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Violence during Early Childhood and Child Development

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Violence during Early Childhood and Child Development

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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 exposure to violence (verbal and/or physical), for two rounds of the survey conducted in 2010 and 2012, on two different outcomes: one that measures vocabulary development (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 control for child-mother unobservable characteristics, improving on the literature that up to know has used cross-sectional data. We find that being exposed to some violence has a negative and significant effect on verbal skills of children. It also hinders socio-emotional development of the child, by increasing her behavioral problem in all three of studied areas: internalization problems, externalization problems, as well as sleep problems. We also find that systematic exposure to violence over time decreases child development in both developmental areas. Finally, we study heterogeneous effects along three lines: child's sex, age, and maternal education level. We find that violence affects girls in terms of their vocabulary development, and that both boys and girls increase their behavioral problems, with stronger effects among boys. We also find that the negative effects diminish as children get older, but they remain negative over the complete age range in the sample. In terms of mother's education, we find stronger effects on children with lower educated mothers. Overall our estimations reveal that exposure to violence has significant negative association with the cognitive and non-cognitive development of children.

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

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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 developed in the first years of life have been shown to have significant impact on later outcomes, 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; Almond et al. 2017). 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 factors that can affect child development, such as parenting styles and exposure to violence at home (Paxon and Schady 2007; Pinquart 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 relatively little attention.[1] Using US state-level panel data Paxon and Waldfogel (1999, 2002)

[1] More attention has been devoted to intimate partner violence. See among others: McElroy and

show that states with more absent fathers and working mothers have higher rates of child maltreatment. In terms of its effects, Currie and Tekin (2012) find that maltreated children are more likely to engage in crime, and Currie 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 lower numeracy test scores and higher dropout among 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 of parenting that include physical or corporal punishment but that do not reach levels 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 Groga-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 less harsher forms of punishment, such as spanking or verbal violence, 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 is that many studies cannot infer causal a relationship between exposure to milder forms of 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 use cross sectional data, which diminishes their potential to infer causality.

In this context, our study seeks to contribute to the literature on the effects of less harsher forms of parenting on child development. We focus on types of violence—verbal/psychological and physical—that are not classified as child abuse. We also contribute to the literature by focusing on early childhood (children aged 7 to 58 months in 2010) development, both in terms of cognitive and non-cognitive development. Cognitive development is measured using the

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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 Groga-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).

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 related to ours, one indirectly and one directly. Although not concerned with child development Currie and Tekin (2012) explore the effects of maltreatment on the likelihood of engaging in criminal activity, incorporating measures of physical abuse. Using OLS, sibling and twins estimates they find that physical abuse increases the probability of crime, and that the effect increases with the frequency of violence. More closely related to our work, 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 quality 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.

Our work expands the contributions provided by Paxon and Shady (2007), as we estimate the effect of less harsher forms 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 exposure to violence in the household. Our estimates provide a contribution to this literature as they are one of the few studies using longitudinal data, overcoming some of the limitations that have been faced by data availability. Our estimates might be interpreted as causal evidence of the harmful effects of harsh parenting under less restrictive assumptions than previous estimates in Paxon and Shady (2007).

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 comes from a nation-wide survey on early infancy in Chile. As part of 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—which were psychologists—filled out a questionnaire reporting several measures of maternal attitudes towards the child, including verbal and/or physical violence, during the visit.[5]

We find that after controlling for child-mother unobservables, exposure to some form of milder violence (either verbal, physical or both) has a negative and significant effect on verbal skills of children (our cognitive outcome). We also find that exposure to some violence significantly increases the number of behavioral

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

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

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

problems that children have, and also increases the probability that the child is considered to be in a clinical range of behavioral problems in general, but also in behavioral problems in areas classified as internalization, externalization, and sleep problems.

Another contribution is to study whether systematic exposure to violence over time affects child development. We find that the more systematic violence is the worse children fare in both dimensions of child development.[6] Finally, we study heterogeneous effects along child's sex, age, and maternal education level. We find that violence negatively affects the vocabulary development of girls, but not boys, and that both boys and girls are negatively affected by violence in terms of their behavioral problems. We also find that negative effects are stronger the younger children are, and that they diminish with the age of the child, but they remain negative over the complete age range in our sample. This result highlights the importance of addressing parental violence as early as possible. In terms of mother's education, we find stronger effects on children with lower educated mothers. Overall our estimations consistently reveal that exposure to violence has significant and negative effects on cognitive as well as non-cognitive early childhood development.

The remainder of the article is organized as follows: section 2 describes the 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 analyses. 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, pregnancy, mother and household.

In this first model the inclusion of past test scores allows us to control for baseline development levels due to initial conditions, which include the effect of past exposure to violence. It also allows us to obtain estimates for the association between child development and children, pregnancy, mother and household characteristics that are time-invariant, such as personality traits of the mother, among others. However, as these estimates use the cross-sectional variation between children, we cannot interpret them as causal estimates of the effect of violence. The model can be represented as follows:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_2 V_{i,t} + \beta_3 C_{i,t-1} + \beta_4 P_{i,t-1} + \beta_5 M_{i,t-1} + \beta_6 H_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

were $Y_{i,t}$ is a contemporaneous measure of cognitive or non-cognitive outcome

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

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 $C_{i,t-1}$, $P_{i,t-1}$, $M_{i,t-1}$ and $H_{i,t-1}$ are vectors of predetermined child, pregnancy, 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, and a dummy variable that takes value 1 if the child is indigenous. Pregnancy variables ($P_{i,t-1}$) include whether the fetus was diagnosed with health problems, the number of medical problems that occurred during delivery of the child, whether it was a preterm delivery, height and weight at birth, whether the mother was diagnosed with mental problems during pregnancy, whether the mother was diagnosed with postpartum depression, and whether she smoked, consumed alcohol or drugs while pregnant. Mothers' characteristics ($M_{i,t-1}$) includes years of schooling, total number of children, whether she has a husband/partner, whether she is head of the household, and age and age squared. It also 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. WAIS is separated into numerical and vocabulary development and BFI is separated into five personality traits: agreeableness, exteriorization, responsibility, neuroticism, and openness to new experiences. Finally, 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.

As indicated previously, estimates from this model cannot be interpreted as causal, as it is likely that there exist unobservables correlated to both violence and child development. Therefore, we take advantage of the longitudinal character of our data and we next estimate a child-mother fixed effect:

$$Y_{i,t} = \beta_0 + \beta_1 V_{i,t} + \beta_2 C_{i,t} + \beta_3 M_{i,t} + \beta_5 H_{i,t} + \rho_i + \mu_t + \varepsilon_{i,t} \qquad (2)$$

were and $C_{i,t}$, $M_{i,t}$ and $H_{i,t}$ are previously defined vectors of time-variant child, mother and household characteristics, ρ_i is a child-mother fixed effect, and μ_t is a time fixed effect.[7]

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

[7] By design ELPI collects cognitive and non-cognitive data on one child per household (and her caretaker), thus, the child fixed effect also operates as a mother fixed effect.

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 (ELPI for its Spanish acronym) carried out in 2010 and 2012 in Chile.[8] 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 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 developmental tests were applied to the main caretaker—who were overwhelmingly the mother—and the child.[9] 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 to measure child development: the Peabody Picture Vocabulary Test (PPVT) and the Child Behavioral Checklist (CBLC). The PPVT measures auditory vocabulary and is widely 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-5. In addition to working with the overall results of the test, we also analyze 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 between the child and others and expectations about the child. It groups two syndromes: attention problems and

[8] The Spanish name of the survey is Encuesta Longitudinal de Primera Infancia (ELPI).
[9] The percentage of main caregivers who are the mother was 99.1 and 98.4 in the 2010 and 2012 rounds, respectively.

