659)	0.010	(0.635)	0.010	(0.680)
Height at age 8	-0.009	(0.511)	-0.014	(0.341)	-0.014	(0.379)	-0.014	(0.378)
continues...								

continues...

Robust p-values in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10

Table A1. Lottery decisions and domestic violence

Dependent variable: 1 = safest,..., 6 = riskiest								
VARIABLES	Fixed effects							
	Linear regression		Fixed effects		bootstrapped			
					individual level		locality level	
Model 1								
...continued								
Peabody test at age 5	-0.002	(0.546)	-0.001	(0.782)	-0.001	(0.773)	-0.001	(0.783)
Cognitive test at age 5	0.017	(0.505)	0.015	(0.606)	0.015	(0.587)	0.015	(0.614)
Peabody test at age 8	-0.002	(0.754)	-0.001	(0.814)	-0.001	(0.821)	-0.001	(0.827)
Math test at age 8	0.001	(0.941)	0.002	(0.839)	0.002	(0.858)	0.002	(0.851)
Female	-0.271***	(0.003)	-0.286***	(0.006)	-0.286***	(0.003)	-0.286***	(0.010)
Event reported at age 1	0.028	(0.882)	0.156	(0.429)	0.156	(0.433)	0.156	(0.441)
Event reported at age 5	-0.266	(0.132)	-0.256	(0.128)	-0.256	(0.155)	-0.256	(0.148)
Event reported at age 8	-0.410**	(0.033)	-0.440**	(0.020)	-0.440**	(0.039)	-0.440**	(0.033)
Observations	1,726		1,726		1,726		1,726	
R-squared	0.026		0.024		0.024		0.024	
Number of localites			118		118		118	

Robust p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

Table A2. Lottery decisions and domestic violence

Dependent variable: 1 = safest,..., 6 = riskiest								
VARIABLES	Fixed effects							
	Linear		Fixed		bootstrapped			
	regression		effects		individual level		locality level	
Model 2								
Child's age (ln)	2.118	(0.216)	1.950	(0.170)	1.950	(0.309)	1.950	(0.209)
Child's years of school.	-0.055	(0.576)	-0.018	(0.867)	-0.018	(0.870)	-0.018	(0.873)
Mother's age (ln)	-0.092	(0.629)	-0.150	(0.421)	-0.150	(0.468)	-0.150	(0.438)
Mother's years of school.	0.014	(0.311)	0.019	(0.210)	0.019	(0.229)	0.019	(0.259)
Single mother	0.040	(0.756)	0.118	(0.291)	0.118	(0.386)	0.118	(0.324)
Catholic	-0.060	(0.593)	-0.052	(0.671)	-0.052	(0.666)	-0.052	(0.684)
Non Spanish speaker	-0.299**	(0.045)	0.105	(0.576)	0.105	(0.637)	0.105	(0.617)
No. of siblings	0.024	(0.417)	0.032	(0.250)	0.032	(0.280)	0.032	(0.248)
Household size	-0.011	(0.561)	-0.010	(0.591)	-0.010	(0.632)	-0.010	(0.604)
Wealth index	-0.813**	(0.013)	-0.895***	(0.005)	-0.895**	(0.019)	-0.895***	(0.009)
Urban area	-0.083	(0.497)	-0.030	(0.852)	-0.030	(0.873)	-0.030	(0.892)
Gender mismatch	-0.078	(0.369)	-0.087	(0.278)	-0.087	(0.330)	-0.087	(0.289)
Drinking propensity	-0.019	(0.723)	-0.005	(0.928)	-0.005	(0.935)	-0.005	(0.932)
Father exper. dom. viol.	0.058	(0.292)	0.041	(0.428)	0.041	(0.474)	0.041	(0.454)
Mother exper. dom. viol.	-0.044	(0.404)	-0.062	(0.183)	-0.062	(0.269)	-0.062	(0.200)
Weight at age 1	-0.011	(0.831)	0.005	(0.935)	0.005	(0.925)	0.005	(0.935)
Height at age 1	-0.008	(0.677)	-0.017	(0.382)	-0.017	(0.405)	-0.017	(0.370)
Weight at age 5	0.015	(0.666)	0.024	(0.528)	0.024	(0.517)	0.024	(0.555)
Height at age 5	-0.006	(0.633)	-0.012	(0.412)	-0.012	(0.449)	-0.012	(0.436)
Weight at age 8	0.009	(0.647)	0.009	(0.664)	0.009	(0.627)	0.009	(0.681)
Height at age 8	-0.008	(0.555)	-0.012	(0.401)	-0.012	(0.424)	-0.012	(0.429)
Peabody test at age 5	-0.002	(0.557)	-0.001	(0.781)	-0.001	(0.769)	-0.001	(0.783)
Cognitive test at age 5	0.015	(0.554)	0.012	(0.690)	0.012	(0.649)	0.012	(0.706)
Peabody test at age 8	-0.001	(0.780)	-0.001	(0.828)	-0.001	(0.836)	-0.001	(0.838)
Math test at age 8	-0.000	(0.986)	0.001	(0.951)	0.001	(0.957)	0.001	(0.955)
Female	-0.265***	(0.003)	-0.280***	(0.007)	-0.280***	(0.003)	-0.280***	(0.010)
No. of reports of dom. viol.	-0.223**	(0.036)	-0.193*	(0.052)	-0.193*	(0.086)	-0.193*	(0.064)
Observations	1,726		1,726		1,726		1,726	
R-squared	0.024		0.021		0.021		0.021	
Number of localities			118		118		118	

