

Maternal Violence during Early Childhood and Child Development

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Extended Abstract:

We study the effects of violence towards children on early childhood cognitive and non-cognitive development. We use data from a longitudinal nationally representative survey of Chilean children to generate estimates of the effect of different types of violence on child development. We have measures of children's exposure to verbal and/or physical violence for two rounds of the survey conducted in 2010 and 2012. We study its effects on two different tests: one that measures vocabulary (Peabody Picture Vocabulary Test, PPVT) and one that measures socio-emotional development (Child Behavioral Check List, CBCL). We contribute to the literature by providing estimates, which can be interpreted as causal under plausible conditions that are less restrictive than cross-sectional estimates. We find that after controlling for child-mother unobservable characteristics, being exposed to either verbal or physical violence has a negative and significant effect on verbal skills of children, and that exposure to any form of violence negatively affects socio-emotional development, increasing internalization and externalization problems, as well as sleep problems. We also find that systematic exposure to violence over time decreases child development in both areas. Finally, we study heterogeneous effects along three lines: child's sex, age, and maternal education level. We find that both boys and girls are negatively affected by violence, particularly in terms of their non-cognitive development, and that its negative effects are stronger among boys. We also find that the negative effects diminish as children get older, but they remain negative over the complete age range. In terms of mother's education, we find stronger effects on children with lower educated mothers. Overall our estimations consistently and clearly reveal that exposure to violence has causal and significant negative effects on the cognitive and non-cognitive development of children.

Keywords: Violence toward children; spanking; corporal punishment; child development; cognitive and non-cognitive outcomes.

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1. Introduction

Most children in the world are exposed to violence, either physical or psychological, and in many cases to both. Of particular concern for their development and well-being is the fact that the majority of the violence they experience originates in their own family environment. Using comparable data for 63 countries or areas, UNICEF (2014a) shows that on average about four in five children between ages 2 and 14 are subject to some form of violent discipline in their homes. Although in recent years there seems to be some decline in mother's endorsement of physical discipline in the U.S. (Ryan et al. 2016), and several countries have prohibited all corporal punishment of children even within the household, the use of some forms of violence is still highly prevalent in most countries in the world—regardless of their income or development level. Furthermore, parental use of violence is legal in more than seventy five percent of countries in the world (Global Initiative, 2017).

The impact of violence on a child's early development can have lasting consequences, since cognitive and non-cognitive skills have been shown to have significant impact on later outcomes in life, including schooling, wages, occupation, and productivity among others (Heckman et al. 2006; Hanushek and Woessmann 2008; Cunha et al. 2006; Cunha and Heckman 2008 and 2009; Gertler et al. 2014). In turn, children's formation of cognitive skills has been shown to be associated with socioeconomic characteristics of their household, their health, and their parental cognitive development (Paxon and Schady 2007; Schady 2011; Schady et al. 2015; Contreras and González 2015; Galasso et al. 2017). However, less is known about other sources of child development, such as parenting styles and exposure to violence at home (Paxon and Schady 2007; Piquart 2017; MacKenzie et al. 2014).

There is a large literature in psychology, social work, and other related fields, which evidences the detrimental effects of severe or extreme forms of violence towards children, referred to as child abuse or maltreatment, and of lack of care, referred as neglect. Child abuse and neglect, as well as exposure to domestic violence, particularly intimate partner violence, has been associated with a wide range of psychosocial, behavioral and cognitive outcomes (Cicchetti and Barnett 1991; Margolin 2000; Waldinger et al. 2001; Hildyard and Wolfe 2002; Walker et al. 2011). For instance, child abuse has been found to have deleterious

effects on brain development (De Bellis et al. 2002; Teicher et al. 2003), educational achievement and attainment (Leiter and Johnsen 1997; Romano et al. 2015) and that it can negatively affect the ability to acquire or demonstrate skills (Delaney-Black et al. 2002).

In economics violence towards children has received little attention.¹ Using US state-level panel data Paxon and Waldfogel (1999, 2002) show that states with more absent fathers and working mothers have higher rates of child maltreatment. In terms of its effects, Curie and Tekin (2012) find that maltreated children are more likely to engage in crime, and Curie and Widom (2010) find that children that were subject to child abuse and/or neglect have lower education, employment, earnings, and assets in their adulthood. Pieterse (2015) finds that childhood maltreatment is associated with numeracy test scores and dropout in children in one city in South Africa.

Overall, there is a broad consensus on the negative effects of severe forms of violence and neglect towards children, yet there is still an ongoing debate on the effects of less harsher forms parenting that include physical or corporal punishment but that do not reach level that can endanger the child integrity.² Many studies have analyzed the association between physical punishment and children's outcomes, including several widely cited reviews and meta-analyses (Larzelere 2000; Gershoff 2002; Benjet and Kazdin 2003; Larzelere and Kuhn 2005; Ferguson 2013; Gershoff and Grogan-Kaylor 2016). These studies have several common findings, which include an increased child compliance following corporal punishment, and increasing negative effects with age and with frequency of punishment. However, there is less agreement on the strength of the association between corporal punishment and other outcomes such as moral internalization, aggression, antisocial behavior, and mental health, among others (MacMillan and Mikton 2017).

One of the main reasons for the lack of agreement on the effects of lesser forms of punishment, such as spanking, is that many studies cannot infer causal a relationship between

¹ More attention has been devoted to intimate partner violence. See among others: McElroy and Homey, 1981; Tauchen et al. ,1991; Tauchen and Witte, 1995; Farmer and Tiefenthaler, 1996; Bloch and Vijayendra, 2002; Pollak, 2004; DeRiviere, 2008; Card and Dahl, 2011; Anderberg and Rainer, 2013; Bobonis et al., 2013; Hidrobo and Fernald, 2013; Anderberg et al., 2016; Hsu, 2017; Cools and Kotsadam, 2017; and Kim et al., 2017.

² Gershoff and Grogan-Kaylor (2016) define physical punishment as “noninjurious, openhanded hitting with the intention of modifying child behavior”. Within this category belongs spanking that it is usually defined as mild open-handed strike to the buttocks or extremities (Ferguson 2013).

violence and children's outcomes. First, studies do not use experimental data for obvious ethical objections to the use of randomized control studies of physical violence. Additionally, most studies are composed of small samples, use self-reported data (either from parents or children), and/or use cross sectional data, which diminishes their potential to generate causal estimates.

Our study seeks to contribute to literature of the effects of less harsher forms of parenting on early childhood development. Cognitive development is measured using the Spanish version of the Peabody Picture Vocabulary Test (PPVT) and non-cognitive development is assessed using the Child Behavioral Checklist (CBCL) test. Two previous studies are closely related to ours. Paxon and Shady (2007) study the relationship between children's early cognitive development and socio-economic status, child health, and parenting quality in Ecuador.³ Parenting style is studied incorporating, among others, an index of parenting harshness. They find that it is negatively correlated with cognitive development. However, as they acknowledge, their estimates must be interpreted with caution in terms of assigning causality given their use of cross-sectional data. As part of their study on the effects of maltreatment Curie and Tekin (2012) incorporate measures of physical abuse. Using OLS, sibling and twins estimates they find that physical abuse increases the probability of criminal activity, and the effect increases with the frequency of violence.

To overcome some of the previously described limitations in the literature we estimate the effect of violence on cognitive and non-cognitive (socio-emotional) development of young children using a longitudinal data set that includes two observations, one in 2010 and another in 2012. With this approach we are able to control for time-invariant, child-mother specific unobservables that could affect child development as well as the violence environment in the household. Our estimates can be interpreted as causal evidence of the harmful effects of harsh parenting under less restrictive assumptions than previous estimates in Paxon and Shady (2007) and Curie and Tekin (2012).

A second contribution is that unlike most studies that use self-reported measures of violence, our paper uses direct observational measures of violence.⁴ Our data on violence

³ They also use the PPVT test as their cognitive outcome.

⁴ Paxon and Shady (2007) also use observational measures of violence.

comes from a nation-wide survey on early infancy in Chile. In the survey, children were administered a series of cognitive and non-cognitive tests. At the end of the visit in which tests were carried out, test administrators—mostly psychologists—filled out a questionnaire reporting several measures of maternal attitudes towards the child, including verbal and physical violence, during the visit.⁵ With this information we are able to create several categories of maternal violence, including verbal and/or physical violence.