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. We report average T-scores for children with no violence and children with some violence. Our final sample includes 4,318 and 5,322 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 developmental categories created in ELPI for both PPVT and CBCL variables depending on children's T-scores, which 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 of them. For PPVT we grouped the three lower score categories (extremely low, moderately low and below average). We find 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, and 51 percent of children are in either of these two categories in 2010, and 35 percent in 2012.

3.2 Measures of violence towards children

Our violence measures come from the HOME (Home Observation for Measurement of the Environment) questionnaire in ELPI. HOME questions are answered by a psychologist present during the second visit to households, and includes several characteristics of the family environment, including learning materials, language stimulation, physical environment, academic stimulation and child acceptance, among others. Among the questions included in HOME there are a series that describe the behavior of the main caregiver towards the child during the visit, including whether the mother shouts, reproaches, criticizes, annuls, or hits him or her. With this information we are able to capture two types violence towards children—verbal/psychological and physical—and we generate several binary variables that capture violence toward the child during the visit.[10]

Relevant to our violence measures, the HOME questionnaire applied in the ELPI was responded not by the mother, but by the person administering the tests. By design, the test administrator was, in all cases, a psychologist with experience in infant evaluations and/or psychological tests, and they also received training on how to administer the tested without intervening and on how to report objectively their observations. Thus, in contrast to most studies, ours uses direct observational data that does not suffer from self-reporting

[10] Appendix **1** reports the specific HOME questions included in the survey. ELPI applied an adaptation of the HOME test from Caldwell and Bradley (1984).

biases, or recall problems as the questionnaire was filled out before the end of the visit by the test administrator.[11]

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 from observations obtained during the visit (that lasted 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 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 mothers report yelling or screaming at the child in last 6 months, and 51 percent report spanking children in the buttocks with their hands (Runyan et al. (2002). These figures are larger than our measures of violence for each round of ELPI (Table 3).

A possible consequence of this underreport is a downward bias of our estimates, which will occur if violence has a negative effect on child development and the group of children that are reported as suffering no violence includes children that are in fact subject to violence. The latter would lower the average developmental level of the no violence group and, therefore, our estimates of violence would be downward biased. In our data this is the most likely case, as many of the children for which no violence is observed during the period in which tests were administered, are likely to actually be exposed to violence in their home.

The first and main variable of exposure to violence measures whether children were subject to any source of violence during the visit, i.e., either verbal or physical. Table 3 reports descriptive statistics on our violence measures for three samples. First for the full sample of children available in the data, and next to the final samples for each outcome. Here is relevant to observe that even though our final sample has substantially less observations, our measures of violence display a similar pattern to the whole sample. We observe that 17.3 percent of children are exposed to some form of violence in 2010, and the percentage increases to 23 percent in 2012.

Since children can be subject to either one or two of these forms of violence we also constructed variables indicating that the child was subject of only verbal violence, only physical violence, and both forms of violence. We observe that in the full sample about 38 percent of children that are subject to violence receive only verbal violence, while overwhelmingly most of the others are subject to both forms of violence; only a small fraction receives only physical violence.

These levels of violence show that a significant fraction of children are exposed to violent environments in Chile, and in addition, it is worrisome to

[11] As we were unable to obtain information our estimates do not control for characteristics of the test administrator.

notice that all types of violence increased between 2010 and 2012. These results are consistent with other reports of violence toward children in Chile, which find little or no decrease in some forms of violence, particularly mild physical violence (UNICEF 2014b).

Given the panel structure of our data, we construct variables that measure the exposure to violence over time. Thus, we construct variables that indicate whether the child was subject to some violence during both surveys rounds, only in one round or in none. 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. We will use this variable to study whether persistency in violence is associated with child development.

Overall, as shown in Figures 1 and 2, it seems that children exposed to some type of violence have lower cognitive development and more behavioral problems. The figures plot the average (and confidence intervals) test scores by violence category (using exposure to some type of violence) and child's 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 tests show that children exposed to violence have higher scores, and are therefore more prone to behavior and socioemotional problems, over the complete range of ages in the sample.

3.3 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 Gonzalez, 2015). Thus, we use results for the Wechsler Adults Intelligence Scale (WAIS) and the Big Five Inventory (BFI) tests applied to mothers. In the WAIS test we include two variables measuring the digit span and vocabulary subtests, which provide a measure of mothers' cognitive ability. In turn, the BFI assesses socioemotional skills separated in five different categories: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience (John and Srivastava 1999). Descriptive statistics for children, pregnancy, mother, and household characteristics (described in Section 2) are reported in Table 5.

4. Results

4.1. Cross-sectional estimates with initial child development

We first estimate the effects of violence on cognitive and non-cognitive development in 2012 controlling for the initial development of each child. As our main question is whether exposure to violence affects early child development,

we report results for any type of violence (either verbal, physical, or both). For each test (PPVT and CBCL), we estimate equation (1) for two outcomes. First, T-scores are used a direct measure of development, and we expect the effect of violence to be negative on child development. However, we also want to have a sense of the importance of the effect on children's development, so we explore whether violence increases the likelihood that children fall into low cognitive development in the PPVT, or into the risk/clinical categories in the CBCL test.

Results are reported in Table 6. They show that being exposed to violence is negatively and significantly associated with cognitive development both in terms of the T-scores as well as with the likelihood of falling into a low-level category.[12,13] Exposure to violence is associated with a decrease of 0.1 standard deviations in the T-score and an increase of 18.6 percent in the probability of low development.[14] In terms of non-cognitive development, violence is significantly associated with increases in children's behavioral problems. Point estimates indicate that violence increase T-scores by 0.3 standard deviations as well as the likelihood of risk/clinical behavioral problems by 33 percent.

At the same time results show that other control variables are associated to cognitive and non-cognitive development in expected ways. Initial levels of cognitive and non-cognitive development (the child's PPVT and CBCL test scores 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 two years later. These results point out towards significant persistence in child 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 child development. In terms of her personality traits, we find a significant association between mother's extraversion and child's cognitive development, which suggest that mother's communication skills are relevant. In turn, higher levels of neuroticism of the mother are associated with children having more behavioral problems, which highlights the importance of maternal mental health in child development. Mother's years of schooling is significantly associated with both areas of development. Finally, girls have better scores in the language test (PPVT) and present lower levels of clinical problems (CBCL).[15]

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[12] 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.

[13] For the binary outcome we report results of a linear probability model, although we also estimated probit regressions with similar results. Results of the probit estimates are available upon request.

[14] Effects of the T-scores are obtained dividing the point estimates by the standard deviation of the dependent variable. For categorical outcomes the effects are obtained dividing point estimates by the average of the dependent variable.

