DISCUSSION PAPER SERIES

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# Violence during Early Childhood and Child Development

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# ABSTRACT

# Violence during Early Childhood and Child Development*

We study the effects of violence towards children on early childhood development. We contribute to the literature providing estimates of the effects of violence (verbal and/or physical) that control for child-mother unobserved characteristics. We find that violence has negative effects on verbal skills (Peabody Picture Vocabulary Test) and socio-emotional development (Child Behavior Check List). We also find that violence affects girls in their vocabulary development and increases behavioral problems of both boys and girls, with stronger effects among boys; that the negative effects diminish as children get older; and that they are more harmful among children with less educated mothers.

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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 socio-emotional 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). Additionally, the formation of child 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 violence towards children 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 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) 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 an ongoing debate on the effects of less harsh forms of

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[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.

violence that include physical or corporal punishment but that do not reach levels that can endanger the child's physical 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 harsh forms of punishment, such as spanking or verbal violence, and 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 because of 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 harsh 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 cognitive and socio-emotional development. Cognitive development is measured using the Spanish version of the Peabody Picture Vocabulary Test (PPVT) and socio-

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[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).

emotional development is assessed using the Child Behavioral Checklist (CBCL) test.

Previous related studies include Currie and Tekin (2012), which explores the effects of maltreatment (measured as neglect, physical, and sexual abuse) on the likelihood of engaging in criminal activity. Using OLS (sibling and twins estimates), they find that maltreatment 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) studies the relationship between children's early cognitive development and socio-economic status, child health, and parenting quality in Ecuador.[3] Parenting quality is studied by 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 harsh forms of violence on cognitive and 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 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).

A second contribution is that unlike most studies that use self-reported measures of

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

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 that administered a series of cognitive and socio-emotional tests. At the end of the visit, test administrators—who were psychologists—filled out the Home Observation for Measurement of the Environment (HOME) questionnaire, reporting several measures of maternal attitudes towards the child, including verbal and/or physical violence during the visit.

We find that after controlling for child-mother unobservables, exposure to milder violence (verbal, physical or both) has a negative and significant effect on verbal skills (our cognitive outcome). We also find that exposure to some violence significantly increases the number of behavioral 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.[5] 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

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[4] Paxon and Shady (2007) also use observational measures of violence.
[5] Exposure was defined as experiencing violence in none of the surveys, in one or in both surveys.

educated mothers. Overall our estimations consistently reveal that exposure to violence has significant and negative effects on cognitive as well as socio-emotional 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 socio-emotional outcomes we perform two different analyses. We first estimate a model of the contemporaneous effect of violence controlling 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 violence and the effects of unobserved mother and child characteristics. It also allows us to obtain estimates for the association between child development and individual and family-level 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 contemporaneous 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 socio-emotional outcome and $Y_{i,t-1}$ is the past level of the outcome variable. $V_{i,t}$ is our variable of interest that measures 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.

Child controls in $C_{i,t-1}$ include age 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, 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, extraversion, conscientiousness, neuroticism, and openness to new experiences. We also control for other characteristics of the parenting style through an index the captures three dimensions: whether the mother does not speak, praise, and/or caress to the child during the interview. 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, because it is likely that there exist unobservables correlated to both violence and child development. Since 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 and that are not perfectly controlled by the lagged variable. To the extent that those factors are time invariant, such as child behavioral tendencies or mother's personality traits, implementing a panel data model that includes child-mother fixed effects would control for those unobservables.

We take advantage of the longitudinal nature of our data and we also estimate a child-mother fixed effect:

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

were and $C_{i,t}$, $M_{i,t}$ and $H_{i,t}$ are previously defined vectors of time-variant child, mother and household characteristics, $\rho_i$ is a child-mother fixed effect, and $\mu_t$ is a time fixed effect.[6]

Thus, equation (2) generates estimates of $\beta_1$—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 rounds of the Early Childhood Longitudinal Survey (ELPI for its Spanish acronym) carried out in 2010 and 2012 in Chile.[7] ELPI is a longitudinal survey designed to be nationally representative of the population of children aged between 6 months and 7 years.