We find that after controlling for child-mother unobservables, exposure to either verbal or physical violence has a negative and significant effect on verbal skills of children (our cognitive outcome). In terms of non-cognitive outcomes we find that exposure to any of the violence measures significantly affects the likelihood of behavioral problems and the probability that the behavioral problems are considered to be in a clinical range. In addition, we find that systematic exposure to violence over time decreases child development.⁶

We also explore in more detail the impact on children's behavioral problems. The behavior problems detected with the CBCL test can be classified in three categories: internalization, externalization, and sleep problems. We study the effects of violence on each of them, and we find that all of our measures of violence increase both internalization and externalization problems. Furthermore, two of the violence measures (verbal and any type of violence) increase sleep problems.

Finally, we study heterogeneous effects along child's sex, age, and maternal education level. We find that both boys and girls are negatively affected by violence, particularly in terms of their non-cognitive development, and the negative effects are stronger on boys. We also find that negative effects diminish with the age of the child but they remain negative over the complete age range in our sample. In terms of mother's education, we find stronger effects on children with lower educated mothers. Overall our estimations consistently show that exposure to violence has significant and negative effects on both, cognitive as well as non-cognitive early childhood development.

The remainder of the article is organized as follows: section 2 describes the

⁵ These questions were part of the Home Observation for Measurement of the Environment (HOME) questionnaire filled by interviewers.

⁶ Exposure was defined as experiencing violence in none of the surveys, in one or in both surveys.

methodology and the identification strategy; section 3 describes the data and variables; section 4 presents and discusses the results; and section 5 provides a discussion on the implications of our study.

2. Empirical Methodology

To estimate the effects of violence on child performance in cognitive and non-cognitive outcomes we perform two different analysis. We first estimate a model of the contemporaneous effects of exposure to violence that controls for past levels of the outcome variable and predetermined characteristics of the child, mother and household:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_2 V_{i,t} + \beta_3 C_{i,t-1} + \beta_4 M_{i,t-1} + \beta_5 H_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is a contemporaneous measure of cognitive or non-cognitive outcome and $Y_{i,t-1}$ is the past level of the outcome variable. $V_{i,t}$ is our variable of interest that measures exposure to violence in period t , and $C_{i,t-1}$, $M_{i,t-1}$ and $H_{i,t-1}$ are vectors of predetermined child, mother and household characteristics.

Childs controls ($C_{i,t-1}$) include age in months of the child, child's sex, height and weight at birth, whether she was premature, height, weight and cranial circumference at the moment of the first evaluation, and a dummy variable that takes value 1 if the child is indigenous. Mothers' characteristics ($M_{i,t-1}$) includes years of schooling, number of children, whether she has a partner, whether she is head of the household, and age and age squared. It also includes characteristics of the pregnancy such as whether she was diagnosed with mental problems, with postpartum depression, the number of health problems during pregnancy, whether the fetus was diagnosed with health problems, whether she smoked, consumed alcohol or drugs, and the number of medical problems that occurred during delivery of the child. Finally, it includes controls for cognitive and socioemotional development of the mother measured by the Wechsler Adults Intelligence Scale (WAIS) and the Big Five Inventory (BFI) tests, respectively. Household characteristics ($H_{i,t-1}$) includes whether the household is urban or rural and its income per capita in the first round of the survey. We also incorporate a series of regional dummies to control for systematic

differences across the fifteen administrative regions of the country.

The inclusion of past test scores in the model allows us to control for baseline development levels, which include the effect of past exposure to violence, at the same time that allows us to obtain estimates for the association between child, mother and household characteristics with our measures of child development. As these estimates use the cross-sectional variation between children, we cannot interpret them as causal estimates of the effect of violence.

In order to generate estimates that can be interpreted as causal under less restrictive assumptions, we next estimate a child-mother (household) fixed effect model of the following form:

$$Y_{i,t} = \beta_0 + \beta_1 V_{i,t} + \beta_2 C_{i,t} + \beta_3 M_{i,t} + \beta_4 H_{i,t} + \rho_i + \mu_t + \varepsilon_{i,t} \quad (2)$$

where $C_{i,t}$, $M_{i,t}$ and $H_{i,t}$ are previously defined vectors of time-variant child, mother and household characteristics, ρ_i is a child-mother (household) fixed effect as by design our data come from a survey that collects cognitive and non-cognitive data on one child per household (and her caretaker), and μ_t is time fixed effect.

Given that exposure to violence is not a random event, even controlling for the past levels of the outcome of interest and a large set of child, mother and household covariates, as in equation (1), estimates might be biased if there are unobserved household factors that simultaneously affect children's outcomes and mother's likelihood of exerting violence on her child. To the extent that those factors are time invariant, such as child behavioral tendencies or mother's personality traits, implementing a panel estimate that includes child-mother fixed effects would control for those unobservables. Thus, equation (2) generates estimates of β_1 —our parameter of interest—that can be interpreted as causal under less restrictive assumptions than with a cross-sectional sample.

3. Data

Our data comes from the two available rounds of the Early Childhood Longitudinal Survey (Encuesta Longitudinal de Primera Infancia, ELPI, in spanish) carried out in 2010

and 2012 in Chile. ELPI is a longitudinal survey designed to be representative of the population of children from 6 months to 7 years at the country level.

The survey was carried in two steps. On a first visit to each household, a sociodemographic survey was taken, which collects information on several socio-economic characteristics of the household, its demographic composition, parental employment status, health of the child, medical conditions of the mother and child during pregnancy, among others. On a second visit, several child developmental tests instruments were applied to the main caretaker (mostly mothers) and the child. The tests were selected to assess cognitive, socioemotional and physical development of the child, as well as the cognitive and socioemotional state of the mother.

3.1 Children's cognitive and non-cognitive tests

We focus on two widely known instruments: the Peabody Picture Vocabulary Test (PPVT) and the Child Behavioral Checklist (CBCL). The PPVT measures auditory vocabulary and has been used in several international studies as a measure of cognitive development (Contreras and Gonzalez 2015, Coddington et al. 2014, Roy et al., 2011, Paxon and Schady 2007).

The CBCL assesses behavior and socioemotional competencies of the child as reported by the parents, and can be used to identify problematic areas in child development (Achenbach and Rescorla 2000). The CBCL test measures results for seven clinical syndromes included in the Diagnostic and Statistical Manual of the American Psychiatric Association, DSM IV (American Psychiatric Association 1994). In addition to working with the overall results of the test, we also use three subcategories in which the CBCL test is decomposed: internalization, externalization and sleep problems. The internalization category includes problems related with the child herself and incorporates four of the seven syndromes: emotional reactivity, anxiety/depression, somatic complaints, and autism. The externalization category includes problems involving conflicts with other people and the expectations about the child. It groups two syndromes: attention problems and aggressive behavior. The sleep problems syndrome stands alone. For both tests we use the T-scores reported in the survey. Descriptive statistics of the test results are reported in Table 1. Our

final sample includes 3,686 and 4,525 children in the PPVT and CBCL estimates, respectively.

Our outcomes are measured as continuous variables, thus, one possible question that arises relates to how to interpret results. For instance, if we find a negative association between violence and tests scores, how does violence translate in putting children at risk in terms of their development? To facilitate interpretation, we use the categories created in ELPI for both PPVT and CBCL variables depending on the T-scores. We create binary variables that indicate whether the child is at risk in terms of development. Table 2 shows the percent of the sample that belongs to each category, and the standardized score used to define each one. Using these categories we generate categorical variables for children falling into critical levels. For PPVT we grouped the three lower score categories (extremely low, moderately low and below average). We have that 25 and 20 percent of the sample belongs to these three lower achievement categories in 2010 and 2012, respectively. For CBCL we grouped children in the risk and clinical range categories. For CBCL the percentage of children in either of these two categories are 51 in 2010 and 34 in 2012.

3.2 Measures of violence towards children

Our violence measures are obtained from another instrument applied by ELPI: the HOME (Home Observation for Measurement of the Environment) questionnaire. Home is applied during the second visit to households, and measures several characteristics of the family environment, including learning materials, language stimulation, physical environment, academic stimulation and child acceptance, among others. ELPI applied an adaptation of the HOME test from Caldwell and Bradley (1984). Among the questions included in HOME there are a series that describe the behavior of the mother towards the child during the visit, including whether the mother shouts, reproaches, criticizes, annuls, or hits her.