[15] Regressions are estimated including the full set of control variables described in Section 2. For

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 once (the comparison group is children that were not exposed to violence in either rounds). Results reported in Table 7 indicate that persistent exposure to violence harms child development in both cognitive and non-cognitive outcomes. Children that were exposed to some form of violence in at least one year (around 30 percent of children) have a higher probability of falling into a low-level developmental category and more behavioral problems than children that were not exposed to violence. Furthermore, children exposed to violence in both rounds (around 5 percent of children) have even lower developmental levels both in terms of language development and behavioral problems, and the negative effects are observed in both the T-scores and categorical outcome. These results reveal that exposure to systematic violence over time is detrimental to child development, and therefore highlight the importance 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, and that might be biasing estimates using cross-sectional data. The panel estimates of equation (2) are presented in Table 8. We found that after controlling for child-mother unobservables, exposure to some type of violence still has a negative and significant effect on verbal skills, although point estimates are reduced with respect to estimates of equation (1) by about a half. In terms of cognitive development, we find that that the negative effect of exposure to violence on vocabulary test scores is equivalent to a reduction of 0.04 standard deviations, and that there is no effect on the likelihood of low-level vocabulary development. We also find that violence significantly affects non-cognitive development, with a negative effect on child behavior problems (T-scores) by 0.18 standard deviations and an increase in the likelihood of risk/clinical problems category by 6.2 percentage points or 13 percent. The difference in results relative to our 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.

An additional question that we can explore with our data is whether

brevity we report a subset of variables, however, tables with all coefficients are available in Online Appendix 1.

verbal and physical violence have different effects on child development. To answer this question, we estimate equation (2) separating the type of violence to which children are exposed into only verbal violence, and physical and verbal violence.[16] Results are reported in Table 9 and they show that for language development once we separate violence by type there are no statistically significant effects (columns 1 and 2). We also find that both types of violence increase children's behavior problems (columns 3 and 4). Apparently point estimates show that if anything verbal violence might have larger negative effects but a test for equality in these points estimates (reported at the bottom of the table) cannot reject the null that they are statistically the same. Thus, our data cannot provide for clear evidence what type of violence is more detrimental to children's development.

As described previously the CBCL measures problems related to seven syndromes, which are classified into three categories of problems: internalization, externalization, and sleep problems. We explore the effect of violence on each of these categories. Results are reported in Table 10, and they show that violence has a negative effect of all three categories, but particularly strongly in internalization and externalization problems. These results highlight that violence can worsen development of a wide range of behavioral problems in children, and they are not confined to one specific area.

Our estimations reveal that exposure to violence has significant effects in both cognitive and non-cognitive child development, and that repeated exposure to violence has more severe effects. The harmful effects of violence are present even if we control for time-invariant unobservable characteristics of the child-mother (our preferred specification), and reach a broad set of behavioral areas, including internalization externalization and sleep problems.

4.3 Heterogeneous effects of violence

We also study whether it is possible that the effects of violence might vary according to child or maternal characteristics. We report estimates of equation (2), the panel estimates. Our estimates results by child sex are reported in Table 11. They show that the effects of violence on cognitive development (PPVT test) for girls and boys are similar in magnitude to those reported for the complete sample (Table 8 column 1). 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, estimates for the likelihood of falling into a low-level category

[16] Theoretically we could have three categories: only verbal, only physical, and both forms of violence. As shown in Table 3. Only a very small fraction of children are subject to only physical violence. In addition, between 86 and 96 percent of children exposed to physical violence are also subject to verbal violence. For this reason we pooled the last two types of violence (only physical and both) into one category.

of development show that violence does negatively affect girls. This suggests that language development for girls is more sensitive to violence than boys, even in a context were girls have slightly lower rates of violence than boys (19.3 percent among girls compared 22.4 percent for boys). For socio-emotional development (CBCL test) we find violence significantly increases problems for both girls and boys, and this happens for both outcomes: T-scores and the probability of risk/clinical problem. In addition, there is some evidence that the harmful effects are stronger for boys (as indicated by the p-value of test on equality of both point estimates).

We also study whether the effect of violence varies depending on the age of the child in 2010. We classified children into 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 aged children. We hypothesize that the effects of violence could be mediated by their access to schooling and the time they spend with their caretakers.

Results are reported in Table 12.[17] It is noteworthy that exposure to violence does not significantly vary with age across these three groups, as reported by the average violence at the bottom of each panel (it diminishes slightly for the group of children older than 72 months). In terms of the estimates for cognitive development, results indicate that effects of violence are concentrated at younger ages, and that for older children (primary school aged children) the negative effect disappears. For behavioral problem we also observe a decreasing effect with age, although the decrease is not statistically significant, indicating that violence has similar effects on children's behavioral problems for all age ranges in our sample.

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.[18] We generate two categories of education: mother with 12 years of completed education or less and mothers with more than 12 years (i.e. more than high school).

In term of levels of violence, we observe that there is slightly less violence in the group of more educated mothers. In terms of the point estimates of the cognitive outcome, we find that the effect is larger for children with more educated mothers although the effects are not statistically significant. For

[17] 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.

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

behavioral problems, we find that the effect of violence is larger among children with less educated mothers, which suggests that access to a better economic environment may ameliorate the negative effects of violence, but still shows that violence increases socio-emotional problems in children.

5. Conclusions

There is ample consensus on the harmful 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 causal evidence on the relationship between mild forms of violence towards children and different outcomes.

We attempt to contribute to the literature by providing novel estimates 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 estimates using 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 our previous understanding of the consequences of violence of child development form work by Paxon and Shady (2007) and Currie and Tekin (2012).

Second, we study the effects of violence over two different types 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 reduces language development (our cognitive outcome) and increases the level of behavioral problems in children. At the same time, violence significantly increases the probability that children fall into categories deemed as risky or in clinical ranges in their behavior, thus in critical developmental levels (in our non-cognitive outcome). Interestingly, our estimates suggest that there is no difference between verbal and physical violence, but what matters is exposure to any of them.

In addition, we study heterogeneous effects on different groups of children finding that violence lowers girl's cognitive development and increases both girls and boys behavioral problems; younger children have larger negative effects on their cognitive development but the negative effect on behavioral problems is similar for all age groups; and children from lower-income households suffer more negative effects in behavioral problems. Interestingly, our data suggests that these heterogeneous effects are not driven by differences in the prevalence of violence across groups, but rather from probable differences in how violence affects different children and the coping mechanisms in these different groups.

As expected, given the inherent difficulties in measuring exposure to violence, our estimates have some limitations. 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 the 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).

All these limitations point towards the need of 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.

References

Achenbach, T. M., Rescorla, L. A. (2000). Manual for the ASEBA Preschool Forms & Profiles. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Aizer, A. (2008) Neighborhood violence and urban youth. National Bureau of Economic Research Working Paper Series, No. 13773.

Anderberg, D., Rainer H. (2013) Economic abuse: A theory of intrahousehold sabotage, Journal of Public Economics 97:282–295.

Anderberg, D., Rainer H., Wadsworth J., Wilson T. (2016). Unemployment and Domestic Violence: Theory and Evidence. The Economic Journal 126(597): 1947-1979.

Almond, D., J. Currie, and V. Duque (2017) "Childhood Circumstances and Adult Outcomes: Act II", NBER Working Paper No. 23017, January. DOI: 10.3386/w23017

Benjet C., Kazdin A.E. (2003) Spanking children: the controversies, findings, and new directions. Clinical Psychology Review, 23: 197-224.

Bloch, F., Vijayendra R. (2002) Terror as a Bargaining Instrument: A Case Study of Dowry Violence in Rural India. The American Economic Review 92(4): 1029-1043.

Bobonis, G., González-Brenes M., Castro R. (2013) Public Transfers and Domestic Violence: The Roles of Private Information and Spousal Control. American Economic Journal: Economic Policy 5(1): 179-205.

Caldwell, B., Bradley, R. (1984) Home Observation for Measurement of the Environment (HOME) - Revised Edition. University of Arkansas, Little Rock.