The survey was carried out in two phases. On a first visit to each household, a sociodemographic survey was taken, which collected information on socio-economic characteristics of the household, its demographic composition, parental employment status, health

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

[7] The Spanish name of the survey is Encuesta Longitudinal de Primera Infancia (ELPI).

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 child and main caretaker—who were overwhelmingly the mother.[8] 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 socio-emotional tests*

We focus on two widely-known instruments to measure child development: the Spanish version of the Peabody Picture Vocabulary Test (PPVT) and the Child Behavior Checklist (CBCL) for pre-school children. 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); it is an important predictor of future cognitive outcomes (Schady, 2012; Case and Paxson, 2008; Cunha and Heckman, 2007).The test consists of showing children a slide with four images and asking them out loud which image corresponds to a given object or action. The child receives a score of 1 if the answer is correct and 0 if incorrect; the test continues until 6 wrong answers are given consecutively. Raw scores are then converted to standardized test scores; the testing agency also reports categories of performance based on the standardized scores.[9] In Chile, it was administered to about 7,300 children who were aged $30 - 59$ months in 2010, and between 30 and 84 months in 2012.

The CBCL assesses behavior and socioemotional competencies of the child (reported by

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[8] The percentage of main caregivers who are the mother was 99.1 and 98.4 in the 2010 and 2012 rounds, respectively.

[9] Test scores were standardized at mean 100 and standard deviation of 15. The performance classification for PPVT results was as follows (test score range in parentheses): extremely low ($55 - 70$), moderately low ($71 - 85$), below average ($86 - 95$), average ($96 - 103$), above average ($104 - 115$), moderately high ($116 - 130$), and extremely high ($131 - 145$).

the parents or teachers), and can be used to identify problematic areas in child development (Achenbach and Rescorla 2000). In our context, parents were asked to assess whether and how intensely their child engages in a list of problem behaviors using a Likert scale (0=Never or almost never, 1=Sometimes, 2=Often or Very Often); higher scores means greater socioemotional difficulties. Raw scores were converted to standardized scores, and the agency also reported performance categories.[10] It was administered to children aged between 18 and 59 months in 2010, and between 18 and 84 months in 2012.

Scores were provided in the data for the total list of behavior problems; additionally, categories of behaviors can be grouped into seven clinical syndromes according to the Diagnostic and Statistical Manual of the American Psychiatric Association, DSM-5.[11] In this paper, we also analyze three sub-categories 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 that involve conflicts between the child and others and expectations about the child. It groups two syndromes: attention problems and aggressive behavior. The sleep problems syndrome stands alone.

Descriptive statistics of the test results are reported in Table 1. We report average scores for children according to whether they experienced violence or not. Our final sample includes 4,318 and 5,322 children in the PPVT and CBCL estimates, respectively (sample sizes vary due

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[10] Test scores were standardized at mean 60 and standard deviation 10. The categories for the CBCL were as follows (test score range in parentheses): normal ($< 60$), at risk ($60 - 63$), and clinical range ($> 63$).
[11] The syndromes include: emotional reactivity, anxiety/depression, somatic complaints, withdrawn, sleep problems, attention problems, and aggressive behavior.

to the children's ages).

To facilitate interpretation, we also analyzed the developmental categories reported for both PPVT and CBCL variables depending on children's test scores, which indicate whether the child is at risk in terms of development. We present these distributions in Table 2, finding that 25 and 20 percent of the sample belongs to these three lower achievement categories in 2010 and 2012, respectively. For the CBCL, 51 percent of children are in the risk or clinical range 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 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.[12]

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

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

psychological tests, and they also received training on how to administer the tests without intervening and on how to report their observations objectively. Thus, in contrast to most studies, ours uses direct observational data that does not suffer from self-reporting biases or recall problems, because the questionnaire was filled out before the end of the visit by the test administrator.[13]

Given these characteristics of the data, it is likely that our measures of violence 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 a conduct 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 not suffering violence includes children that are in fact subject to violence. In this scenario, the development outcomes of the no-violence group would be lower and our estimates of the effect of violence would be biased downward. In our data this is the most likely case, as many of the children for which no violence is observed when tests were administered, are likely to actually be exposed to violence in their home.[14]

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

[14] The 2012 ELPI survey included a question regarding parental disciplinary methods, including

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: the full sample of children available in the data, followed by two samples that include the number of children that received the PPVT and CBCL tests and for whom all variables of interest were available both years, respectively. We observe that in our sample, 17.3 percent of children were exposed to some form of violence in 2010, and the percentage increases to 23 percent in 2012. Observed violence is similar in the three samples.