Robust p-values in parentheses

\*\*\* - &lt;0.01 \*\* - &lt;0.05 \* - &lt;0.10

Table A3. Gender differences on the effect of domestic violence

VARIABLES	Cognitive development	Lottery choices
	(Common factor)	(1=safest...6=riskiest)
	F.E. & I.V	F.E. & I.V
	$z_1 = dv_5 - dv_1, z_2 = dv_8 - dv_5$ $z_{1f} = dv_{5f} - dv_{1f}, z_{2f} = dv_{8f} - dv_{5f}$	
Female	-0.041 [0.033] (0.223)	-0.236** [0.105] (0.024)
Event reported at age 5 ( $dv_5$ )	-0.011 [0.104] (0.919)	-0.045 [0.296] (0.879)
Event reported at age 8 ( $dv_8$ )	0.119 [0.104] (0.255)	-0.605* [0.326] (0.064)
Event reported at age 5×Female ( $dv_{5f}$ )	0.175 [0.138] (0.203)	-0.654 [0.445] (0.142)
Event reported at age 8×Female ( $dv_{8f}$ )	0.130 [0.161] (0.420)	0.052 [0.497] (0.917)
		$H_0 : dv_5 + dv_{5f} = 0$ $\chi^2(1) = 3.85$ p-value = 0.0499
		$H_0 : dv_8 + dv_{8f} = 0$ $\chi^2(1) = 1.87$ p-value = 0.1711
Observations	1,723	1,721
R-squared	0.386	0.021
Number of localities	113	113

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

Table A4. Domestic violence and care at age 1

VARIABLES	Number of	Planned	Baby	if the baby cries...		
	people caring for the child	pregnancy	cries frequently	Hold him/her	Swaddle him/her	Breastfeed him/her
Model without gender interaction terms						
Female	-0.131	0.021	-0.044***	-0.038	0.006	-0.028
	[0.217]	[0.025]	[0.014]	[0.026]	[0.014]	[0.022]
	(0.546)	(0.410)	(0.002)	(0.159)	(0.675)	(0.211)
Dom. violence at age 1	-0.687*	-0.110*	0.089	-0.074	-0.005	-0.109**
	[0.363]	[0.060]	[0.059]	[0.049]	[0.041]	[0.045]
	(0.061)	(0.070)	(0.139)	(0.135)	(0.898)	(0.016)
R-squared	0.081	0.029	0.025	0.023	0.015	0.042
Model with gender interaction terms						
Female	-0.133	0.033	-0.046***	-0.034	0.004	-0.027
	[0.236]	[0.025]	[0.014]	[0.029]	[0.016]	[0.022]
	(0.575)	(0.199)	(0.001)	(0.246)	(0.790)	(0.214)
Dom. violence at age 1	-0.703	0.016	0.063	-0.034	-0.026	-0.107
	[0.611]	[0.079]	[0.078]	[0.067]	[0.046]	[0.076]
	(0.253)	(0.843)	(0.419)	(0.615)	(0.574)	(0.163)
Dom. violence at age 1 $\times$ Female	0.027	-0.217**	0.044	-0.069	0.036	-0.003
	[0.510]	[0.085]	[0.086]	[0.084]	[0.065]	[0.089]
	(0.958)	(0.012)	(0.611)	(0.415)	(0.587)	(0.969)
Observations	1,871	1,867	1,871	1,871	1,871	1,871
R-squared	0.081	0.031	0.025	0.023	0.015	0.042
Number of localities	118	118	118	118	118	118

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

**Included regressors:** Age of child in months (ln), child's highest school grade comp., mothers years of age (ln), mother's years of education, single mother, mother is Catholic, mother language is not Spanish, No. of siblings, household size, household's wealth index, urban area, indicator that the mother would have liked a child of opposite gender, No. of reports of excessive drinking, No. of reports of domestic violence/child abuse in child's father's household, No. of reports of domestic violence/child abuse in child's mother's household, child's height.