Card, D., Dahl G. (2011) Family violence and football: the effect of unexpected emotional cues on violent behavior. Quarterly Journal of Economics 126:103–143.

Cicchetti, D., Barnett, D. (1991) Attachment organization in maltreated preschoolers. Development and Psychopathology, 3(4): 397-411. doi:10.1017/S0954579400007598

Contreras, D., González S. (2015) Determinants of early child development in Chile: Health, cognitive and demographic factors. International Journal of Educational Development 40: 217-230. https://doi.org/10.1016/j.ijedudev.2014.06.010.

Cools, S., Kotsadam A. (2017). Resources and Intimate Partner Violence in Sub-Saharan Africa. World Development.

Cunha, F., Heckman J. (2008) Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation. Journal of Human Resources 43(4): 738-782.

Cunha, F., Heckman J. (2009) The economics and psychology of inequality and human development. Journal of the European Economic Association 7(2-3): 320-364.

Cunha, F., Heckman J.J., Lochner L.J., Masterov D.V. (2006) Interpreting the evidence on life cycle skill formation, in E.A. Hanushek - F. Welch (eds.), Handbook of the Economics of Education, chap. 12, North-Holland, Amsterdam, pp. 697-812.

Currie, J., Tekin E. (2012) Understanding the Cycle Childhood Maltreatment and Future. Journal of Human Resources 47(2): 509-549. doi: 10.3368/jhr.47.2.509

De Bellis, M., Keshavan M., Shifflett H, Iyengar S., Beers S., Hall J., and Moritz G. (2002) Brain Structures in Pediatric Maltreatment-Related Posttraumatic Stress Disorder: A Sociodemographically Matched Study. Biological Psychiatry 52: 1066-1078.

Delaney-Black, Virginia; Chandice Covington; Steven J. Ondersma; et al (2002) "Violence Exposure, Trauma, and IQ and/or Reading Deficits among Urban Children", Arch Pediatr Adolesc Med. 2002; 156(3): 280-285. doi:10.1001/archpedi.156.3.280.

DeRiviere, L. (2008) Do Economists Need to Rethink Their Approaches to Modeling Intimate Partner Violence? Journal of Economic Issues 42(3): 583-606.

Farmer, A., Tiefenthaler J. (1996) Domestic Violence: The Value of Services as Signals. The American Economic Review, 86(2): 274-279. Papers and Proceedings of the Hundredth and Eighth Annual Meeting of the American Economic Association San Francisco, CA.

Ferguson, Christopher J. (2013) Spanking, corporal punishment and negative long-term outcomes: A meta-analytic review of longitudinal studies, Clinical Psychology Review, 33(1): 196–208.

Galasso E., Weber A., Fernald L. (2017) Dynamics of child development: Analysis of a longitudinal cohort in a very low income country. World Bank Economics Review. DOI: 10.1093/wber/lhw065

Gershoff, Elizabeth (2002) Corporal Punishment by Parents and Associated Child Behaviors and Experiences: A Meta-Analytic and Theoretical Review. Psychological Bulletin, Vol. 128, No. 4, 539–579. DOI: 10.1037//0033-2909.128.4.539

Gershoff, Elizabeth T., Grogan-Kaylor, Andrew (2016) "Spanking and child outcomes: Old controversies and new meta-analyses." Journal of Family

Psychology, 30(4): 453-469. http://dx.doi.org/10.1037/fam0000191

Gertler, P., Heckman J., Pinto R., Zanolini A., Vermeersch C., Walker S., Chang S., Grantham-Mcgregor S. (2014) Labor market returns to an early childhood stimulation intervention in Jamaica. Science 344(6187):998-1001. DOI: 10.1126/science.1251178

Global Initiative (n.d.). Welcome to the Global Initiative to End all Corporal Punishment. Retrieved April 14th, 2017 from http://www.endcorporalpunishment.org/.

Grogger, J. (1997) Local violence and educational attainment. Journal of Human Resources 32(4): 659–682.

Hanushek, E., Woessmann L. (2008) The Role of Cognitive Skills in Economic Development. Journal of Economic Literature 46(3): 607-668. doi:10.1257/jel.46.3.607

Heckman, J., Stixrud J., Urzua S. (2006) The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior. Journal of Labor Economics 24(3):411-482. DOI: 10.1086/504455

Hidrobo, M., Fernald L. (2013) Cash transfers and domestic violence. Journal of Health Economics 32(1):304–319.

Hildyard, K., D.A. Wolfe. Child neglect: Developmental issues and outcomes, Child Abuse & Neglect, 26 (2002), pp. 679–695.

Hsu, L. (2017) The Timing of Welfare Payments and Intimate Partner Violence. Economic Inquiry 55(2):1017–1031. DOI: 10.1111/ecin.12413.

John, O., Srivastava S. (1999) The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. Pervin, & O. John, Handbooks of Personality: Theory and Research (102-138). New York: Guilford Press.

Kim, I., Byeon J., Lee D. (2017) Violent crime and female victimization: evidence from metropolitan regions in South Korea. Applied Economics 1(16).

Larzelere, Robert E. (2000) Child Outcomes of Nonabusive and Customary Physical Punishment by Parents: An Updated Literature Review, Clinical Child and Family Psychology Review, 3(4).

Larzelere, Robert E., Brett R. Kuhn (2005) Comparing Child Outcomes of Physical Punishment and Alternative Disciplinary Tactics: A Meta-Analysis. Clinical Child and Family Psychology Review, 8(1). DOI: 10.1007/s10567-005-2340-z

Leiter, Jeffrey; Matthew C. Johnsen (1997) "Child Maltreatment and School Performance Declines: An Event-History Analysis", American Educational Research Journal, Volume 34(3): 563-589. DOI: https://doi.org/10.3102/00028312034003563

MacKenzie, M., Nicklas E., Waldfogel J., Brooks-Gunn J. (2013) Spanking and Child Development Across the First Decade of Life, Pediatrics Volume 132(5).

MacMillan, H., Mikton C. (2017) Moving research beyond the spanking debate. Child Abuse & Neglect xxx (2017) xxx–xxx

Margolin, G., Elana B. Gordis (2000) The Effects of Family and Community Violence on Children. Annu. Rev. Psych 51: 445-479.

McElroy, M., Homey M. (1981) Nash-Bargained Household Decisions: Toward a Generalization of the Theory of Demand. International Economic Review 22(2): 333-349.

Paxson, C., Schady N. (2007) Cognitive Development among Young Children in Ecuador The Roles of Wealth, Health, and Parenting. Journal Human Resources 42(1): 49-84. DOI: 10.3368/jhr.XLII.1.49

Pieterse, D. (2015). Childhood maltreatment and educational outcomes: Evidence from South Africa. Health economics, 24(7): 876-894. DOI: 10.1002/hec.3065

Pinquart, Martin (2017) Associations of parenting dimensions and styles with externalizing problems of children and adolescents: An updated meta-analysis. Developmental Psychology 53(5):873-932. http://dx.doi.org/10.1037/dev0000295

Pollak, R. (2004) An intergenerational model of domestic violence. Journal of Population Economics 17: 311–329. DOI 10.1007/s00148-003-0177-7

Romano, Elisa; Babchishin, Lyzon; Marquis, Robyn; Frechette, Sabrina (2015) Childhood Maltreatment and Educational Outcomes. Trauma, Violence, & Abuse, 16(4): 418-437. DOI: 10.1177/1524838014537908

Runyan, D., Wattam, C., Ikeda, R., Hassan, F., Ramiro, L. (2002) Child abuse and neglect by parents and other caregivers. In: Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, editors. World report on violence and health. Geneva: World Health Organization.