Table 3 also reports whether the child was subject to only verbal violence, only physical violence, or to both forms of violence. We observe that among children subject to violence in the full sample, about 38 percent receive only verbal violence and most 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 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, i.e., 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 5 percent of children

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harsh parenting; 36% of children suffered physical and verbal violence according to self-reported questions, compared to approximately 23% using observational data in the HOME questionnaire. Furthermore, 55% of children had consistent measures (observed and self-reported), 34% mothers reported some form of mild violence that was not observed during the visit, and in 15% of cases mothers did not report violence when the interviewer observed it.

were victims of some type of violence in both years and 30 percent of children were victims of some type of violence in at least one of the two years. We will use this variable to study whether persistence of violence is associated with child development.

Figures 1 and 2 reveal that children exposed to some type of violence have lower cognitive development and more behavioral problems. The figures plot the average test scores (and confidence intervals) by exposure to some type of violence and child's age (months). Children aged 30 to 60 months that were 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 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, as control variables we include 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). A Parenting Style Index is also constructed by analyzing three questions of the HOME questionnaire that characterize the relationship between the mother and the child during the visit. The questions include whether the mother does not speak, praise, and/or caress her child; thus our variable takes values between 0 and 3, with higher vales

indicating more uninvolved or detached parenting styles (Jones et al. 2014). Descriptive statistics for variables that describe the child, pregnancy, mother, and household (detailed 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 socio-emotional development in 2012 controlling for the initial development of each child in 2010. 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 outcome (PPVT and CBCL), we estimate equation (1) for two outcomes: standardized test scores, and to have a sense of the importance of the effect, we estimate regressions of a discrete variable that indicates whether children fall into low cognitive development (in the PPVT) or into the risk/clinical behavior category (in the CBCL).

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 test scores as well as with the likelihood of falling into a low-level category.[15,16] Exposure to violence is associated with a decrease of 1.9 points on the PPVT test, which is equivalent to 0.1 standard deviations in the test scores, and an increase of 0.04 (18.6 percent) in the probability of low development.[17] In terms of

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[15] In PPVT, higher values are associated with higher cognitive development. Since the CBCL measures problem behaviors, higher values mean worse socio-emotional development.

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

[17] Effects of the test 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.

socio-emotional development, violence is significantly associated with increases in children's behavioral problems. Point estimates indicate that violence increase CBCL scores by 0.3 standard deviations and 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 socio-emotional development in the expected relations. Initial levels of cognitive and socio-emotional development (the child's PPVT and CBCL test scores in 2010) indicate that children with higher initial cognitive development obtain better results in 2012, 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.

Among other results, girls have better scores in the language test (PPVT) and present lower levels of behavior problems (CBCL), and mother's years of schooling is significantly associated with both areas of development. It is interesting to point out that mother's cognitive abilities and socio-emotional characteristics are relevant determinants of children's outcomes. Her verbal skills (WAIS vocabulary) are significantly associated with both types of child development (not her numeracy skills). 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.[18]

Next, we take advantage of the two rounds of the survey and investigate if persistence of

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[18] 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.

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 socio-emotional 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 their test scores and problem categories. These results reveal that exposure to systematic violence over time is detrimental to child development, and therefore highlights 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, results from our cross-sectional estimates could be biased if unobservable characteristics are correlated to the likelihood of violence towards children and early childhood development. Since our data is a panel of children, we are able to control for the child-mother time-invariant unobsrevables with a fixed-effects model. The panel estimates of equation (2) are presented in Table 8.

We found that after controlling for child-mother fixed-effects, being subject to some type of violence still has a negative and significant effect on verbal skills, although point estimates are reduced with respect to cross-sectional estimates by about a half. In terms of cognitive

development, we find that that violence reduces vocabulary test scores by 0.04 standard deviations, with no effect on the likelihood of low-level vocabulary development. We also find that violence significantly affects socio-emotional development, increasing behavior problem test scores by 0.18 standard deviations and also increasing in the likelihood of being in the risk/clinical 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 and that they account for a significant fraction of the effect of violence, therefore they need to be accounted for in empirical estimations.