We construct four binary variables that capture violence toward the child during the visit.⁷ First, a variable that is equal to one if the child is subject to verbal or psychological

⁷ Appendix 1 reports the specific HOME questions included in the survey.

violence. This includes whether the mother shouts, reproaches, criticizes, or annuls the child. We denominate this variable as verbal violence. Second, a physical violence variable equal to one if the mother hits the child during the visit. Third, a measure for some violence that is equal to one if the child is subject to either verbal or physical violence. Lastly, a measure of both types of variables, equal to one if the child receives verbal and physical violence.

The HOME questionnaire applied in ELPI has two relevant characteristics in terms of our violence measures: first, it was responded not by the mother, but by the person administering the tests; and second, it was completed before the end of the visit. By design of the survey the person administering the test had to be someone highly trained, and in all cases it was a psychologist with experience in infant evaluations and/or psychological tests. Thus, in contrast to most studies, ours uses direct observational data that does not suffer from self-reporting biases, as it is reported by the test administrator, or recall problems as the questionnaire was filled during the visit.

Given these characteristics of the data, it is likely that our violence measures represent lower bounds for the actual levels of violence toward children. First, it is obtained using information from a relatively brief period of time, i.e., the duration of the visit, which according to survey design should be of at least three hours. Second, it is likely that the presence of the test administrator deters some mothers from engaging in conducts that can be perceived as socially undesirable. For both of these reasons we expect our measures of violence to underestimate the actual prevalence within the household, compared to studies that use parental reports over longer periods of time. However, it is also likely that our measure of violence is capturing the more severe cases of exposure to violence within the population.

For instance, internationally comparable data from the World Studies of Abuse in the Family Environment project (WorldSAFE) which reports retrospective data, indicates that in Chile 84 percent of parents report yelling or screaming at the child in last 6 months, and 51 percent report spanking children in the buttocks with their hands (Krug et al. 2002). This numbers are larger than our measures of violence, which are reported in Table 3 for each round of ELPI, and for the panel sample. In the latter sample, test administrators reported that 19.6 percent of children were victims of verbal violence while the evaluations were

taking place, and that 12 percent were victims of physical violence. Almost 23 percent of children evaluated were victims of some type of violence, and 11 percent of children were both shouted and hit while assessments were conducted.

These levels of violence show that a significant fraction of children are exposed to violent environments, and in addition, it is worrisome to notice that all types of violence showed some increase between 2010 and 2012. These results are consistent with other reports of violence toward children in Chile that have shown little or no decrease in some forms of violence, particularly mild physical violence (UNICEF 2014b).

Besides these four measures of violence, and given that we have longitudinal data, we construct variables that measure the exposure to violence over time. Thus, we construct three variables that indicate whether the child was subject to violence during both surveys rounds, only in one of them or in none.⁸ Table 4 shows that 6 percent of children were victims of some type of violence in both years and 32 percent of children were victim of some type of violence in at least one of the two years.

Figures 1 and 2 show the average (and confidence intervals) of test scores by violence category (using exposure to any type of violence) and age (months). PPVT tests show that children aged 30 to 60 months exposed to some type of violence have lower cognitive development, particularly around 35 to 45 months of age. In turn, CBCL shows that children exposed to violence have higher scores and therefore more prone to present some behavior and socioemotional problems over the complete range of ages in the sample.

3.2 Mother's cognitive and socioemotional development and other control variables

In our estimates we also want to control for cognitive and socioemotional development of the mother, as it has been shown that they significantly affect their children's development (Contreras and Sepulveda, 2016). Thus, we use results for the Wechsler Adults Intelligence Scale (WAIS) and the Big Five Inventory (BFI) tests applied to caregivers. In the WAIS test we include two variables measuring both the digit span and vocabulary

⁸ In the results section we report results for the variable that measure exposure to any type of violence (verbal or physical), although results for the other variables are similar to the ones reported here and are available upon request.

subtests, which provide a measure of the mother's cognitive ability. In turn, the BFI assess socioemotional skills of the mother, separated in five different categories: extraversion, agreeableness, conscientiousness, neuroticism, openness to experience (John and Srivastava 1999). Descriptive statistics for other children, mother, and household controls (described in Section 2) are reported in Table 5.

Other control variables measured in 2010 that are not reported here include, child's weight and height at birth, weight, height, and cranial circumference of the child, child's age (in months), whether the child is of indigenous descent, mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Also, whether the mother had problems during pregnancy: mental problems, postpartum depression, fetus diagnosed with medical problems, and preterm delivery. Whether during pregnancy the mother consumed tobacco, alcohol, or drugs, and the number of health problems she had during pregnancy and during delivery. Household variables include whether the household is located in an urban area, household income, a series of categorical variables for region of residency.

4. Results

4.1. Cross-sectional estimates with initial child development

Our empirical strategy first estimates the effects of violence on cognitive and non-cognitive development controlling for the initial development of each child. Results are reported in Table 6. They show that being exposed to verbal violence (column 1) or to some type of violence (column 3) are negatively and significantly associated with cognitive development.⁹ Noticeably, the effects of suffering physical violence (column 2) or being exposed some both types of violence (column 4) have negative but not significant association PPVT test scores. One possible explanation for the lack of significance is the fact that physical and both types of violence have a much lower prevalence than verbal or both types (the last row of the table reports the average of the respective violence measures). In terms

⁹ In the PPVT test higher values are associated with higher cognitive development. As the CBCL tests measures clinical syndromes higher values mean that the child has more behavioral problems.

of non-cognitive development, all four violence variables are significantly associated with increases in children's behavioral problems.

At the same time results show that the other variables are associated to cognitive and non-cognitive development in expected ways. Initial levels of cognitive and non-cognitive development (PPVT and CBCL test in 2010) indicate that children with higher initial cognitive development obtain better results, and children with more initial developmental problems tend to have more problems later on in life. These results point out towards significant levels of persistency in development, highlighting the importance of early interventions to reduce inequality across children.

Mother's characteristics are also relevant. First, her verbal skills (WAIS vocabulary) are significantly associated with both types of development. In terms of her personality traits, we find a significant association between her extraversion and cognitive development. Both results point towards the importance of mother's communication skills. In turn, higher levels of neuroticism of the mother are associated with children having more behavioral problems. Mother's years of schooling is significantly associated with both types of development. Finally, girls have better scores in the language test (PPVT) and present higher levels of clinical problems (CBCL).¹⁰

We expect the effect of violence to be negative on child development, however, we also want to have a sense of how important is the effect on a child's life. One way to assessing this question is to explore whether violence puts children at some form of risk or danger, both in their cognitive and non-cognitive development. For this we use our categorical variables that measure whether children fall into a relatively low cognitive development in the PPVT, or into the risk/clinical categories in the CBCL test. The effects of different types of violence on the probability of falling into these categories are reported in Table 7.¹¹

Results are consistent with estimates using the continuous measure of tests results. Exposure to either verbal or some type violence increase the probability of falling into a low

¹⁰ Regressions are estimated including the full set of control variables described in Section 2. For brevity we report a subset of variables, however, tables with all coefficients are available in Online Appendix 1.

¹¹ We report results of a linear probability model, although we also estimated probit regressions with similar results. Results are available upon request.

level of verbal development (PPVT) by 15 and 17 percent respectively.¹² In terms of non-cognitive outcomes three of the four violence measures are associated to increases in the likelihood of being classified in the category of having clinical problems (CBCL). For instance, exposure to violence increases the probability of been in clinical range by 11 percentage points which represents a 31 percent increase in the probability. These results indicate that violence is associated with large increases in the probability of falling into problematic developmental levels. The other control variables show similar results as previously discussed, with the addition of the conscientiousness variable: mother's that show higher levels of responsibility are associated with children less likely to be classified in the clinical range category.

Next, we take advantage of the two rounds of the survey and investigate if persistence of violence over time is relevant by introducing two categorical variables indicating whether the child was exposed to some form of violence in both years or whether she was exposed only one time (the comparison group are children that were not exposed to violence in either rounds). Results, reported in Table 8, indicate that the greater exposure to violence is, children fare worst in both outcomes. Children that were exposed to some form of violence in at least one year (32 percent of children) have lower developmental levels than children that were not exposed to violence, but children exposed to violence in both rounds (5.8 percent of children) have even lower developmental levels. These results imply that exposure to systematic violence over time is detrimental to child development. They also highlight the importance of being subjected to violence over time and, therefore, the relevance of efforts conducive to reducing violence towards children as early as possible.