Ryan, R. M., Kalil, A., Ziol-Guest, K. M., Padilla, C. (2016). Socioeconomic gaps in parents' discipline strategies from 1988 to 2011. Pediatrics, 138(6).

Schady, N. (2011) Parental Education, Vocabulary, and Cognitive Development in Early Childhood: Longitudinal Evidence from Ecuador. American Journal of Public Health 101(12): 2299–307.

Schady, N., Behrman J., Araujo M.C., Azuero R., Bernal R., Bravo D, Lopez-Boo F., Macours K., Marshall D., Paxson C., Vakis R. J. (2015) Wealth Gradients in Early Childhood Cognitive Development in Five Latin American Countries. Journal of Human Resources 50(2): 446-463. DOI: 10.3368/jhr.50.2.446

Tauchen, H., Witte A. (1995) The Dynamics of Domestic Violence. The American Economic Review, 85(2):414-418. Papers and Proceedings of the Hundredth and Seventh Annual Meeting of the American Economic Association Washington, DC.

Tauchen, H., Witte A., Long S. (1991) Domestic Violence: A Nonrandom Affair," International Economic Review 32: 491–511.

Teicher, M., Andersen S., Polcari A., Anderson C., Navalta C., Kim D. (2003). The neurobiological consequences of early stress and childhood maltreatment. Neuroscience and Biobehavioral Reviews 27: 33-44.

Todd, P. E., and K. I. Wolpin. (2003). On the Specification and Estimation of the Production Function for Cognitive Achievement. The Economic Journal 113(485):3-33.

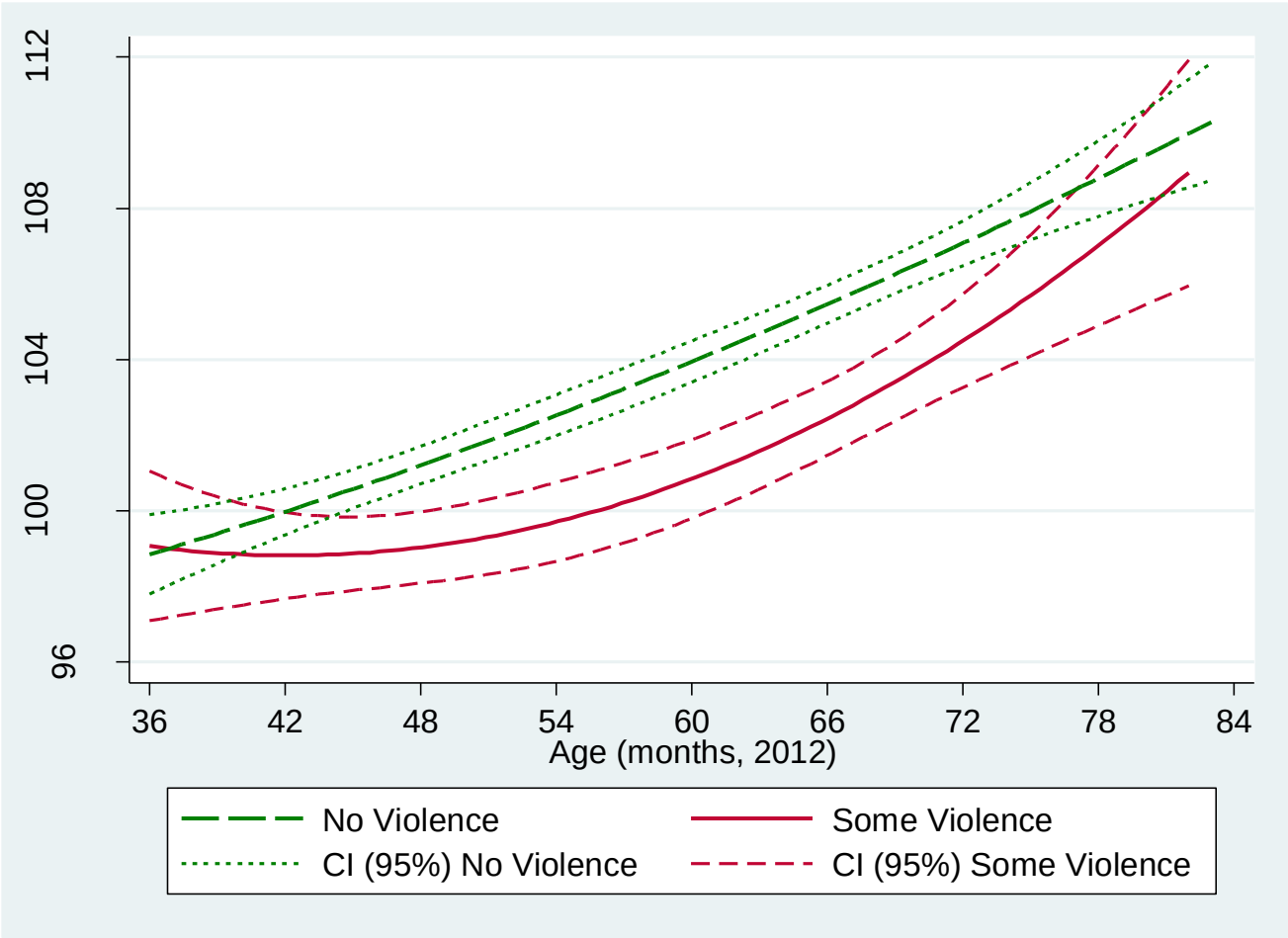
United Nations Children's Fund (2014a) Hidden in Plain Sight: A statistical analysis of violence against children, UNICEF, New York.

United Nations Children's Fund (2014b) 4to Estudio de Maltrato Infantil en Chile: Analisis Comparativo 1994-2000-2006-2012. UNICEF, Santiago de Chile.

Waldinger, R. J., Toth, S. L., Gerber, A. (2001). Maltreatment and internal representations of relationships: core relationship themes in the narratives of abused and neglected preschoolers. Social Development 10(1): 41–58.