An additional question that we can explore with our data is whether 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.[19] 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). Point estimates suggest that 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 clear evidence of which type of violence is more detrimental to children's development.

As described previously, the CBCL measures problems related to seven syndromes that can be classified into three broad categories of problems: internalization, externalization, and sleep

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[19] Theoretically we could have three categories: only verbal, only physical, and both forms of violence. However, only a very small fraction of children are subject to only physical violence and 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.

problems. We explore the effect of violence on each of these categories and report our results in Table 10. We find that violence has a negative effect on all three types of syndromes, but particularly strong effect on 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 on both cognitive and socio-emotional 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 they reach a broad set of behavioral areas, including internalization, externalization and sleep problems.[20]

## 4.3 Heterogeneous effects of violence

We also study whether it is possible that the effects of violence might vary according to the child's sex, her age, and mother's education. We report estimates of equation (2), the panel estimates, which is our preferred specification because it controls for child-mother unobservables. Table 11 presents results for children according to their sex. They show that the effects of violence

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[20] As a robustness check to control for the possible omitted variables bias induced by time-variant unobservables, we also implemented an instrumental variables estimation of equation (1). Controlling for previous (initial) development of each child, we instrumented observed violence towards the child in 2012 with observed violence in 2010. Our hypothesis is that past violence effects child development, but since we control for the previous level of development, past violence should not be correlated with the error term in equation (1) but should help to predict the likelihood of current violence (in 2012). Results are reported and discussed in Appendix 2. The I.V. estimates are consistent with our estimates reported in Table 6 in terms of the direction of the effects, although as expected, standard errors increase substantially and point estimates are no longer significant (with the exception of the probability of falling into a low PPVT category). Furthermore, I.V. results suggest that OLS underestimates the impact of violence on cognitive skills, while results for child behavior are similar in magnitude.

on cognitive development (PPVT) test scores 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 of cognitive development show that violence negatively affects girls. This suggests that language development for girls is more sensitive to violence than boys, even in a context where 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 is verified with both outcomes (test scores and the probability of risk/clinical problems). 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.[21] 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

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[21] For the group of children with less than 48 months of age we do not have estimates on cognitive test, as PPVT 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.

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, suggesting 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 (i.e., her education in 2010) and report our results in Table 13. We use mother's education as proxy for permanent income of the household, because current income levels could be affected by child behavior or cognitive development.[22] 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 effects on cognitive development, we find that the effect is larger for children with more educated mothers, although the effects are not statistically significant. For 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; however, even among higher-income children, violence increases socio-emotional problems.

## 5.    Conclusions

There is ample consensus on the harmful effects of sever forms of child abuse and neglect

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[22] 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.

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 socio-emotional development. Our work makes several contributions to a limited literature in economics.

First, by taking advantage of a longitudinal data set of children that allows us to control for child-mother time-invariant unobservables (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 for child development (Paxon and Shady, 2007 and Currie and Tekin, 2012).