4.2. Panel estimates with child-mother fixed effects

As discussed in the methodology section, we are able to estimate the effects of violence with a panel of children, thus controlling for the child-mother and household unobservables that could be correlated with exposure to violence and test results. Estimates for the violence variables are presented in Table 9. We found that after controlling for these

¹² In order to compute these percentage increases we divide the estimated coefficient of the violence measure by the mean of the dependent variable (reported at the bottom of the table) and multiply it by 100.

unobservables, exposure to either verbal or physical violence still has a negative and significant effect on verbal skills. In term of non-cognitive outcomes, we find that all four measures of violence significantly affect child development, with exposure to any form of violence having the largest effect. It is interesting to notice that for both outcomes the panel estimates are smaller relative to the cross-sectional ones: for PPVT estimates are less than half, and for CBCL the are between 20 to 40 percent smaller. The difference with cross-sectional estimates indicates that unobservables do play a role in shaping the effect of parental violence. In our case, time invariant children-mother unobservables account for a significant fraction of the effect of violence, therefore they need to be accounted for in the estimations.

Also using the panel of children, we estimate effects of violence on the probability having cognitive and non-cognitive developmental levels that could put children at some form of risk or danger. Results are reported in Table 10. Although no significant effect is found in the PPVT test, they show that exposure to either, both or any type of violence does significantly increases children's probability of being classified in the clinical range category of the CBCL test. For instance, exposure to either verbal or physical violence (column 7) increases the clinical range likelihood by almost 6 percentage points or 14 percent.

As the CBCL measures problems related to seven syndromes, which are classified into three categories of problem (internalization, externalization, and sleep problems), we next explore the effect of violence in each of these categories. Results are reported in Tables 11 and 12. Table 11 reports results where the dependent variable are test scores, and they show that consistently, all types of violence have the causal effect increasing both internalization and externalization problems. In addition, two of the violence measures (verbal and some violence) have an effect increasing sleep problems in children. These results are interesting as they highlight that violence can contribute to the development or deepening of a wide range of behavioral problems in children, and they are not confined to one specific area. These results are also observed when we estimate the effects on the probability of been in a clinical range (see Table 12). For instance, exposure to some form of violence increases by 13 percent the likelihood of clinical range in the internalization and externalization (columns 3 and 7), and by 5 percent of having sleep problems.

Overall our estimations consistently show that exposure to violence has significant effects in cognitive as well as non-cognitive development. In addition, we find that repeated exposure to violence has more severe effects, and that the effects on non-cognitive development can reach a broad set of behavioral areas, including internalizing, externalizing and sleep problem.

4.3 Heterogeneous effects of violence

Next, we study whether it is possible that the effects of violence might vary according to children's characteristics or their mother's. We report estimates of equation (2) the panel estimates which are our preferred method.

First, we estimate results by the child's sex. Results are reported in Table 13 and they show that for both girls and boys the effect on cognitive development (PPVT test) although still negative, and similar in magnitude to those reported in the complete sample (Table 9), is no longer statistically significant (columns 3). We attribute the lack of significance to the loss in power due to smaller sample sizes, relative to the full sample, as indicated by the larger standard errors in these estimates. However, for socio-emotional development (CBCL test) we find that all violence measures significantly increase problems for both girls and boys. In addition, we observe that the effects boys are stronger than in girls, with the exception of the variable that includes both forms of violence. One possible explanation could be that boys have higher rates of prevalence, which turns out to be correct, although they are only present in the verbal and some violence variables. There are no discernible differences in the physical and both forms of violence variables, as can be seen in the last row of each panel in Table 13, which reports the average of the violence variable in each group. Another possibility is that boys are punished with greater severity or with a higher frequency (both of which we cannot observe in our data), thus generating stronger effects on the outcomes.

We also study whether the effect of violence varies depending on the age of the child in 2010. We classified children in three groups: less than 48 months, between 48 and 71 months, and 72 or more months. This classification responds to ages for different school levels: less than 48 includes children not old enough to go to preschool, 48 to 72 months

include preschoolers, and 72 or older includes primary school age children. We hypothesize that the effects of violence could be mediated by their access to schooling, the time they spend with their caretakers, and thus exposed to maternal violence, among others.

Results are reported in Table 14.¹³ We find several interesting results. First, notice that exposure to violence does not significantly varies with age across these three groups (as reported by the average violence at the bottom of each panel). In terms of the estimates for cognitive development results indicates that effects are concentrated at younger ages, and that for older children (primary school aged children) the effect disappears. A similarly decreasing effect is observed for non-cognitive development, although the effect still remains detrimental in some types of violence (verbal and any violence) even for school aged children. It is possible that a decreasing effect is due to a relative decreasing intensity and /or frequency of violence, or that as children grow they develop coping mechanism to deal with violence thus reducing its effects. Although our results do not provide information regarding the mechanisms that could explain this decreasing effect with age, still our estimate provide relevant information that could guide, for instance, policies aimed at reducing the impacts of violence toward children.

Finally, we study whether the effects of violence vary depending on the level of education of the mother. We use mother's education as proxy for permanent income of the household, as current income levels could be affected by child behavior or cognitive development.¹⁴ We generate two categories of education: mother with 12 or less years of education completed and mothers with more than 12 years (more than high school).

In term of levels of violence, we observe that there is slightly less violence in the group of more educated mother, particularly verbal violence (and therefore in the both types variables), although their overall levels are still high. In the estimations we find that the effect of violence seems to be larger in children from less educated mothers. In the case of cognitive development, we find that some violence does have a negative effect. For children with more

¹³ For the group of children with less than 48 months of age we do not have estimates on cognitive test, as the PPVT test is applied to children older than 30 months of age. Thus, there are no children aged less than 48 months in 2010 with tests both in 2010 and 2012.

¹⁴ Income measures might be correlated with child behavior or cognitive development, as for instance mothers could choose not participate in the labor market if they observe behavioral problems or a lagging cognitive development in their children.

educated mothers we find that although the effects are not significant the point estimates are larger but estimated with less precision, most likely due to the reduced sample size. For socio-emotional development we find negative effect in both groups of children, but stronger effects in the group from less educated mothers. These results suggest that the access to a better economic environment may ameliorate the negative effects of violence, but violence still will increase the level of socio-emotional problems in children.

5. Conclusions

There is an ample consensus on the deleterious effects of child abuse and neglect on children. However, the consensus diminishes when lesser forms of violence towards children, including verbal violence or corporal punishment are analyzed (MacMillan and Mikton 2017). The main reason for this lack of consensus is the lack of strong causal evidence of the relationship between mild forms of violence towards children and different outcomes.

We attempt to contribute to the literature by providing estimates, which can be interpreted as causal under plausible conditions, of the effect of experiencing violence in early life stages and cognitive and non-cognitive development. Our work contributes along several directions to this limited literature in economics.

First, by taking advantage of a longitudinal data set of children, therefore controlling for child-mother time-invariant unobservables that could be correlated with violence and child development (in addition to controlling for other time variant covariates), we generate estimates that could be interpreted as causal under less restrictive conditions than with cross-sectional data. To our knowledge no other study in economics has used this methodology in the context non-harmful violence towards children, therefore we provide results that advance results provided by Paxson and Shady (2007) and Curie and Tekin (2012), whom provide estimates using cross sectional data, and thus cannot be interpreted as causal.

Second, we study the effects of violence on two type of outcomes: cognitive and non-cognitive development using standard measures (test): PPTV for cognitive development and the CBCL test for non-cognitive development. Third, we study whether different types of violence toward children—verbal and/or physical—have different effects on their

development. We also take advantage of the longitudinal data to study whether systematic exposure to violence over time affects child development.

Our estimates indicate that after controlling for child-mother time invariant unobservables, exposure to violence not only increases the level of behavioral problems in children, but also can significantly increase the probability of children falling into categories deemed as risky or in clinical ranges, thus in critical developmental levels. In addition, we find that there are heterogeneous effects, with boys, younger children, and children from household with less educated mothers suffering more negative effects. Interestingly, our data suggest that these heterogeneous effects are not driven by differences in the prevalence of violence across groups, but probably from the way in which children in those groups are affected and can cope with exposure to violence.

As expected, given the inherent difficulties in measuring exposure to violence, our estimates have some limitations. We cannot disentangle whether the negative effect comes from immediate exposure to violence, if for instance, being hit during the test administration and interview reduces children confidence or concentration and therefore their immediate performance in the tests, from the effects of belonging to a household where harsh parenting, at least from the mother, is present.