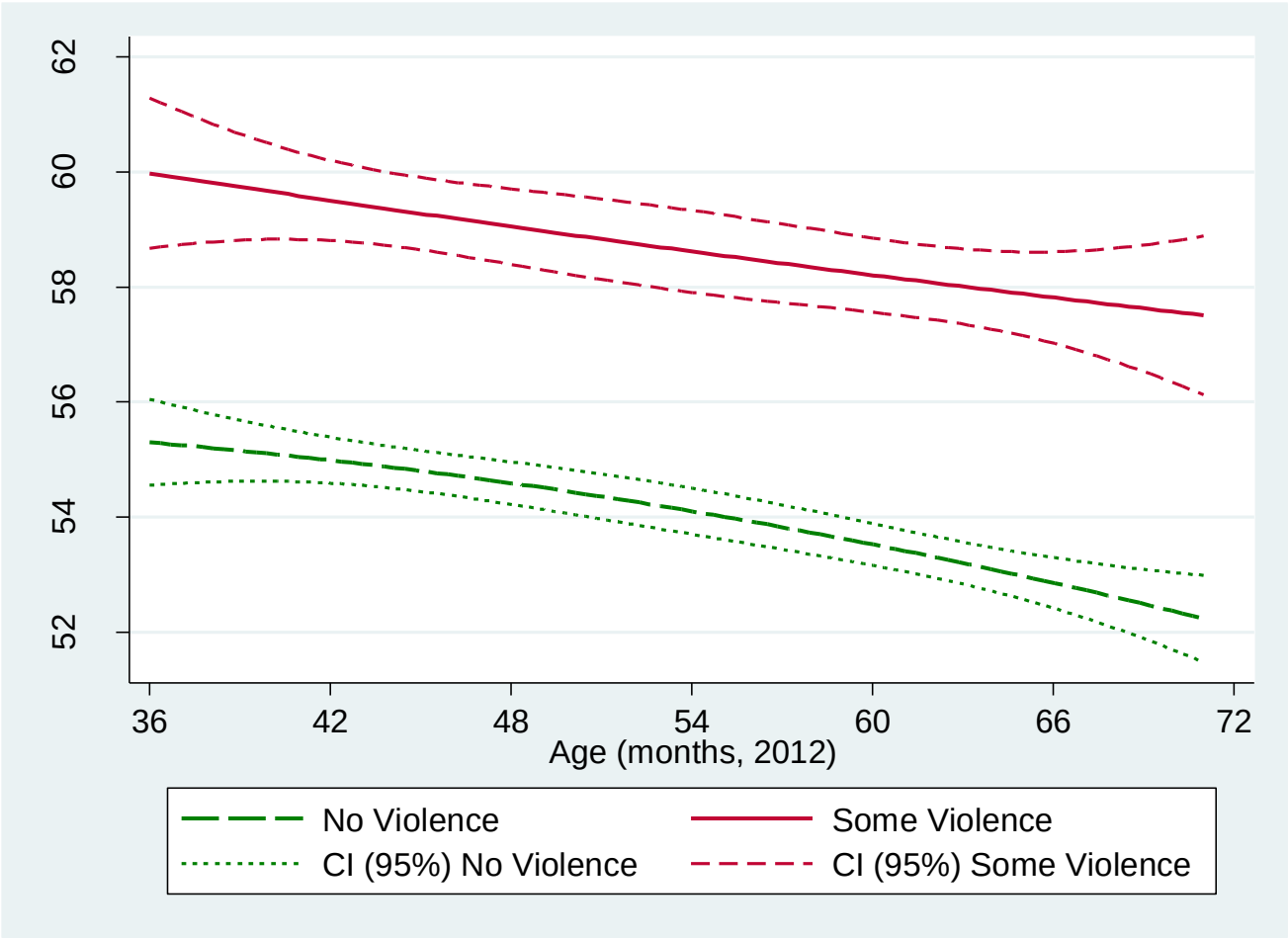
Walker, S.P. et al. (2011) Inequality in early childhood: risk and protective factors for early child development. Lancet 378(9799): 1325–38.

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



Notes: Authors' calculations using 2012 ELPI surveys.

Figure 2. Average CBCL test scores by violence category and age (T-scores)



Notes: Authors' calculations using 2012 ELPI surveys.

Table 1. Descriptive Statistics of PPVT and CBCL test by Violence Category (T-scores)

	Violence 2010		Violence 2012	
	None	**Some**	**None**	**Some**
PPVT				
Mean	104.6	102.4	106.9	103.2
St. Dev.	(15.3)	(14.9)	(18.4)	(19.9)
Observations	3,505	813	3,336	982
CBCL				
Mean	59.8	62.1	53.7	58.6
St. Dev.	(9.4)	(10.1)	(11.7)	(11.2)
Observations	4,349	973	4,074	1,248

Notes: Authors' calculations using 2010 and 2012 ELPI surveys. Final sample includes children with test in both years and all control variables.

Table 2. Distribution of children in PPVT and CBCL categories (percentages)

Test/Category:	2010	2012
PPVT		
Extremely Low	0.3	5.7
Moderately Low	7.6	7.2
Average Low	17.4	7.3
Average	32.0	20.8
Average High	18.6	26.4
Moderately High	17.7	24.6
Extremely High	6.4	8.1
Observations	4,318	4,318
CBCL		
Normal	48.7	65.3
Risk	14.8	11.5
Clinical Range	36.6	23.2
Observations	5,322	5,322

Notes: Authors' calculations using 2010 and 2012 ELPI surveys. Final sample includes children with test in both years and all control variables. T-score ranges for PPVT are defined as follows: extremely low 55-70; moderately low 71-85; average low 86-95; average 96-103; average high 104-115; moderately high 116-130; extremely high 131-145. T-score ranges for CBCL are: normal <93; risk 93-97; clinical range >98.

Table 3. Frequency of Violence by type (percentages)

Sample:	**All Children:**		**PPVT Sample:**		**CBCL Sample:**	
	2010	2012	2010	2012	2010	2012
Type of Violence:	(1)	(2)	(3)	(4)	(5)	(6)
None	82.7	77.0	81.2	77.3	81.7	76.6
Some Violence	17.3	23.0	18.8	22.7	18.3	23.5
Only Verbal	6.6	8.7	7.9	9.1	7.7	9.4
Only Physical	0.4	1.9	0.4	1.8	0.6	1.8
Both forms of Violence	10.3	12.4	10.5	11.8	10.1	12.3
Observations	14,146	11,435	4,318	4,318	5,322	5,322

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. PPVT and CBCL sample include children with test in both years and all control variables.

Table 4. Persistence of violence by type (percentages)

Sample:	All Children			PPVT Sample			CBCL Sample		
Type of Violence:	None	Once	Both	None	Once	Both	None	Once	Both
Some Violence	64.8	30.3	4.9	64.2	30.8	5.1	64.3	30.8	5.0
Only Verbal	66.6	29.1	4.4	65.7	29.9	4.4	66.0	29.6	4.4
Only Physical	76.8	21.7	1.5	77.2	21.5	1.3	77.6	21.1	1.4
Both forms of Violence	78.9	19.9	1.2	79.2	19.6	1.2	79.6	19.3	1.1

Notes: Authors' calculations using 2010 and 2012 ELPI surveys. The number of observations is 10,835 in the all chindren sample, 3,721 in the PPVT sample and 4,567 in the CBCL sample.

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

	PPVT Sample:				CBCL Sample:			
	2010		2012a		2010		2012a	
Variables:	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Child Characteristics								
Male	0.51	0.50			0.50	0.50		
Indigenous descent	0.11	0.32			0.11	0.32		
Age (months in 2010)	41.0	6.88	66.87	6.94	31.57	8.17	57.40	8.19
Pregnancy Characteristics								
Fetus had prob. during pregnancy (fraction)	0.12	0.33			0.12	0.33		
Num. Prob. During Delivery (fraction)	0.32	0.61			0.32	0.60		
Preterm birth (fraction)	0.02	0.14			0.02	0.14		
Height at birth (cm)	49.8	2.04			49.79	2.03		
Weight at birth (grs)	3,411.5	484.55			3,405.6	483.4		
Mother's Mental Prob. in Pregnancy (fraction)	0.10	0.29			0.11	0.32		
Mothers' Post-Partum Depression (fraction)	0.10	0.30			0.12	0.33		
Num. Prob. During Pregnancy (fraction)	3.27	4.89			3.45	5.03		
Smoked during pregnancy (fraction)	0.09	0.29			0.10	0.30		
Alcohol during pregnancy (fraction)	0.07	0.25			0.07	0.26		
Drugs during pregnancy (fraction)	0.01	0.09			0.01	0.09		