Second, we study the effects of violence on two different types of outcomes: cognitive and socio-emotional development using standard test measures: PPTV for cognitive development and the CBCL for socio-emotional 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 harms 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. Interestingly, our estimates suggest that there is no difference between verbal and physical violence, but what matters is exposure to either 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 suffer larger negative effects in terms of their cognitive development, but the negative effect on behavioral problems is similar for all age groups. Finally, we find that 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, 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 persistence 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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**Figure 1. Average PPVT scores by violence category and age (Standardized test scores)**
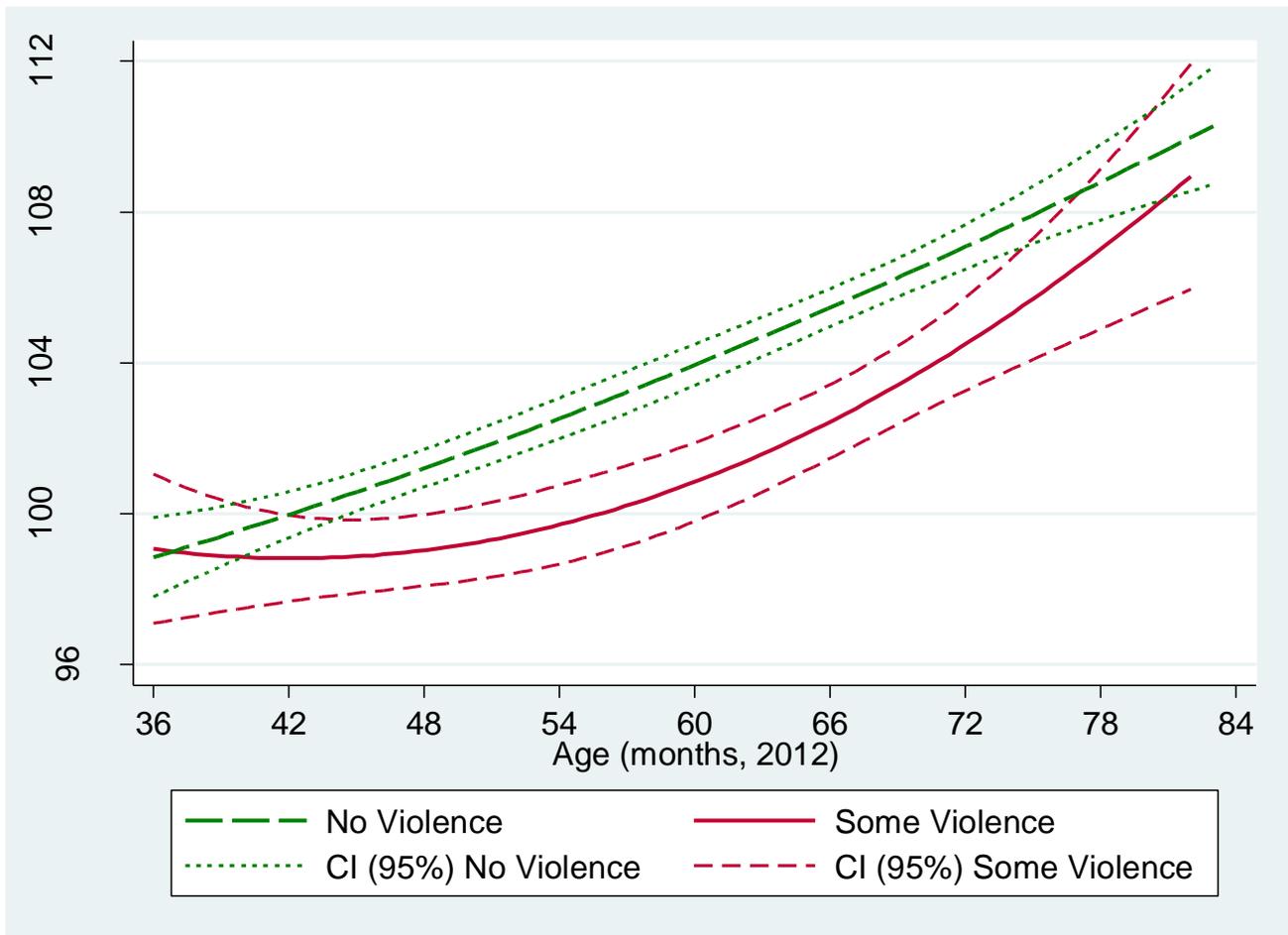


Notes: Authors' calculations using 2012 ELPI surveys.