Table A5. Differential treatment by gender - Fixed effects at household level

VARIABLES	Mayor injuries		Physical Punishment	
	(1)	(2)	(3)	(4)
Event of domestic violence	0.001 [0.021] (0.952)	0.045 [0.033] (0.172)	0.044* [0.024] (0.071)	0.018 [0.033] (0.578)
Event of domestic violence×Female		-0.086** [0.043] (0.043)		0.054 [0.048] (0.265)
Age of child in months	-0.001 [0.001] (0.523)	-0.001 [0.001] (0.491)	-0.004*** [0.001] (0.001)	-0.004*** [0.001] (0.001)
Height of child (cm.)	-0.001 [0.001] (0.617)	-0.001 [0.001] (0.635)	0.002 [0.002] (0.305)	0.002 [0.002] (0.315)
Weight of child (kg.)	0.000 [0.002] (0.882)	0.000 [0.002] (0.852)	0.006* [0.003] (0.057)	0.006* [0.003] (0.059)
Wealth index	0.023 [0.047] (0.621)	0.024 [0.047] (0.611)	-0.044 [0.065] (0.494)	-0.044 [0.065] (0.493)
HH experienced a bad shock	0.025*** [0.010] (0.009)	0.025*** [0.010] (0.009)	0.004 [0.012] (0.774)	0.003 [0.012] (0.789)
Observations	5,773	5,773	3,834	3,834
R-squared	0.014	0.015	0.025	0.026
Number of children	1,943	1,943	1,938	1,938

Robust standard errors in brackets, p-values in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

Table A6. Domestic violence and use of time by children - individual level fixed effects

VARIABLES	Sleep	Child care	Household chores	Non paid work	Paid work	At school	Study	Play
Event of dom. viol.	-0.078 [0.090]	0.003 [0.077]	0.012 [0.059]	0.054 [0.063]	0.005 [0.004]	0.079 [0.133]	0.054 [0.070]	-0.057 [0.171]
Age of child in months	-0.016*** [0.004]	0.006* [0.003]	0.014*** [0.003]	0.008*** [0.003]	0.000 [0.000]	0.091*** [0.007]	0.025*** [0.003]	-0.000 [0.009]
Height of child (cm.)	0.007 [0.008]	-0.006 [0.006]	0.001 [0.006]	0.002 [0.005]	-0.001 [0.001]	0.002 [0.013]	0.000 [0.007]	-0.024 [0.017]
Weight of child (kg.)	-0.008 [0.011]	0.017** [0.008]	-0.008 [0.008]	-0.014** [0.006]	0.001** [0.001]	-0.086*** [0.015]	-0.019** [0.009]	0.067*** [0.021]
Wealth index	-0.202 [0.232]	-0.399** [0.183]	-0.082 [0.181]	-0.297* [0.159]	-0.037* [0.019]	0.686* [0.359]	0.156 [0.183]	0.109 [0.455]
HH experienced a bad shock	0.053 [0.049]	0.042 [0.036]	0.010 [0.031]	0.018 [0.032]	-0.003 [0.002]	0.012 [0.066]	0.047 [0.036]	-0.260*** [0.088]
Observations	3,833	3,832	3,833	3,832	3,833	3,832	3,832	3,833
R-squared	0.110	0.030	0.158	0.045	0.010	0.610	0.300	0.010
Number of children	1,938	1,938	1,938	1,938	1,938	1,938	1,938	1,938

Robust standard errors in brackets

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10

Table A7. Domestic violence and use of time by children - individual level fixed effects