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

	PPVT Sample:				CBCL Sample:			
	2010		2012[a]		2010		2012[a]	
Variables:	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Mother Characteristics								
Years of Schooling	11.41	2.97	11.45	3.01	11.45	2.97	11.48	2.93
Number of Children	2.00	1.00	2.12	0.98	1.95	0.99	2.06	0.98
Has a partner (fraction)	0.72	0.45	0.72	0.45	0.71	0.45	0.71	0.45
Head of Household (fraction)	0.13	0.33	0.19	0.39	0.12	0.33	0.19	0.39
Age (years)	30.3	7.05	32.4	7.02	29.5	7.00	31.6	6.98
Numeric WAIS	6.91	2.72			6.94	2.71		
Vocabulary WAIS	8.17	3.55			8.14	3.56		
BFI agreeableness	3.84	0.59			3.83	0.60		
BFI exteriorization	3.49	0.74			3.51	0.74		
BFI responsibility	4.00	0.57			3.99	0.57		
BFI neuroticism	3.06	0.81			3.07	0.81		
BFI openness to new experiences	3.78	0.64			3.78	0.64		
Parenting Style Index Care 2012 (0-3)	0.57	0.84			0.50	0.79		
Household Characteristics								
Urban	0.88	0.32			0.89	0.31		
Income per capita 2010 (CL$ 000)	471.0	847.3	519.5	478.2	467.2	774.8	525.2	487.1
Number of observations	4,318		4,318		5,322		5,322	

Notes: Authors' calculations using 2010 and 2012 ELPI surveys. [a]: Time invariant variables are only reported in 2010.

Table 6. Effects of violence toward children on cognitive and non-cognitive outcomes (2012).

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
	T-scores	Low PPVT Category	T-scores	Risk CBCL Category
Variables:	(1)	(2)	(3)	(4)
Some violence	-1.934***	0.0376**	3.471***	0.114***
	(0.644)	(0.0149)	(0.338)	(0.0150)
PPVT 2010	0.423***			
	(0.0189)			
PPVT 2010 Low Category		0.205***		
		(0.0162)		
CBCL 2010			0.398***	
			(0.0178)	
CBCL 2012 Clinical Risk				0.235***
				(0.0135)
Male	-2.270***	0.0395***	0.609**	0.0351***
	(0.513)	(0.0117)	(0.288)	(0.0121)
Mother's Mental Prob. in Pregnancy	-0.641	0.0239	1.106**	0.0536**
	(0.919)	(0.0213)	(0.504)	(0.0214)
Num. Prob. During Pregnancy	0.0792	-0.00230**	0.0697**	0.00106
	(0.0525)	(0.00117)	(0.0298)	(0.00126)
Alcohol during pregnancy	1.302	-0.0428*	0.935	0.00522
	(0.942)	(0.0222)	(0.588)	(0.0244)
Mother's education	0.662***	-0.0122***	-0.296***	-0.0157***
	(0.109)	-0.00242	(0.0600)	(0.00246)
Number of Children	-1.050***	0.0118	-0.485***	-0.0159**
	(0.311)	(0.00738)	(0.177)	(0.00712)
Mother has a partner	-0.241	-0.00307	-0.791**	-0.0306**
	(0.649)	(0.0148)	(0.358)	(0.0153)
Mother is Head of Household	-2.070**	0.0442**	0.211	0.0125
	(0.832)	(0.0194)	(0.453)	(0.0197)

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in 2010 (months), child is of indigenous descent, fetus had problems during pregnancy, number of problems during delivery, premature, height at birth, weight at birth, mothers' post-partum depression, smoked during pregnancy, drugs during pregnancy, mothers' age, mothers' age squared, urban household, household income per capita 2010, and a series of categorical variables for region of residency. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 6 (continued). Effects of violence toward children on cognitive and non-cognitive outcomes (2012).

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
Variables:	T-scores (1)	Low PPVT Category (2)	T-scores (3)	Risk CBCL Category (4)
Mothers' WAIS Numeric	-0.0590	0.000635	-0.0305	-0.00367
	(0.108)	(0.00238)	(0.0592)	(0.00245)
Mothers' WAIS Vocabulary	0.360***	-0.00730***	-0.131***	-0.00445**
	(0.0891)	(0.00207)	(0.0494)	(0.00206)
Mothers' BFI Agreeableness	0.0713	-0.0118	-0.165	-0.00438
	(0.486)	(0.0112)	(0.270)	(0.0116)
Mothers' BFI Extraversion	0.784**	-0.00878	-0.0597	0.000327
	(0.374)	(0.00876)	(0.209)	(0.00903)
Mothers' BFI Conscientiousness	0.317	-0.0175	-0.580**	-0.0317***
	(0.499)	(0.0115)	(0.275)	(0.0117)
Mothers' BFI Neuroticism	-0.0248	-0.0101	0.814***	0.0554***
	(0.366)	(0.00816)	(0.215)	(0.00884)
Mothers' BFI Openness to experience	0.338	-0.00535	0.334	0.00767
	(0.443)	(0.0103)	(0.250)	(0.0106)
Parenting Style Index Care 2012(0-3)	-1.168***	0.0124**	1.333***	0.0406***
	(0.262)	(0.00629)	(0.163)	(0.00672)
Observations	4,318	4,318	5,322	5,322
R-squared	0.241	0.130	0.241	0.185
Mean Dep. Variable	106.1	0.202	54.87	0.347
Mean Violence	0.227	0.227	0.234	0.234

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in 2010 (months), child is of indigenous descent, fetus had problems during pregnancy, number of problems during delivery, premature, height at birth, weight at birth, mothers' post-partum depression, smoked during pregnancy, drugs during pregnancy, mothers' age, mothers' age squared, urban household, household income per capita 2010, and 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. Persistence of violence on cognitive and non-cognitive outcomes (T-scores, 2012).

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
Variables:	T-scores (1)	Low PPVT Category (2)	T-scores (3)	Risk CBCL Category (4)
Some Violence in both surveys	-3.437***	0.0815***	3.174***	0.113***
	(1.282)	(0.0293)	(0.666)	(0.0280)
Some Violence in one survey	-0.710	0.0264**	2.065***	0.0656***
	(0.558)	(0.0130)	(0.316)	(0.0136)
Observations	4,318	4,318	5,322	5,322
R-squared	0.241	0.131	0.234	0.181
Mean Dep. Variable	106.1	0.202	54.87	0.347
Fraction Violence: Two times	0.054	0.054	0.052	0.052
Fraction Violence: One time	0.308	0.308	0.313	0.313
F-test Equality (p-value)	0.038	0.067	0.103	0.100

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's weight 2010, child's height in 2010, child's cranial circumference in 2010, male, child's age in 2010 (months), child is of indigenous descent, mother's mental prob. in pregnancy, mothers' post-partum depression, num. prob. during pregnancy, fetus had prob. during pregnancy, smoked during pregnancy, alcohol during pregnancy, drug during pregnancy, num. prob. during delivery, premature, height at birth, weight at birth, mother's education, number of children, mother has a partner, mother is head of household, mothers' age, mothers' age squared, mothers' WAIS numeric, mothers' WAIS vocabulary, mothers' BFI agreeableness, mothers' BFI extraversion, mothers' BFI conscientiousness, mothers' BFI neuroticism, mothers' BFI openness to experience, parenting style index care in 2012 (0-3), urban household and 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. Panel estimates of the effect of violence toward children on cognitive and non-cognitive outcomes.