**Figure 2. Average CBCL test scores by violence category and age (Standardized test scores)**
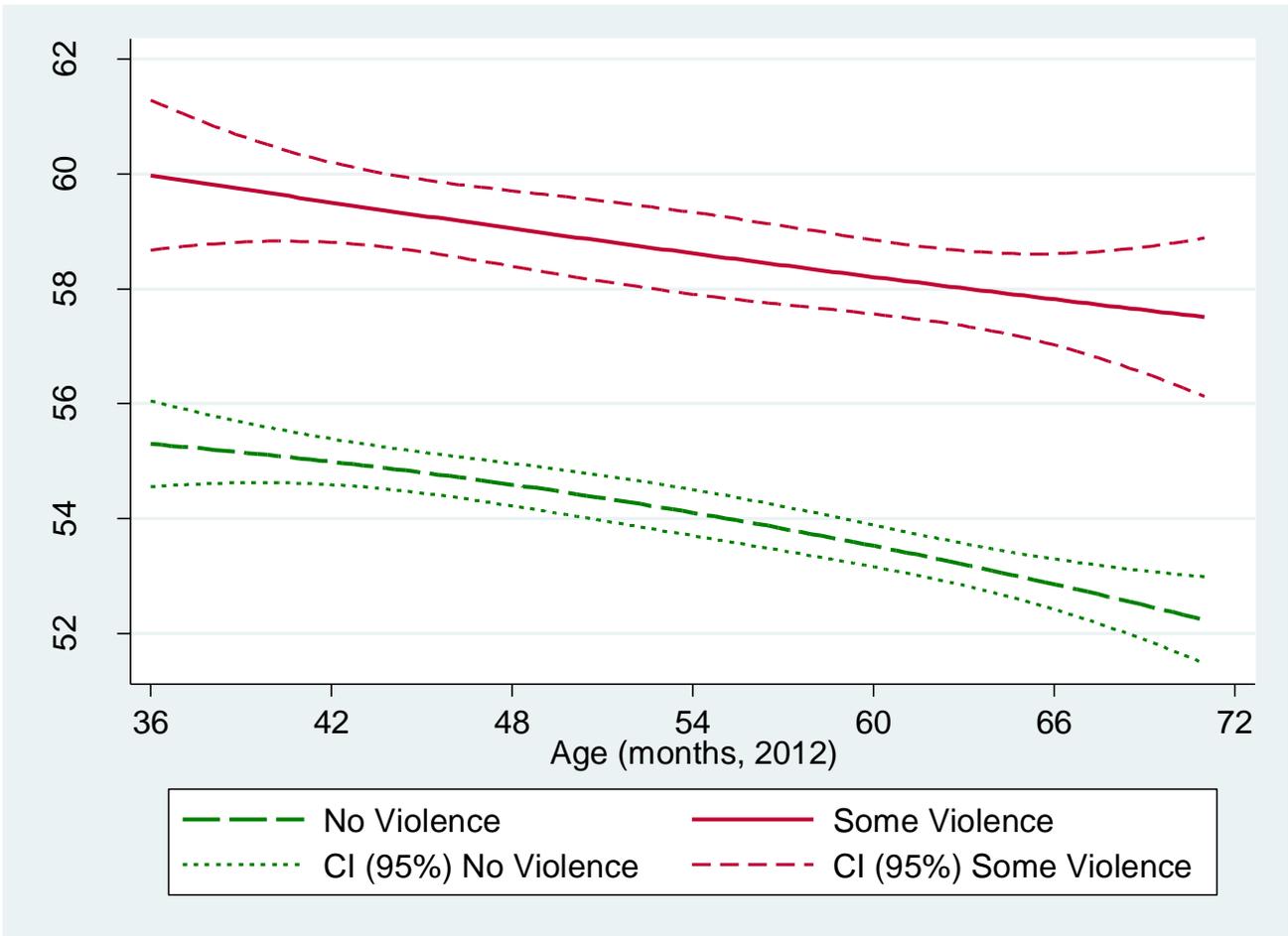


Notes: Authors' calculations using 2012 ELPI surveys.

**Table 1. Descriptive Statistics of PPVT and CBCL test by Violence Category (Standardized test 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. PPVT scores were standardized at mean 100 and standard deviation of 15; CBCL scores were standardized at mean 60 and standard deviation 10.

**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. Test 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. Test score ranges for CBCL are: normal <60; risk 60-63; clinical range >63.