Also, our measures of violence do not fully capture the intensity of violence suffered by children. Although we are partly capturing intensity through separating verbal from physical violence, still there are degrees of both verbal and physical violence that we are not accounting for. In addition, we are not fully capturing how systematic or repetitive is exposure to violence, although again, we attempt at partially capturing this dimension by using two separate observations over time.

These limitations are also present when we estimate heterogeneous effects as, for instance, we have no information regarding how harshness or frequency varies between boys and girls (although our measures indicate no significant differences in the levels of violence between these two groups). Still, we believe that our measures of violence allow us to capture some of the potential effects of different categories of violence on child development.

All these limitations point toward further avenues of research in this area. Generating

better measures of exposure, intensity and persistency of violence suffered by children, and characteristics of parenting styles, as well as generating better longitudinal data sets would allow us to improve our estimates of the causal effects of exposure to violence.

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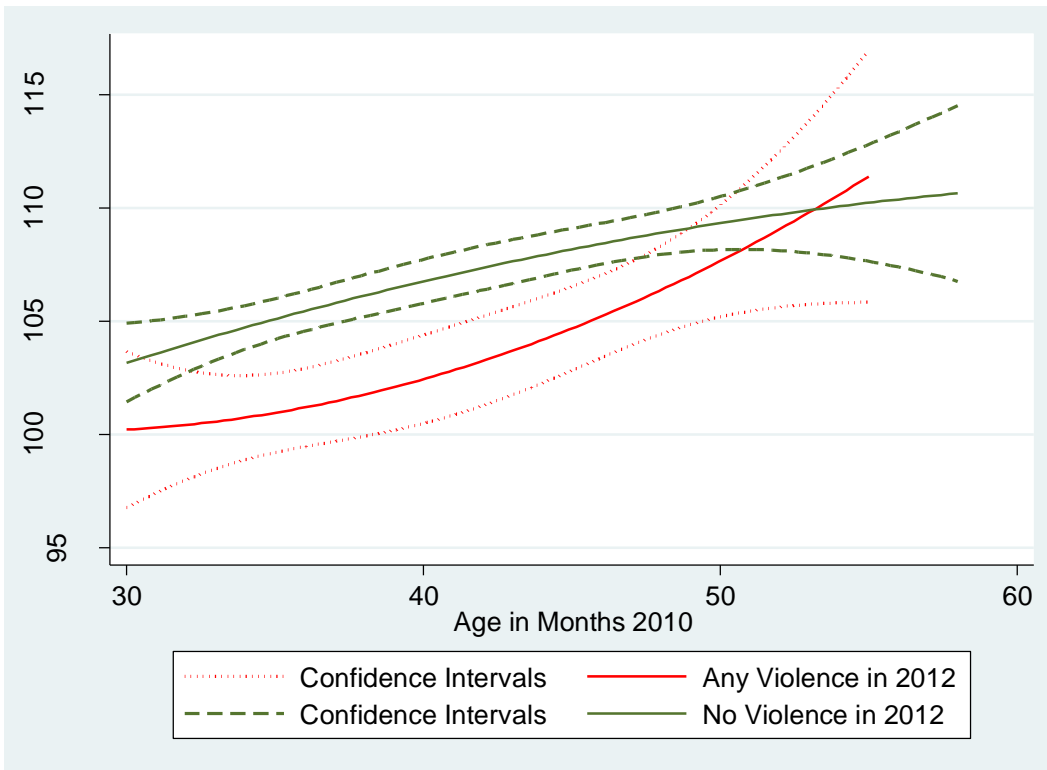
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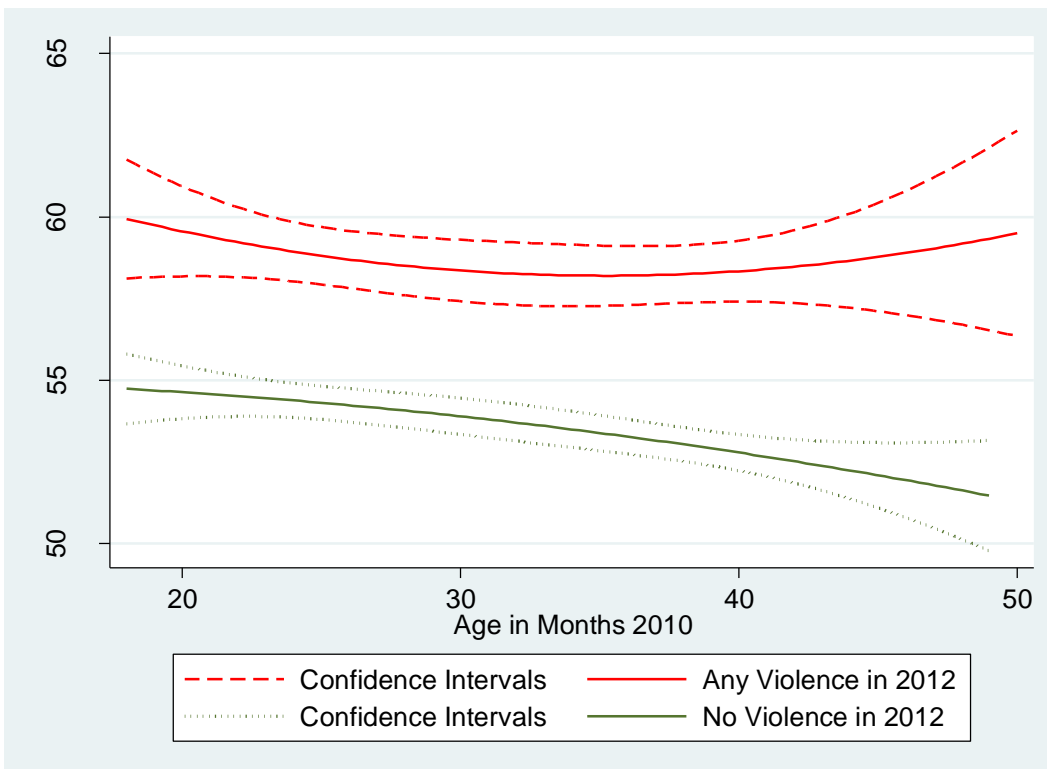
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Figure 1. Average PPVT test scores by violence category and age (T-scores)



Notes: Authors' calculations using 2010 and 2012 ELPI surveys.

Figure 2. Prevalence of violence by age and CBCL test scores (T-scores)



Notes: Authors' calculations using 2010 and 2012 ELPI surveys.

Table 1. Descriptive Statistics of PPVT and CBCL test (T-scores in 2010 and 2012)

Variables:	2010	2012
Panel A: PPVT Statistics		
Mean	104.19	106.04
Standard Deviation	(15.19)	(18.75)
Observations	3686	
Panel B: CBCL Statistics		
Mean	60.23	54.82
Standard Deviation	(9.59)	(11.62)
Observations	4525	

Notes: Authors' calculations using 2010 and 2012 ELPI surveys.

Table 2. Descriptive Statistics of PPVT and CBCL categories (2010 and 2012)

Test:	2010	2012	T score Range
PPVT			
Extremely Low	0.33	5.56	55-70
Moderately Low	7.70	7.54	71-85
Average Low	17.23	7.11	86-95
Average	31.99	20.51	96-103
Average High	18.45	26.78	104-115
Moderately High	18.10	24.58	116-130
Extremely High	6.21	7.92	131-145
Observations	3686		
CBCL			
Normal	48.86	65.75	<93
Risk	14.72	11.60	93< T <97
Clinical Range	36.42	22.65	>98
Observations	4525		

Notes: Authors' calculations using 2010 and 2012 ELPI surveys.

Table 3. Frequency of Violence by type (percentages in 2010, 2012 and panel samples)

Type of Violence:	2010	2012	Panel
PPVT Sample			
Verbal	17.7	21.0	19.7
Physical Violence	10.6	13.5	12.4
Any Violence	21.2	23.5	22.6
Both forms of violence	10.2	11.7	11.3
Total Observations	3686	3686	10584
CBCL Sample			
Verbal	16.7	21.3	19.7
Physical Violence	10.2	13.5	12.4
Any Violence	20.3	23.9	22.7
Both forms of violence	9.6	11.8	11.2
Total Observations	4520	4525	12910

Notes: Authors' calculations using 2010 and 2012 ELPI surveys. Reports percentage of children subject to each type of violence in each year. Types of violence are not mutually exclusive.