VARIABLES	Sleep	Child care	Household chores	Non paid work	Paid work	At school	Study	Play
Event of dom. viol.	-0.047 [0.124]	0.003 [0.112]	0.098 [0.083]	0.086 [0.099]	0.009 [0.008]	0.080 [0.168]	0.028 [0.096]	-0.277 [0.220]
Events of dom viol. ×Female	-0.065 [0.180]	-0.001 [0.154]	-0.184 [0.117]	-0.070 [0.125]	-0.008 [0.008]	-0.002 [0.270]	0.056 [0.140]	0.471 [0.343]
Age of child in months	-0.017*** [0.004]	0.006* [0.003]	0.014*** [0.003]	0.008*** [0.003]	0.000 [0.000]	0.091*** [0.007]	0.025*** [0.003]	-0.000 [0.009]
Height of child (cm.)	0.007 [0.008]	-0.006 [0.006]	0.001 [0.006]	0.002 [0.005]	-0.001 [0.001]	0.002 [0.013]	0.000 [0.007]	-0.024 [0.017]
Height of child (kg.)	-0.008 [0.011]	0.017** [0.008]	-0.008 [0.008]	-0.014** [0.006]	0.001** [0.001]	-0.086*** [0.015]	-0.019** [0.009]	0.066*** [0.021]
Wealth index	-0.202 [0.232]	-0.399** [0.183]	-0.082 [0.181]	-0.297* [0.159]	-0.037* [0.019]	0.686* [0.359]	0.156 [0.183]	0.107 [0.456]
HH experienced a bad shock	0.053 [0.049]	0.042 [0.037]	0.011 [0.031]	0.019 [0.032]	-0.003 [0.002]	0.012 [0.066]	0.047 [0.036]	-0.262*** [0.088]
Observations	3,833	3,832	3,833	3,832	3,833	3,832	3,832	3,833
R-squared	0.110	0.030	0.159	0.045	0.010	0.610	0.301	0.011
Number of children	1,938	1,938	1,938	1,938	1,938	1,938	1,938	1,938

Robust standard errors in brackets

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10



Table A8. Domestic violence and children's perceptions

	Most people in my neighbourhood can be trusted	I feel safe when I go out of the house on my own	Do you think people in this area treat you well or badly?	Is this area you live in safe for children?	If you had a problem is there someone who would help you?	Do you help other children who have a problem?
	1=Strong. disagree,..., 5=Strongly agree	1=Strong. disagree,..., 5=Strongly agree	0=Badly, 0.5=More/Less, 1=Well	0=No, 0.5=More/Less, 1=Yes	0=No, 1=Yes	0=Never, 0.5=Sometimes, 1=Always
Female	0.086*	-0.138***	0.012	-0.013	0.018**	0.023
	0.049	0.049	[0.011]	[0.015]	[0.007]	[0.016]
Event at age 1	-0.063	0.063	-0.022	0.005	-0.022	-0.037
	0.093	0.133	[0.027]	[0.036]	[0.023]	[0.034]
Event at age 5	-0.078	0.053	-0.011	-0.028	0.006	-0.022
	0.087	0.100	[0.025]	[0.049]	[0.018]	[0.026]
Event at age 8	-0.058	-0.183*	-0.046	-0.063	-0.068**	-0.053
	0.095	0.103	[0.032]	[0.049]	[0.030]	[0.035]
R-squared	0.007	0.021	0.021	0.009	0.023	0.028
Female	0.095**	-0.187***	0.010	-0.018	0.014*	0.037**
	0.045	0.050	[0.013]	[0.016]	[0.008]	[0.016]
Event at age 1	-0.112	-0.193	-0.016	-0.028	-0.027	-0.021
	0.158	0.191	[0.045]	[0.053]	[0.042]	[0.049]
Event at age 5	-0.022	0.024	-0.025	-0.038	0.023	0.007
	0.117	0.117	[0.037]	[0.061]	[0.026]	[0.035]
Event at age 8	-0.028	-0.339***	-0.044	-0.070	-0.114***	0.006
	0.145	0.119	[0.035]	[0.052]	[0.043]	[0.042]
Report at age 1×Female	0.087	0.424*	-0.010	0.057	0.006	-0.022
	0.196	0.222	[0.055]	[0.066]	[0.051]	[0.066]
Report at age 5×Female	-0.115	0.064	0.029	0.021	-0.036	-0.059
	0.182	0.174	[0.048]	[0.060]	[0.034]	[0.050]
Report at age 8×Female	-0.063	0.321*	-0.006	0.014	0.097**	-0.122**
	0.228	0.171	[0.053]	[0.074]	[0.040]	[0.048]
R-squared	0.008	0.025	0.022	0.010	0.028	0.031
Observations	1,857	1,860 <sup>48</sup>	1,853	1,854	1,859	1,859
Number of localities	118	118	118	118	118	118

Robust standard errors in brackets. Basic covariates included.

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10