**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 children 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)**

| Variables: | PPVT Sample: | | | | CBCL Sample: | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 2010 | | 2012a | | 2010 | | 2012a | |
| | 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 socio-emotional outcomes (2012)**

| Variables: | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | Standardized test-scores (1) | Low PPVT Category (2) | Standardized test-scores (3) | Risk CBCL Category (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 (cont.) Effects of violence toward children on cognitive and socio-emotional outcomes (2012)**

| Variables: | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | **Standardized test-scores** (1) | **Low PPVT Category** (2) | **Standardized test-scores** (3) | **Problem/Risk 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 socio-emotional outcomes (2012)**

| Variables: | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | **Standardized test-scores** (1) | **Low PPVT Category** (2) | **Standardized test-scores** (3) | **Problem/Risk 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 socio-emotional outcomes**

| Variables: | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | Standardized test-scores (1) | Low PPVT Category (2) | Standardized test-scores (3) | Problem/Risk 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 socio-emotional outcomes by type of violence**

| Variables: | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | Standardized test-scores (1) | Low PPVT Category (2) | Standardized test-scores (3) | Problem/Risk 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 types of violence.

**Table 10. Panel estimates of the effect of violence toward children on CBCL test scores by syndrome categories**

| Variables: | CBCL: Internalization | | CBCL: Externalization | | CBCL: Sleep Problems | |
|---|---|---|---|---|---|---|
| | Standardized test scores (1) | Risk Category (2) | Standardized test scores (3) | Risk Category (4) | Standardized test scores (5) | Risk Category (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 socio-emotional outcomes, by Sex of the Child**

| | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | **Standardized test-scores** | **Low PPVT Category** | **Standardized test-scores** | **Problem/Risk Category** |
| Variables: | (1) | (2) | (3) | (4) |
| **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 |
| **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 |

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 socio-emotional outcomes, by Age of the Child**

| Variables: | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | Standardized test-scores (1) | Low PPVT Category (2) | Standardized test-scores (3) | Problem/Risk 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 socio-emotional outcomes, by Mother's education**

| Variables: | Cognitive Outcome: PPVT | | Socio-emotional Outcome: CBCL | |
|---|---|---|---|---|
| | **Standardized test-scores** (1) | **Low PPVT Category** (2) | **Standardized test-scores** (3) | **Low PPVT 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 on 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 shout 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 reproach, criticize, or annul 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.

## Appendix 2. Robustness Check: Instrumental Variables

In order to account for the possibility of omitted variables bias due to time-variant unobservables, we estimated equation (1) with instrumental variables. We instrument children's observed violence in 2012 with violence in 2010. We expect that past exposure to violence affects previous levels of child development, so that controlling for previous levels of development, past violence should meet the exclusion restriction. At the same time, we expect that past violence should be a predictor of the likelihood of current violence.

Results for the instrumental variables estimates are reported in Table A2.1. Columns (1) and (4) report the first stage estimates for some violence (verbal and/or physical) towards the child. Estimates indicate that children being exposed to violence in 2010 are more likely to suffer violence in 2012. Point estimates for the PPVT test scores (column 2) and the probability of being in the low category (column 3) increase, however, the effect of violence is significant only for the low category variable. For the socio-emotional outcomes (columns 5 and 6), the point estimates are similar in magnitude to the OLS estimates and indicate the same direction of the effects, but since I.V. estimates have substantially larger standard errors, the point estimates are not statistically significant. Overall, our I.V. estimates suggest that OLS underestimates the effect of violence on cognitive skills, while results for socio-emotional development are similar in magnitude.