Table 4. Persistence of violence by type (percentages in panel sample)

Type of Violence:	Persistence:		
	None	One time	Both Surveys
PPVT Sample			
Verbal	65.8	29.8	4.4
Physical Violence	77.2	21.5	1.3
Any Violence	61.4	32.6	6.1
Both forms of violence	79.3	19.6	1.2
CBCL Sample			
Verbal	66.1	29.6	4.4
Physical Violence	77.6	21	1.3
Any Violence	61.9	32.1	6.0
Both forms of violence	79.7	19.2	1.1

Notes: Authors' calculations using 2010 and 2012 ELPI surveys. The number of observations is 3,686 in the PPVT sample and 4,525 in the CBCL sample.

Table 5. Descriptive Statistics of control variables (2010 and 2012)

Variables:	PPVT Sample		CBCL Sample	
	ELPI 2010 and 2012	Restricted Sample	ELPI 2010 and 2012	Restricted Sample
Child Characteristics				
Age (months in 2010)	41.1	41.0	31.6	31.6
Male	0.50	0.51	0.50	0.50
Height in 2010 (cm)	98.7	98.6	92.1	92.0
Weight in 2010 (kg)	16.6	16.6	14.6	14.6
Cranial Circumference in 2010 (cm)	50.6	50.6	49.7	49.7
Height at birth (cm)	49.9	49.8	49.8	49.8
Weight at birth (kg)	3.40	3.40	3.39	3.4
Mother Characteristics				
Years of Schooling	11.33	11.42	11.36	11.46
Numeric WAIS	6.85	6.90	6.90	6.95
Vocabulary WAIS	8.05	8.21	7.80	8.14
BFI agreeableness	3.84	3.84	3.83	3.83
BFI exteriorization	3.50	3.48	3.52	3.51
BFI responsibility 4	4.01		3.99	3.99
BFI neuroticism	3.05	3.05	3.07	3.07
BFI openness to new experiences	3.79	3.78	3.79	3.78
Age (years)	30.4	30.3	29.5	29.44
Household Characteristics				
Household Income (\$CL)	467,196	470,477	461,737	466930
Urban Zone	0.89	0.88	0.89	0.89
Number of observations	5765	3686	5765	4525

Notes: Authors' calculations using 2010 and 2012 ELPI surveys. PPVT and CBCL samples includes children with data for the PPVT and CBCL tests, respectively. ELPI 2010 and 2012 in

Table 6. Effect of violence toward children on cognitive and non-cognitive outcomes (T-scores, 2012).

Variables:	Cognitive Outcome: PPVT Test				Non Cognitive Outcome: CBCL Test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Verbal violence	-2.160*** (0.765)				3.306*** (0.385)			
Physical violence		-0.909 (0.909)				2.016*** (0.462)		
Some violence			-2.444*** (0.737)				3.798*** (0.368)	
Both forms of violence				-0.449 (0.944)				1.498*** (0.496)
PPVT 2010	0.401*** (0.0212)	0.403*** (0.0212)	0.402*** (0.0212)	0.403*** (0.0212)				
CBCL 2010					0.388*** (0.0193)	0.393*** (0.0194)	0.387*** (0.0192)	0.394*** (0.0194)
WAIS Numeric	-0.0661 (0.119)	-0.0620 (0.119)	-0.0710 (0.119)	-0.0604 (0.119)	-0.0449 (0.0640)	-0.0487 (0.0643)	-0.0372 (0.0638)	-0.0539 (0.0643)
WAIS Vocabulary	0.374*** (0.0968)	0.370*** (0.0968)	0.374*** (0.0968)	0.370*** (0.0968)	-0.139** (0.0548)	-0.138** (0.0547)	-0.143*** (0.0545)	-0.137** (0.0548)
BFI Agreeableness	0.294 (0.549)	0.291 (0.550)	0.304 (0.549)	0.285 (0.550)	-0.207 (0.295)	-0.217 (0.296)	-0.207 (0.293)	-0.214 (0.297)
BFI Extraversion	0.919** (0.409)	0.936** (0.408)	0.950** (0.408)	0.932** (0.408)	-0.101 (0.229)	-0.107 (0.229)	-0.138 (0.228)	-0.0979 (0.230)
BFI Conscientiousness	-0.238 (0.578)	-0.299 (0.578)	-0.224 (0.578)	-0.309 (0.578)	-0.547* (0.297)	-0.489 (0.299)	-0.572* (0.297)	-0.475 (0.299)
BFI Neuroticism	-0.567 (0.418)	-0.623 (0.417)	-0.540 (0.417)	-0.632 (0.418)	1.037*** (0.236)	1.083*** (0.237)	1.007*** (0.235)	1.089*** (0.237)
BFI Openness to experience	0.332 (0.490)	0.348 (0.492)	0.325 (0.490)	0.347 (0.492)	0.302 (0.270)	0.275 (0.271)	0.331 (0.268)	0.266 (0.271)
Mother's education	0.692*** (0.124)	0.704*** (0.125)	0.689*** (0.124)	0.706*** (0.125)	-0.336*** (0.0651)	-0.353*** (0.0653)	-0.331*** (0.0650)	-0.355*** (0.0654)
Mother's age	0.0447 (0.370)	0.0725 (0.371)	0.0568 (0.370)	0.0696 (0.371)	-0.0541 (0.206)	-0.103 (0.206)	-0.0525 (0.205)	-0.104 (0.206)
Male	-2.862*** (0.596)	-2.884*** (0.597)	-2.821*** (0.595)	-2.891*** (0.597)	0.565* (0.323)	0.579* (0.325)	0.497 (0.322)	0.595* (0.326)
Constant	9.065 (14.18)	9.196 (14.19)	8.854 (14.17)	9.479 (14.19)	49.66*** (7.963)	49.25*** (8.027)	49.23*** (7.929)	49.34*** (8.039)
Observations	3,686	3,686	3,686	3,686	4,525	4,525	4,525	4,525
R-squared	0.240	0.239	0.241	0.238	0.234	0.224	0.239	0.222
Mean Violence	0.21	0.135	0.235	0.117	0.213	0.135	0.239	0.118

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as T-scores using reported data by ELPI. Other control variables measured in 2010 that are not reported here include, child's weight and height at birth, weight, height, and cranial circumference of the child, child's age (in months), whether the child is of indigenous descent, mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Also whether the mother had problems during pregnancy: mental problems, postpartum depression, fetus diagnosed with medical problems, and preterm delivery. Whether during pregnancy the mother consumed tobacco, alcohol, or drugs, and the number of health problems she had during pregnancy and during delivery. Household variables include whether the household is located in an urban area, household income, a series of categorical variables for region of residency. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Effect of violence toward children on clinical risk of cognitive and non-cognitive development (2012).

Variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cognitive outcome: PPVT in low level category				Non-Cognitive outcome: CBCL in clinical risk category			
Verbal violence	0.0386** (0.0173)				0.0995*** (0.0157)			
Physical violence		0.0329 (0.0202)				0.0421** (0.0183)		
Some violence			0.0424** (0.0165)				0.110*** (0.0151)	
Both forms of violence				0.0266 (0.0212)				0.0300 (0.0195)
PPVT 2010 Low Category	0.196*** (0.0178)	0.197*** (0.0178)	0.196*** (0.0178)	0.197*** (0.0178)				
CBCL 2012 Clinical Risk					0.224*** (0.0135)	0.226*** (0.0135)	0.223*** (0.0135)	0.226*** (0.0135)
WAIS Numeric	0.000876 (0.00259)	0.000827 (0.00259)	0.000957 (0.00259)	0.000767 (0.00259)	-0.00384 (0.00240)	-0.00401* (0.00241)	-0.00363 (0.00240)	-0.00412* (0.00241)
WAIS Vocabulary	-0.00750*** (0.00221)	-0.00744*** (0.00221)	-0.00751*** (0.00221)	-0.00745*** (0.00221)	-0.00547*** (0.00203)	-0.00534*** (0.00203)	-0.00554*** (0.00202)	-0.00531*** (0.00203)
BFI Agreeableness	-0.0167 (0.0123)	-0.0168 (0.0123)	-0.0169 (0.0123)	-0.0167 (0.0123)	-0.00754 (0.0115)	-0.00765 (0.0115)	-0.00758 (0.0115)	-0.00749 (0.0115)
BFI Extraversion	-0.00729 (0.00929)	-0.00761 (0.00927)	-0.00782 (0.00928)	-0.00737 (0.00928)	-0.000698 (0.00892)	-0.000846 (0.00895)	-0.00181 (0.00891)	-0.000584 (0.00895)
BFI Conscientiousness	-0.00788 (0.0127)	-0.00713 (0.0127)	-0.00809 (0.0127)	-0.00697 (0.0127)	-0.0329*** (0.0116)	-0.0304*** (0.0117)	-0.0334*** (0.0116)	-0.0302*** (0.0117)
BFI Neuroticism	-0.00104 (0.00901)	-0.000316 (0.00900)	-0.00147 (0.00900)	-0.000100 (0.00900)	0.0596*** (0.00871)	0.0614*** (0.00872)	0.0589*** (0.00869)	0.0616*** (0.00872)
BFI Openness to experience	-0.00945 (0.0112)	-0.00982 (0.0112)	-0.00935 (0.0112)	-0.00986 (0.0112)	0.00787 (0.0106)	0.00712 (0.0106)	0.00863 (0.0106)	0.00690 (0.0106)
Mother's education	-0.0112*** (0.00266)	-0.0113*** (0.00266)	-0.0111*** (0.00266)	-0.0113*** (0.00266)	-0.0154*** (0.00242)	-0.0161*** (0.00243)	-0.0153*** (0.00242)	-0.0161*** (0.00244)
Mother's age	-0.00845 (0.00801)	-0.00898 (0.00801)	-0.00867 (0.00800)	-0.00888 (0.00801)	-0.0130* (0.00766)	-0.0143* (0.00767)	-0.0131* (0.00765)	-0.0143* (0.00767)
Male	0.0417*** (0.0132)	0.0421*** (0.0132)	0.0410*** (0.0132)	0.0424*** (0.0132)	0.0312** (0.0125)	0.0314** (0.0125)	0.0294** (0.0125)	0.0317** (0.0125)
Constant	1.079*** (0.325)	1.082*** (0.325)	1.081*** (0.325)	1.079*** (0.325)	0.924*** (0.300)	0.914*** (0.301)	0.914*** (0.299)	0.914*** (0.301)
Observations	3,686	3,686	3,686	3,686	5,618	5,618	5,618	5,618
R-squared	0.129	0.128	0.129	0.128	0.176	0.170	0.178	0.169
Mean Dep. Variable	0.253	0.253	0.253	0.253	0.357	0.357	0.357	0.357
Mean Violence	0.21	0.135	0.235	0.117	0.21	0.136	0.234	0.119

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as binary variables equal to 1 if the child is on the low score category of PPVT test, and on the clinical risk category on the CBCL test as reported data by ELPI. Other control variables measured in 2010 that are not reported here include, child's weight and height at birth, weight, height, and cranial circumference of the child, child's age (in months), whether the child is of indigenous descent, mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Also whether the mother had problems during pregnancy: mental problems, postpartum depression, fetus diagnosed with medical problems, and preterm delivery. Whether during pregnancy the mother consumed tobacco, alcohol, or drugs, and the number of health problems she had during pregnancy and during delivery. Household variables include whether the household is located in an urban area, household income, a series of categorical variables for region of residency. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Persistence of violence on cognitive and non-cognitive outcomes (T-scores, 2012).

Variables:	Cognitive: PPVT Test (1)	Non Cognitive: CBCL Test (2)
Violence in both surveys	-3.908** (1.520)	3.818*** (0.648)
Violence in one survey	-1.163* (0.607)	2.095*** (0.345)
WAIS Numeric	-0.0650 (0.119)	-0.0465 (0.0640)
PPVT 2010	0.401*** (0.0212)	
CBCL 2010		0.386*** (0.0194)
WAIS Vocabulary	0.370*** (0.0966)	-0.139** (0.0547)
BFI Agreeableness	0.293 (0.548)	-0.230 (0.295)
BFI Extraversion	0.953** (0.408)	-0.140 (0.229)
BFI Conscientiousness	-0.279 (0.576)	-0.477 (0.299)
BFI Neuroticism	-0.529 (0.417)	1.000*** (0.237)
BFI Openness to experience	0.311 (0.492)	0.326 (0.271)
Mother's education	0.702*** (0.124)	-0.340*** (0.0653)
Mother's age	0.0508 (0.370)	-0.0796 (0.205)
Male	-2.834*** (0.594)	0.493 (0.325)
Constant	9.451 (14.17)	49.28*** (7.975)
Observations	3,686	4,520
R-squared	0.241	0.231

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as T-scores using reported data by ELPI. Other control variables measured in 2010 that are not reported here include, child's weight and height at birth, weight, height, and cranial circumference of the child, child's age (in months), whether the child is of indigenous descent, mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Also whether the mother had problems during pregnancy: mental problems, postpartum depression, fetus diagnosed with medical problems, and preterm delivery. Whether during pregnancy the mother consumed tobacco, alcohol, or drugs, and the number of health problems she had during pregnancy and during delivery. Household variables include whether the household is located in an urban area, household income, a series of categorical variables for region of residency. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Panel estimates of the effect of violence toward children on cognitive and non-cognitive outcomes (T-scores).

Variables:	Cognitive: PPVT test				Non-Cognitive: CBCL test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Verbal violence	-0.462 (0.488)				1.987*** (0.274)			
Physical violence		-0.505 (0.570)				1.496*** (0.321)		
Some violence			-0.977** (0.468)				2.239*** (0.261)	
Both forms of violence				0.158 (0.594)				1.207*** (0.335)
Observations	10,584	10,585	10,585	10,585	12,910	12,911	12,911	12,911
R-squared	0.020	0.020	0.021	0.020	0.211	0.207	0.214	0.206
Number of folio	5,665	5,666	5,666	5,666	6,914	6,915	6,915	6,915
Mean violence	0.197	0.12	0.226	0.113	0.197	0.124	0.227	0.112

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as T-scores using reported data by ELPI. Other control variables not reported here include: child's age (in months), mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Household variables include whether the household is located in an urban area and household income. Also includes a year fixed effect. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 10. Panel estimates of violence toward children on clinical risk of cognitive and non-cognitive development.

Variables:	Cognitive outcome: PPVT in low level category				Non-Cognitive outcome: CBCL in clinical risk category			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Verbal violence	-0.00451 (0.0134)				0.0554*** (0.0120)			
Physical violence		0.0114 (0.0157)				0.0504*** (0.0140)		
Some violence			0.00651 (0.0129)				0.0589*** (0.0115)	
Both forms of violence				-0.00437 (0.0163)				0.0388*** (0.0146)
Observations	10,584	10,585	10,585	10,585	16,152	16,153	16,153	16,153
R-squared	0.015	0.015	0.015	0.015	0.083	0.082	0.084	0.082
Number of folio	5,665	5,666	5,666	5,666	8,645	8,646	8,646	8,646
Mean Dep. Variable	0.237	0.237	0.237	0.237	0.434	0.434	0.434	0.434
Mean Violence	0.197	0.124	0.226	0.113	0.194	0.124	0.223	0.112

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as binary variables equal to 1 if the child is on the low score category of PPVT test, and on the clinical risk category on the CBCL test, as reported data by ELPI. Other control variables not reported here include: child's age (in months), mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Household variables include whether the household is located in an urban area and household income. Also includes a year fixed effect. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 11. Panel estimates of the effect of violence toward children on CBCL test scores by categories (T-scores).

Variables:	CBCL Internalization				CBCL Externalization				CBCL Sleep problems			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Verbal violence	1.798*** (0.278)				1.888*** (0.280)				0.862** (0.405)			
Physical violence		1.565*** (0.326)				1.064*** (0.329)				0.241 (0.474)		
Some violence			2.160*** (0.265)				1.932*** (0.268)				1.099*** (0.387)	
Both forms of violence				1.225*** (0.340)				0.905*** (0.343)				0.222 (0.495)
Observations	12,910	12,911	12,911	12,911	12,918	12,919	12,919	12,919	12,918	12,919	12,919	12,919
R-squared	0.104	0.101	0.108	0.100	0.236	0.231	0.237	0.231	0.056	0.055	0.056	0.055
Number of folio	6,914	6,915	6,915	6,915	6,918	6,919	6,919	6,919	6,918	6,919	6,919	6,919
Mean Violence	0.197	0.124	0.227	0.111	0.197	0.124	0.227	0.112	0.197	0.124	0.227	0.112

Source: estimates using ELPI survey data from 2010 and 2012. Notes: CBCL tests are measured as T-scores using reported data by ELPI. Other control variables not reported here include: child's age (in months), mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Household variables include whether the household is located in an urban area and household income. Also includes a year fixed effect. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 12. Panel estimates of the effect of violence toward children on CBCL test clinical risk by categories, 2012.