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
Variables:	T-scores (1)	Low PPVT Category (2)	T-scores (3)	Risk CBCL Category (4)
Some violence	-0.824*	0.00475	2.063***	0.0626***
	(0.495)	(0.0141)	(0.263)	(0.0134)
Observations	9,838	9,838	11,992	11,992
R-squared	0.022	0.016	0.222	0.112
Number of Children	4,919	4,919	5,996	5,996
Mean Dep. Variable	104.7	0.238	57.58	0.432
Mean Violence	0.208	0.208	0.209	0.209

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in months; mother's education; number of children; mother has a partner; mother is head of household; mothers' age; mothers' age squared; parenting style index care 2012 (0-3); urban household; household income per capita, a categorical variable for 2012, and a series of categorical variables for region of residency. Standard errors clustered at the child level 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 by type of violence (T-scores).

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
Variables:	T-scores (1)	Low PPVT Category (2)	T-scores (3)	Risk CBCL Category (4)
Only Verbal Violence	-1.073	-0.00599	2.464***	0.0571***
	(0.731)	(0.0217)	(0.391)	(0.0197)
Physical and Verbal Violence[a]	-0.674	0.0112	1.819***	0.0660***
	(0.591)	(0.0164)	(0.321)	(0.0161)
Observations	9,838	9,838	11,992	11,992
R-squared	0.022	0.016	0.223	0.112
Number of Children	4,919	4,919	5,996	5,996
Mean Dep. Variable	104.7	0.238	57.58	0.432
Mean Verbal Violence	0.084	0.084	0.085	0.085
Mean Both Violences	0.124	0.124	0.124	0.124
F-test Equality (p-value)	0.643	0.490	0.173	0.705

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in months; mother's education; number of children; mother has a partner; mother is head of household; mothers' age; mothers' age squared; parenting style index care 2012 (0-3); urban household; household income per capita, a categorical variable for 2012, and a series of categorical variables for region of residency. Standard errors clustered at the child level in parentheses *** p<0.01, ** p<0.05, * p<0.1. [a]: Includes children with only physical violence and children with both violences.

Table 10. Panel estimates of the effect of violence toward children on CBCL test scores by categories (T-scores and categories).

	CBCL: Internalization		CBCL: Externalization		CBCL: Sleep Problems	
	T-scores	Risk Category	T-scores	Risk Category	T-scores	Risk Category
Variables:	(1)	(2)	(3)	(4)	(5)	(6)
Some violence	1.925***	0.0613***	1.891***	0.0560***	0.813**	0.0155*
	(0.264)	(0.0138)	(0.275)	(0.0135)	(0.409)	(0.00818)
Observations	11,992	11,992	11,992	11,992	11,992	11,992
R-squared	0.115	0.048	0.243	0.128	0.057	0.015
Number of Children	5,996	5,996	5,996	5,996	5,996	5,996
Mean Dep. Variable	57.74	0.48	56.58	0.403	66.9	0.077
Mean Violence	0.209	0.209	0.209	0.209	0.209	0.209

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in months; mother's education; number of children; mother has a partner; mother is head of household; mothers' age; mothers' age squared; parenting style index care 2012 (0-3); urban household; household income per capita, a categorical variable for 2012, and a series of categorical variables for region of residency. Standard errors clustered at the child level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 11. Panel estimates of the effect of violence toward children on cognitive and non-cognitive outcomes by Sex of the Child (T-scores and categories).

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
Variables:	T-scores (1)	Low PPVT Category (2)	T-scores (3)	Risk CBCL Category (4)
Girls:				
Some violence	-0.950	0.0450**	1.561***	0.0434**
	(0.671)	(0.0195)	(0.380)	(0.0192)
Observations	4,928	4,928	5,994	5,994
R-squared	0.038	0.025	0.230	0.112
Mean Dep. Variable	105.7	0.219	57.04	0.409
Mean Violence	0.193	0.193	0.193	0.193
Boys:				
Some violence	-0.736	-0.0328	2.527***	0.0797***
	(0.722)	(0.0203)	(0.365)	(0.0186)
Observations	4,910	4,910	5,998	5,998
R-squared	0.025	0.019	0.219	0.116
Mean Dep. Variable	103.7	0.257	58.12	0.454
Mean Violence	0.224	0.224	0.226	0.226

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in months; mother's education; number of children; mother has a partner; mother is head of household; mothers' age; mothers' age squared; parenting style index care 2012 (0-3); urban household; household income per capita, a categorical variable for 2012, and a series of categorical variables for region of residency. Standard errors clustered at the child level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 12. Panel estimates of the effect of violence toward children on cognitive and non-cognitive outcomes by Age of the Child (T-scores and categories).

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
Variables:	T-scores (1)	Low PPVT Category (2)	T-scores (3)	Risk CBCL Category (4)
Less than 48 months:				
Some violence			2.253***	0.105***
			(0.664)	(0.0337)
Observations			1,720	1,720
R-squared			0.116	0.062
Mean Dep. Variable			56.95	0.445
Mean Violence			0.217	0.201
Between 48 to 71 months:				
Some violence	-1.289**	-0.000564	2.008***	0.0547***
	(0.588)	(0.0172)	(0.286)	(0.0146)
Observations	6,836	6,836	10,272	10,272
R-squared	0.023	0.014	0.242	0.122
Mean Dep. Variable	103.8	0.254	57.50	0.430
Mean Violence	0.214	0.214	0.210	0.210
Equal or more than 72 months:				
Some violence	0.393	0.0156	1.520***	0.0534*
	(0.914)	(0.0245)	(0.562)	(0.0277)
Observations	3,002	3,002	3,022	3,022
R-squared	0.041	0.038	0.097	0.041
Mean Dep. Variable	106.8	0.202	58.89	0.444
Mean Violence	0.196	0.196	0.188	0.188

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in months; mother's education; number of children; mother has a partner; mother is head of household; mothers' age; mothers' age squared; parenting style index care 2012 (0-3); urban household; household income per capita, a categorical variable for 2012, and a series of categorical variables for region of residency. Standard errors clustered at the child level 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 Mother's education (T-scores and categories).

	Cognitive Outcome: PPVT Test		Non-Cognitive Outcome: CBCL Test	
Variables:	T-scores (1)	Low PPVT Category (2)	T-scores (3)	Risk CBCL Category (4)
Mothers' Years of schooling: 12 or less				
Some violence	-0.673	0.00817	2.265***	0.0728***
	(0.555)	(0.0164)	(0.305)	(0.0152)
Observations	7,714	7,714	9,396	9,396
R-squared	0.026	0.020	0.219	0.115
Mean Dep. Variable	102.9	0.269	58.50	0.472
Mean Violence	0.216	0.216	0.214	0.214
Mothers' Years of schooling: more than 12				
Some violence	-1.573	-0.00378	1.265**	0.0220
	(1.102)	(0.0264)	(0.506)	(0.0277)
Observations	2,124	2,124	2,596	2,596
R-squared	0.035	0.025	0.255	0.118
Mean Dep. Variable	111.3	0.128	54.25	0.287
Mean Violence	0.182	0.182	0.190	0.190

Source: estimates using ELPI survey data from 2010 and 2012. Other control variables measured in 2010 that are not reported here include child's age in months; mother's education; number of children; mother has a partner; mother is head of household; mothers' age; mothers' age squared; parenting style index care 2012 (0-3); urban household; household income per capita, a categorical variable for 2012, and a series of categorical variables for region of residency. Standard errors clustered at the child level 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.