**Table A2.1. Instrumental Variables estimates of the effect of violence toward children**

| | Cognitive Outcome: PPVT | | | Socio-emotional Outcome: CBCL Test | | |
|---|---|---|---|---|---|---|
| Variables: | 1st stage Dep. Var: Some Violence '12 (1) | Standardized test scores (2) | Low PPVT Category (3) | 1st stage Dep. Var: Some Violence '12 (4) | Standardized test scores (5) | Risk CBCL Category (6) |
| Some form of violence (2012=1) | | -9.038 | 0.589* | | 1.056 | 0.0769 |
| | | (12.26) | (0.327) | | (8.007) | (0.325) |
| Some form of violence (2010=1) | 0.0554*** | | | 0.0495*** | | |
| | (0.0172) | | | (0.0159) | | |
| TVIP 2010 | | 0.419*** | | | | |
| | | (0.0206) | | | | |
| PPVT 2010 in low level categories | | | 0.189*** | | | |
| | | | (0.0211) | | | |
| CBCL 2010 | | | | | 0.403*** | |
| | | | | | (0.0240) | |
| CBCL 2010 in Risk or Clinical range | | | | | | 0.236*** |
| | | | | | | (0.0156) |
| Male | 0.0312** | -2.048*** | 0.0224 | 0.0268** | 0.672* | 0.0361** |
| | (0.0128) | (0.640) | (0.0168) | (0.0117) | (0.363) | (0.0149) |
| Mother's education | -0.00631** | 0.620*** | -0.0090*** | -0.00691*** | -0.311*** | -0.016*** |
| | (0.00264) | (0.129) | (0.00335) | (0.00244) | (0.0792) | (0.00326) |
| Number of Children | 0.0197*** | -0.911** | 0.000932 | 0.0114 | -0.455** | -0.0155* |
| | (0.00763) | (0.387) | (0.0104) | (0.00704) | (0.201) | (0.00811) |
| Mother has a partner | -0.000395 | -0.244 | -0.00283 | -0.00837 | -0.810** | -0.0309** |
| | (0.0162) | (0.655) | (0.0171) | (0.0145) | (0.363) | (0.0154) |
| Mother is Head of Household | 0.0181 | -1.936** | 0.0336 | -0.0108 | 0.189 | 0.0122 |
| | (0.0211) | (0.867) | (0.0229) | (0.0188) | (0.461) | (0.0199) |

**Table A2.1 (continued). Instrumental Variables estimates of the effect of violence toward children**

| | | | | | | |
|---|---|---|---|---|---|---|
| WAIS Numeric | -0.00362 | -0.0819 | 0.00245 | -0.00431* | -0.0403 | -0.00383 |
| | (0.00256) | (0.115) | (0.00295) | (0.00236) | (0.0671) | (0.00281) |
| WAIS Vocabulary | 0.00237 | 0.377*** | -0.0087*** | 0.00235 | -0.125** | -0.0044** |
| | (0.00213) | (0.0941) | (0.00254) | (0.00191) | (0.0541) | (0.00221) |
| BFI Agreeableness | 0.00766 | 0.120 | -0.0158 | -0.00541 | -0.176 | -0.00456 |
| | (0.0124) | (0.499) | (0.0134) | (0.0111) | (0.274) | (0.0116) |
| BFI Extraversion | 1.52e-05 | 0.793** | -0.00979 | 0.00393 | -0.0466 | 0.000511 |
| | (0.00960) | (0.381) | (0.0105) | (0.00881) | (0.213) | (0.00914) |
| BFI Conscientiousness | 0.0389*** | 0.591 | -0.0387** | 0.0305*** | -0.503 | -0.0305** |
| | (0.0124) | (0.679) | (0.0182) | (0.0114) | (0.372) | (0.0153) |
| BFI Neuroticism | 0.0301*** | 0.191 | -0.0269* | 0.0255*** | 0.859*** | 0.0562*** |
| | (0.00919) | (0.515) | (0.0137) | (0.00843) | (0.264) | (0.0114) |
| BFI Openness to experience | -0.0107 | 0.255 | 0.00132 | -0.0115 | 0.304 | 0.00722 |
| | (0.0116) | (0.473) | (0.0126) | (0.0105) | (0.271) | (0.0112) |
| Parenting Style Index | 0.0387*** | -0.891 | -0.00901 | 0.0276*** | 1.400*** | 0.0416*** |
| | (0.00690) | (0.551) | (0.0146) | (0.00650) | (0.270) | (0.0112) |
| Constant | 0.0512 | 29.84*** | 0.907*** | 0.606*** | 46.31*** | 0.739** |
| | (0.236) | (9.386) | (0.247) | (0.215) | (6.827) | (0.291) |
| Observations | 4,318 | 4,318 | 4,318 | 5,322 | 5,322 | 5,322 |
| R-squared | 0.052 | 0.217 | -0.185 | 0.043 | 0.234 | 0.184 |
| Mean Dep. Variable | 0.227 | 106.1 | 0.202 | 0.234 | 54.87 | 0.347 |
| Partial R-squared | | 0.003 | 0.003 | | 0.002 | 0.002 |
| F-statistic (Weak instruments) | | 10.2 | 10.1 | | 8.6 | 9.1 |

Source: 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, mother had mental health problem during pregnancy, 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 residence. Robust standard errors clustered at the child level in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.