Variables:	Internalization: clinical risk				Externalization: clinical risk				Sleep problems: clinical risk			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Verbal violence	0.0509*** (0.0126)				0.0556*** (0.0119)				0.0206** (0.00801)			
Physical violence		0.0514*** (0.0147)				0.0287** (0.0139)				0.0135 (0.00938)		
Some violence			0.0602*** (0.0121)				0.0530*** (0.0114)				0.0202*** (0.00767)	
Both forms of violence				0.0428*** (0.0153)				0.0232 (0.0145)				0.0202** (0.00979)
Observations	16,152	16,153	16,153	16,153	16,160	16,161	16,161	16,161	12,918	12,919	12,919	12,919
R-squared	0.041	0.040	0.042	0.040	0.105	0.103	0.105	0.103	0.014	0.013	0.014	0.014
Number of folio	8,645	8,646	8,646	8,646	8,649	8,650	8,650	8,650	6,918	6,919	6,919	6,919
Mean Dep. Variable	0.479	0.479	0.479	0.479	0.404	0.404	0.404	0.404	0.403	0.403	0.403	0.403
Mean Violence	0.194	0.124	0.223	0.112	0.194	0.124	0.223	0.112	0.197	0.124	0.227	0.112

Source: estimates using ELPI survey data from 2010 and 2012. Notes: CBCL tests is measured as binary variables equal to 1 if the child in on the clinical risk category on the CBCL test, as reported data by ELPI. Other control variables not reported here include: child's age (in months), mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Household variables include whether the household is located in an urban area and household income. Also includes a year fixed effect. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 13. Panel estimates of the effect of violence toward children on cognitive and non-cognitive outcomes by Sex of the Child (T-scores).

Variables:	Cognitive Outcome: PPVT Test				Non Cognitive Outcome: CBCL Test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Girls:								
Verbal violence	-0.429 (0.674)				1.537*** (0.389)			
Physical violence		-0.858 (0.784)				1.361*** (0.449)		
Some violence			-0.968 (0.649)				1.756*** (0.373)	
Both forms of violence				-0.0196 (0.814)				1.207*** (0.468)
Observations	5,298	5,298	5,298	5,298	6,447	6,447	6,447	6,447
R-squared	0.04	0.04	0.04	0.04	0.22	0.22	0.22	0.22
Number of folio	2,834	2,834	2,834	2,834	3,450	3,450	3,450	3,450
Mean Violence	0.18	0.12	0.21	0.11	0.18	0.12	0.21	0.11
Boys:								
Verbal violence	-0.511 (0.704)				2.417*** (0.386)			
Physical violence		-0.336 (0.826)				1.651*** (0.460)		
Some violence			-1.001 (0.674)				2.690*** (0.368)	
Both forms of violence				0.165 (0.865)				1.234** (0.482)
Observations	5,286	5,287	5,287	5,287	6,463	6,464	6,464	6,464
R-squared	0.02	0.02	0.02	0.02	0.21	0.20	0.21	0.20
Number of folio	2,831	2,832	2,832	2,832	3,464	3,465	3,465	3,465
Mean Violence	0.21	0.13	0.24	0.12	0.21	0.13	0.25	0.11

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as T-scores using reported data by ELPI. Other control variables not reported here include: child's age (in months), mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Household variables include whether the household is located in an urban area and household income. Also includes a year fixed effect. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 14. Panel estimates of the effect of violence toward children on cognitive and non-cognitive outcomes by Age of the Child (T-scores).

Variables:	Cognitive Outcome: PPVT Test				Non Cognitive Outcome: CBCL Test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Child's age: less than 48 months								
Verbal violence					2.303*** (0.733)			
Physical violence						1.498* (0.837)		
Some violence							2.152*** (0.680)	
Both forms of violence								1.308 (0.875)
Observations					1,848	1,848	1,848	1,848
R-squared					0.107	0.100	0.107	0.099
Number of folio					988	988	988	988
Mean Violence					0.19	0.13	0.22	0.12
Child's age: between 48 to 71 months								
Verbal violence=1	-0.699 (0.584)				1.912*** (0.295)			
Physical violence=1		-1.204* (0.690)				1.496*** (0.347)		
Any Violence=1			-1.435** (0.562)				2.216*** (0.283)	
Both forms of violence				-0.289 (0.721)				1.201*** (0.362)
Observations	7,351	7,352	7,352	7,352	11,062	11,063	11,063	11,063
R-squared	0.021	0.022	0.023	0.021	0.231	0.227	0.233	0.226
Number of folio	3,933	3,934	3,934	3,934	5,926	5,927	5,927	5,927
Mean Violence	0.20	0.13	0.23	0.11	0.20	0.12	0.23	0.11
Child's age: equal or more than 72 months								
Verbal violence=1	0.131 (0.887)				1.611*** (0.567)			
Physical violence=1		1.048 (1.014)				0.647 (0.651)		
Any Violence=1			0.169 (0.848)				1.499*** (0.541)	
Both forms of violence				1.059 (1.049)				0.500 (0.673)
Observations	3,233	3,233	3,233	3,233	3,242	3,242	3,242	3,242
R-squared	0.037	0.038	0.037	0.038	0.090	0.086	0.090	0.086
Number of folio	1,732	1,732	1,732	1,732	1,731	1,731	1,731	1,731
Mean Violence	0.18	0.12	0.21	0.11	0.18	0.12	0.21	0.11

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as T-scores using reported data by ELPI. Estimates with children younger than 48 month includes children between 39 and 47 months old. Estimates for children equal or older than 72 months include children between 72 and 83 months. Other control variables not reported here include: child's age (in months), mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Household variables include whether the household is located in an urban area and household income. Also includes a year fixed effect. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 15. Panel estimates of the effect of violence toward children on cognitive and non-cognitive outcomes by mother's education of the Child (T-scores).

Variables:	Cognitive Outcome: PPVT Test				Non Cognitive Outcome: CBCL Test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother's years of schooling: 12 or less								
Verbal violence	-0.244 (0.541)				2.172*** (0.316)			
Physical violence		-0.374 (0.634)				1.644*** (0.373)		
Some violence			-0.988* (0.520)				2.477*** (0.302)	
Both forms of violence				0.444 (0.661)				1.317*** (0.390)
Observations	8,246	8,247	8,247	8,247	10,058	10,059	10,059	10,059
R-squared	0.023	0.023	0.023	0.023	0.208	0.203	0.211	0.202
Number of folio	4,389	4,390	4,390	4,390	5,360	5,361	5,361	5,361
Mean Violence	0.20	0.13	0.24	0.11	0.20	0.13	0.23	0.11
Mother's years of schooling: 13 or more								
Verbal violence	-1.575 (1.128)				1.246** (0.535)			
Physical violence		-1.196 (1.313)				0.887 (0.615)		
Some violence			-1.168 (1.075)				1.310** (0.512)	
Both forms of violence				-1.190 (1.358)				0.710 (0.640)
Observations	2,338	2,338	2,338	2,338	2,852	2,852	2,852	2,852
R-squared	0.034	0.033	0.034	0.033	0.245	0.243	0.246	0.243
Number of folio	1,276	1,276	1,276	1,276	1,554	1,554	1,554	1,554
Mean Violence	0.17	0.12	0.20	0.11	0.18	0.12	0.20	0.11

Source: estimates using ELPI survey data from 2010 and 2012. Notes: PPVT and CBCL tests are measured as T-scores using reported data by ELPI. Other control variables not reported here include: child's age (in months), mother's number of children, whether the mother has a partner, whether she is the head of the household, age and age squared, and years of education. Household variables include whether the household is located in an urban area and household income. Also includes a year fixed effect. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Appendix 1. Home questionnaire and violence variables

HOME questionnaire is based in responses provided by test administrators at the end of the visit. In order to construct our measures of violence, we use the following questions from the HOME questionnaire implemented in the 2010 and 2012 ELPI rounds:

Question 9: The mother or tutor DOES NOT shouts at the child during the visit.

Question 11: The mother or tutor DOES NOT hit the child during the visit.

Question 12: The mother or tutor DOES NOT reproaches, criticizes, or annuls the child during the visit.

Questions 9 and 12 are used to generate a measure of verbal/psychological violence and question 11 is used to construct our physical violence variable.